Coping with Hard Times in NW Iceland: Zooarchaeology, History, and Landscape Archaeology at Finnbogastaðir in the 18th century

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ABSTRACT:
During a cooperative archaeological project in NW Iceland (Strandasýsla) involving the Icelandic National Museum and Hunter College of the City University of New York.1990 season, a small rescue excavation at the site of Finnbogastaðir generated a quantifiable collection of animal bones dating to the early modern period, mainly to the 18th century. The 18th c was a period of hardship in much of Iceland, with widespread tenantry, adverse climate, and degradation of many terrestrial landscapes posing severe challenges to poor farmers- perhaps most intensely in the Vestfirðir. The animal bone collection from Finnbogastaðir reflects a multi-stranded subsistence economy involving seals, birds, and fish as well as domestic stock. Reconstruction of the fishing pattern indicates a mixed strategy that probably produced some stockfish for local exchange or for export but was mainly aimed at household provisioning. The nearly contemporary Jarðabók land register provides a direct comparison to the documentary record, and ongoing site survey and excavation in the NW provides a broader landscape/seascape perspective on the archaeofauna and documents. This small rescue investigation thus serves to illustrate the potential for an integrated, interdisciplinary approach to Iceland's past, including periods with extensive documentary resources.

KEYWORDS: ***North Atlantic, Iceland, Early Modern, Zooarchaeology, Jarðabók, Landscape Archaeology***

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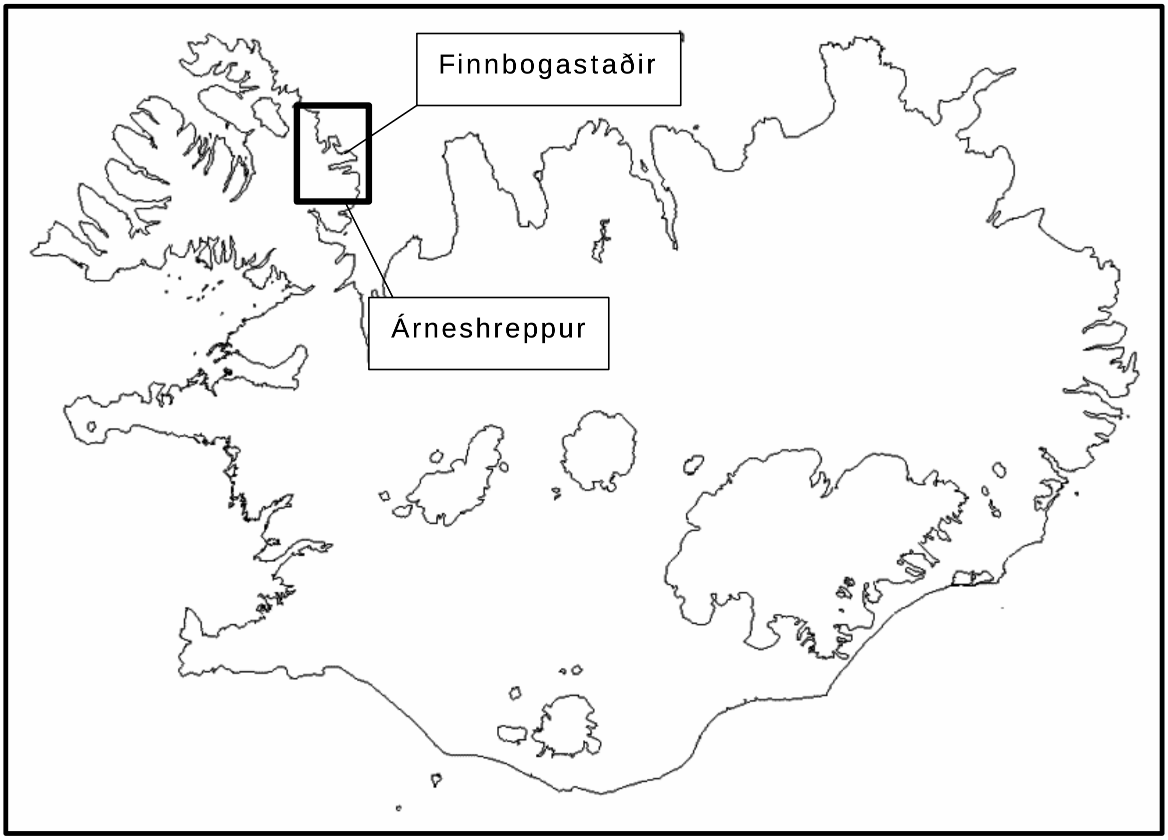
Introduction: The Region

This paper provides a report of the analysis of an animal bone collection excavated in 1990 from 18th-early 19th c deposits at the site of Finnbogastaðir, Árneshreppur, Strandasýsla, NW Iceland (*Vestfirðir*) and seeks to place the results in the larger context of early modern economy in the region through the integration of historical documentary sources and an ongoing program of landscape archaeology in the region. The district (*hreppur*, plural *hreppar*) of Árneshreppur covers a larger area than most hreppar in the south and south



west of Iceland, and takes in a landscape of deep narrow fjords, narrow glacial valleys, and high mountains (Figure 1).

There is little area that can be cultivated between the mountains and the sea and by the later 19th c the farmers in the area were known for a wide ranging subsistence strategy. The major resources of the NW in the 19th c included fishing, sealing, egg collection, bird hunting, driftwood, and the windfalls provided by the stranding of both whales and ships (Krístjansson 1980). In the mid 19th century there were 27 farms in the Árnes district and in the beginning of the 20th century this number had increased to 50 farms. This expansion was a result of increased fishing which affected the whole of Iceland at the time. However, decline in fishing from the mid 20th century onwards has caused farms to be abandoned, especially in the NW. In 2000 there were only 8 farms still occupied in the area, and there is now a real concern for the long term viability of the community as a whole. The changing demography of this now marginalized region cannot be fully understood without reference to a properly historical ecology which can both document prior shifts in population and identify coping strategies employed by prior generations in this area. The NW has long suffered hard times as well as periods of prosperity, and a better understanding of past conjunctions of market and subsistence economy, rapid social change, and climate fluctuation is required if effective strategies for a genuinely sustainable present and future are to be devised and implemented.

The image scholars have traditionally had of Árneshreppur, and indeed of the whole of the Northwest, is of a poor region where residents had to struggle just to stay alive as marginalized sheep -raising subsistence farmers. This image derives mainly from 19th century written sources describing the NW of Iceland at a time when political decisions, climatic cooling, and both local and regional economic changes had caused a general decline in the area. In fact, little is known about the economic organization in earlier periods, though there is some documentary evidence that suggests that during the medieval period the Vestfirðir peninsula was an important resource center for rich farmers both within the district and outside it. Archaeological investigations since the 1990 cooperative *Icelandic Paleoeconomy Project* that are combining survey, excavation and interdisciplinary analysis integrating paleoclimatology, zooarchaeology, archaeobotany, and geoarchaeology are steadily improving our understanding of this poorly known region. Radiocarbon dates on layers from both fishing booth sites and farm middens in Árneshreppur demonstrate an active use of marine resources and probable participation in commercial-scale fisheries in the 13th-15th centuries (Perdikaris et al 2003). The possibility for connecting high-resolution paleoclimatology with archaeology and history in the NW is generating widespread interest in the area both in Iceland and abroad and a fresh program of coordinated interdisciplinary investigation is now underway (see Edvardsson 2002). This paper seeks to contribute to this new program of research by combining archaeological and documentary evidence for 18th c economic response of small farmers in Árneshreppur to harsh social and environmental conditions.

The Excavation at Finnbogastaðir

The Finnbogastaðir archaeofauna (archaeological animal bone collection, for terminology see Reitz & Wing 1999) was collected in the summer of 1990 as part of a larger cooperative *Icelandic Paleoeconomy Project* involving the National Museum of Iceland and the City University of New York. The work at Finnbogastaðir represented a small-scale rescue project following the accidental discovery of a bone-rich midden deposit directly outside the modern farmhouse in the course of driveway extension work by the farmer. With the kind cooperation and warm hospitality of the modern family, our team was not only able to recover bones from the spoil displaced by the driveway work but also to cut back the working face and collect more material from *in situ* contexts and to draw profiles. The total area excavated was 1.1 m x 3.0m in area, and extended 80 cm below modern ground surface. The work in 1990 completed only the rescue excavation necessary for the driveway extension but did not reach the base of the archaeological deposit in any area. All excavated material was sieved through 4 mm mesh dry mesh, including the spoil heap created by the initial non-archaeological excavation. Artifacts recovered (ceramics and a single kaolin pipe stem) indicate that the deposits sampled extend from the early 18th to early 19th centuries, with the most productive context (context 6) probably dating to the first quarter of the 18th c (Amorosi 1996). Finnbogastaðir is a substantial archaeological site, with much more extensive deposits directly around the modern farm building. This small rescue excavation provides only a very partial sample of the later phases of the farm midden deposits, and has all the limitations of a small-scale trench excavation. However, the rich midden layers did produce a quantifiable archaeofauna with an identified bone count (NISP) of 6,410 fragments out of a total collection (TNF) of 7,379 bone fragments, providing the basis for an initial discussion of economic strategies in the early modern period at this farm and material for comparison to 18th c documentary records and landscape archaeology.

Laboratory Methods

Analysis of the Finnbogastaðir 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 (no goat bones were in fact positively identified from this collection). Fish identifications follow the most current ICAZ Fish Remains Working Group recommendations (including most cranial and vertebral elements), with only positively identified fragments being given species level identification (thus creating the usual large cod-family or *gadid* category as well as a substantial number of unidentified fish bones). Following NABO Zooarchaeology Working Group recommendations and the established traditions of N Atlantic zooarchaeology we have made a simple fragment count (NISP) the basis for most quantitative presentation. Measurements (Mitoyo digimatic digital caliper, to nearest mm) 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 7th 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 are 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.

Taphonomic Evidence

Tables 1-3 summarize the evidence for some of the many taphonomic forces that differentially affect the survival of animal bone in different archaeofauna (Lyman 1994) and provide a comparison between the Finnbogastaðir collection (rural early modern site) with archaeofauna from Tjarnargata 3 c in downtown Reykjavík (proto-urban early modern site) and from Sveigakot in Mývatnssveit (rural mid 10th c site) analyzed by the same team and recorded using the same methods (Perdikaris et al 2002, McGovern in Vésteinsson 2003). Bone fragmentation categories (table 1) are similar in the two rural sites, with most bone fragments clustering in the 1-5 cm size range. The presence of a higher proportion of larger bones in the urban context of Tjarnargata 3 c may reflect a somewhat less complete processing for marrow extraction.

Table 1	Finnbogastaðir		Tjarnargata 3 c		Sveigakot "M"	
Fragment size	Count	%	Count	%	Count	%
Up to 1 cm	1450	19.55	208	6.14	1505	20.65
1 cm- 2 cm	2605	35.13	423	12.49	3240	44.45
2 cm-5 cm	2606	35.14	1146	33.84	2247	30.83
5 cm-10 cm	660	8.90	1117	32.98	225	3.09
>10 cm	94	1.27	493	14.56	70	0.96

Table 2 presents the count and percentage data for burning at the same three sites. In both the early modern sites the proportion of strongly burnt (white calcined) bone is lower than in 10th c Sveigakot, a pattern that may relate to changing refuse disposal habits and to the shift from a central hearth to more elaborately constructed stoves providing less immediate access for casual disposal of meal scraps.

Table 2	Finnbogastaðir		Tjarnargata 3 c		Sveigakot "M"	
Burning	Count	%	Count	%	Count	%
Unburnt	7146	96.39	3135	92.56	5005	81.42
Blackened	26	0.35	114.00	3.37	157	2.55
White (calcined)	242	3.26	79.00	2.33	971	15.80
Scorched	0	0.00	59.00	1.74	14	0.23

Table 3 presents the animal tooth markings for the same three sites, indicating the generally low frequencies of tooth marks of any species on any Icelandic sites. The mix of dog and rodent tooth marks at both the early modern sites is interesting, but probably should not be interpreted as evidence for significantly higher levels of rodent infestation in later periods.

Table 3	Finnbogastaðir		Tjarnargata 3 c		Sveigakot "M"	
Gnawing	Count	%	Count	%	Count	%
None	7365	99.81	69426	99.94	7275	99.81
Dog	11	0.15	27	0.04	14	0.19
Rodent	2	0.03	13	0.02	0	
Dog & Rodent	1	0.01	2	0.01	0	

Our available taphonomic indicators thus suggest that the Finnbogastaðir archaeofauna is not radically different in its formation processes and taphonomic history from other Icelandic animal bone collections and may reasonably be used for comparative purposes.

Overview of Species Present

Table 4 presents the fragment count for all bone-bearing contexts at Finnbogastaðir, including the unstratified (00) sieved spoil of the initial machine excavation.

Table 4 Finnbogastaðir

Fragments Identified	***Stratigraphic unit***									
Taxon	***00 spoil***	***1***	***8***	***9***	***10***	***11***	***13***	***14***	***15***	***Total***
Domesticates										
Cattle (*Bos taurus dom*. L.)					1	16				23
Sheep (*Ovis aries dom.* L.)	51	1		5		40	1	1	3	102
Caprine	83	11		1	1	27	1	3		127
Cetacea										
Large whale species indet.	26	4	1	1		1				33
Seals										0
Harbor seal *(Phoca vitulina* L.)	20	4		1		16				41
Seal species indet.	16	1				17				34
Birds										0
Guillemot/Murre (*Uria* sp.)	7	1			1				1	10
Eider (*Somateria mollis*. L)	1									1
Fulmar (*Fulmaris gla*c. Erch.)	1									1
Red throated diver (*Gavia stellata* L.)	1									1
Gull species (*Laridae*)	2									2

Bird species indet.	24	2		1						27
Fish										0
Atlantic cod (*Gadus morhua* L.)	984	33	1	49	39	697	2	5	3	1813
Haddock (*Melanogrammus aelgf*. L.)	28	5		1	7	17	2			60
Ling (*Molva molva* L.)	19	2				18	3			42
Saithe (*Pollachius virens* L,)	7			6	17	50				80
Torsk (*Brosme brosme* L.)						8				8
Cod family (*Gadidae*)	423	25	1	14	11	330	2	2		808
Wolf fish (*Anarch. lupus* L.)	18					1				19
Halibut (*Hippogl* sp)	4					5				9
Greenland shark (*Somin. microceph*.L)				1	1					2
Ray species (*Rajidae*)		1			1					2
Flat fish species	5					2				7
Fish species indet.	1181	78	3	152	52	944	7	1		2418
Mollusca										0
Mussel (*Mytilus ed*. L)	231	18	4		6	40	66			365
Common whelk (*Bucc*. sp.)	1					2				3
Clam sp. (*Mya* sp.)	12					1				13
Periwinkle (*Littorina nest. L.*)	1									1
Mollusca species indet.	356				2					358
Total NISP	3,508	186	10	232	139	2,232	84	12	7	6,410
Large Terrestrial Mammal	17	1				10			1	29
Medium Terrestrial Mammal	299	24	4	5	1	107	4	1	2	447

Unidentified mammal fragments	273	45		23	15	113	3	15	6	493
Total TNF	4,097	256	14	260	155	2,462	91	28	16	7,379

As table 4 indicates, the great majority of the *in situ* bone collected came from the densely packed context (layer) 11 and from the unstratified spoil already disturbed by the machine excavation, which almost certainly also largely derived from context 11. As it was clear in the field that the bone from the spoil came entirely from this unit and the time range (18^{th} c) suggested by the artifact collection is fairly restricted, it seems reasonable to treat the archaeofauna as a unit (with the understanding that the great majority of the bone derives from the earlier half of the century). Figure 2 presents the overall distribution of identified bone fragments (% NISP), which are made up mainly of fish bone but with significant numbers of domestic and wild mammals, birds and mollusca.

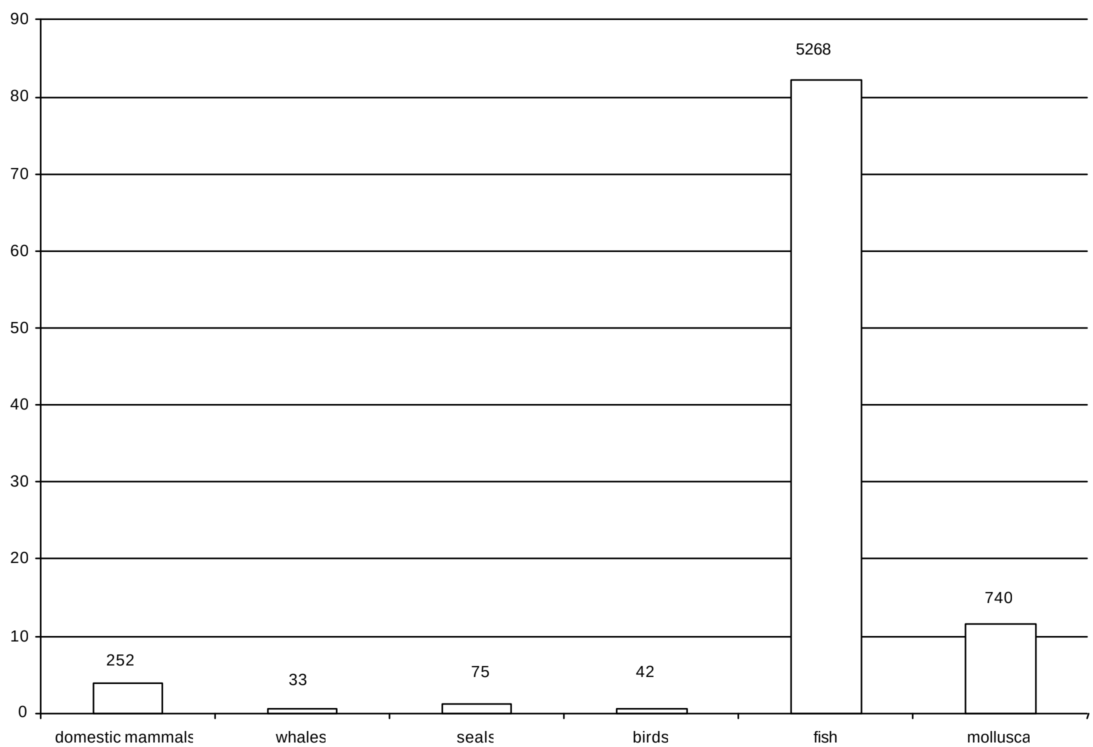


Figure 2

Domestic Mammals:

The identified domestic mammals are cattle (9.13 %) and sheep or caprine (90.87%). As is common in late medieval and early modern contexts in Iceland, pig and goat bones are entirely absent and it is likely that the entire “caprine” category (fragments that could belong to either sheep or goat) is in fact composed of sheep. The approximate ratio cattle bone to caprine bone is approximately one to ten. Dog, cat, or rodent bones are not present in the archaeofauna, but (as noted above) tooth marks of both dog and rodent (probably mouse) chewing are present on several bones.

Domesticates age at death:

The Finnbogastaðir archaeofauna provides too few domestic mammal bones for any complete discussion of domesticate herding strategy based on inferred age of death of the cattle and caprines, but it may be useful to record what indications are available.

Table 5 presents the percentage of bones that were of newborn calves and lambs (neonatal, less than one month old in most cases).

Table 5	% Neonatal
Cattle	21.74
All Caprine	1.20

While there are a few very young lamb bones in the collection, almost all of the caprine remains recovered come from adults or juveniles at least several months old. Very young lamb bones may represent stillbirths or culling of twins to protect the health of an ewe that was sickly or suffering from limited winter feeding. By contrast, the much larger number of young calf bones reflects the normal Icelandic pattern (from 9th c archaeofauna onwards) of culling most young cattle shortly after birth as part of a normal dairying economy (see discussion in Halstead 1998). The Finnbogastaðir collection thus parallels other known Icelandic archaeofauna in suggesting cattle keeping strategies focused tightly upon dairy production rather than management for meat production, a tradition extending back to first settlement (McGovern in Vésteinsson 2003).

Unfortunately, the sample size from Finnbogastaðir is not large enough to allow an effective reconstruction of caprine herding strategy from the epiphyseal fusion of long bones (see data archive) and only ten sheep mandibles are available for analysis using the Grant (1982) scoring method (table 6). While both tooth eruption and wear are inherently variable, the usual correlations would indicate one mandible at or near birth (F-155), seven in the 4-9 month range, one in the 11-13 month range (F-23), and one fairly old adult (F-22).

Table 6 Sheep Mandible Wear States

ref #	Dp4	P4	M1	M2	M3
F-155	a				
F-172	f		a		
F-154	g		b		
F-21	g		b		
F-156	absent		d		
F-158	g		d		
F-16	h		g	B	
F-153	h		g	C	
F-23	k		g	D	
F-22		j	m	H	f

Domestic Mammal Butchery

The pattern of element distribution of both cattle and caprines includes all parts of the skeleton, cranial fragments, long bones, and toes (see data archive). This mixture of meat-rich and meat-poor elements suggests the usual Icelandic pattern of home butchery of stock and the deposition of both primary butchery waste and the remains of meal consumption into the same midden deposit. The collection shows many examples of the characteristic bi-perforation of caprine metapodials for marrow extraction, which involves circular holes in the proximal articular facet, and the plantar surface of the distal shaft. This method of marrow extraction allows preservation of the usefully shaped metapodials for craftwork and keeps bone splinters out of the rich metapodial marrow. The technique was widespread in the Shetlands, Faroe Islands, and Iceland after ca AD 1100 but has not been reported from Norse archaeofauna from Greenland or Norway, and appears to be a later medieval foodway developed in the N Atlantic islands (Bigelow 1985). The Finnbogastaðir collection also contains several examples of the ancient Scandinavian dish *svið* (a singed half sheep cranium split along the midline), still enjoyed in Iceland today. Such split crania of sheep and goats have been recovered from 9th c Icelandic collections, and Greenlandic collections indicate not only that the preparation method spread with the 10th c settlers but also that it was applied to caribou heads as well as caprines.

Wild Mammals

The wild mammals from Finnbogastaðir are all marine species, whale and seal. The whalebone fragments (none identifiable to species) are probably mainly from broken artifacts or from the debris of artifact fabrication, as nearly all show multiple tool marks. This pattern is familiar from other Icelandic collections, and as usual leaves the issue of whale meat contribution to the diet open (it is equally possible to bring home hundreds of kilos of boneless whale meat or to collect meatless bones for tool manufacture). The seal bones may be more informative. All seal bones that can be identified to species level (using the criteria of Møhl nd with minor additions) are harbor or common seals (*Phoca vitulina* L.) and 63% of the seal bones are from newborn pups less than two months old. This suggests a pattern of predation upon harbor seal pupping beaches similar to that documented extensively in Kristjánsson (1980) for the NW. Patterns of cut marks are consistent with the butchery methods illustrated in Kristjánsson (1980) and probably reflect use of both skins and meat.

Birds

As Table 1 indicates, birds make up a small portion of the Finnbogastaðir archaeofauna, and appear to be mainly Guillemot/Murre (*Uria* sp.) with trace elements of other species. The presence of the now-common fulmar is an additional temporal indicator, as this species appears to have immigrated to Iceland in the early modern period, probably spreading widely through the N Atlantic along with intensified offshore fishing in late medieval to early modern times (Petersen 1998)

Fish

Fish bones are the most common element of the Finnbogastaðir archaeofauna, and the great majority of these are from the cod (gadid) family. Figure 3 presents the relative abundance of gadid fish identified to species level, indicating the overwhelming dominance of cod (*Gadus morhua* L.) within this group.

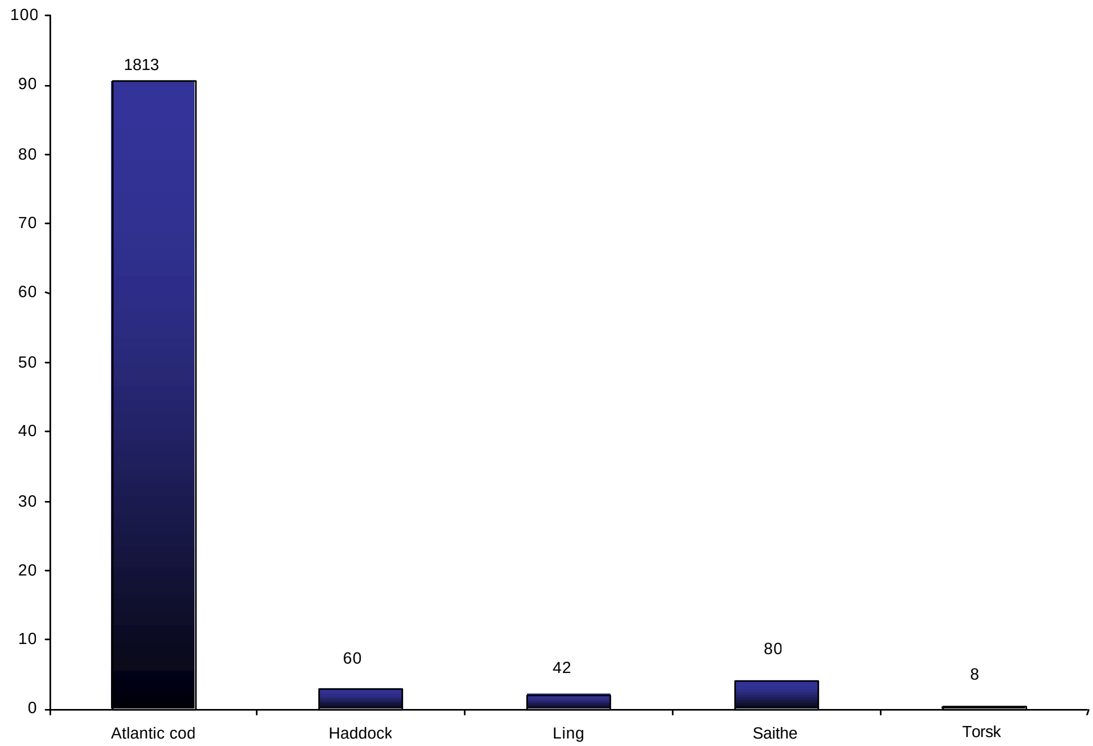


Figure 3

The relatively few non-gadid fish remains belong to five taxa, including wolf fish, shark, flatfish, and rays. The most common non-gadid is *Anarchus lupus*, wolf fish (represented primarily through dense cranial bones and teeth). Wolf fish is a common by-catch with gadids, and long been exploited in Iceland for its meat and (recently) for its leathery skin. Also represented by the presence of teeth is the Greenland shark, *Somniosus microcephalus*. The Greenland shark is a large, sluggish, deep-water shark, with pointed upper teeth, and relatively flat lower teeth, feeding primarily on seals, crabs, and fish (Migdalski, 1976). The presences of these shark teeth are the only evidence for the historically documented shark fisheries carried out in this district down to recent times (centered on both the Greenland shark and the larger Basking shark). Shark bone is soft and cartilaginous and is not preserved in most depositional contexts, so the low frequency of identifiable shark remains in this archaeofauna need not reflect the actual economic importance of shark fishing. In addition to Greenland shark and wolfish, at least two species of flatfish are present. Most identifiable of these is the Atlantic halibut, one of the largest of the flatfishes. Thornback rays are represented by teeth only.

Fish skeletal element frequency

The distribution of the different portions of the fish skeleton recovered from archaeological sites has been used to trace inter-regional trade in preserved fish and to aid the recognition of specialized sites producing preserved fish for an external market (Perdikaris 1999). Large cod-family (gadid) fish are usually processed by gutting and beheading, and the stripping out of a variable number of the upper (thoracic) vertebrae (depending on the preservation method used). Specialist production sites near the landing point thus should have many cranial and upper vertebral bones, while consumption sites far from the coast should lack most of these same bones. Subsistence fishers eating their own catch as fresh fish should generate middens with a balance of skeletal elements more similar to that found in live fish. Zooarchaeologists often use the MAU measure (minimum animal unit, see Reitz & Wing 1999), which divides the bones found per skeletal element by the number of times it appears in the live fish to allow for a direct comparison of different parts of the skeleton, as a tool for investigating patterns of differential deposition and survival. An MAU score converted to percentages should show equal numbers for each element in the unlikely event that all survive to reach the analyst's laboratory in actual anatomical proportion. In practice, different densities and fragmentation patterns of different elements of fish skeletons heavily affect the survival and recovery of many individual elements, so most workers tend to use the MAU % of groups of elements for comparisons (upper, middle, lower vertebrae, larger skull parts) rather than individual bones (Enghoff 2003).

Figure 4 uses MAU % to compare the distribution of cod (*Gadus morhua*) grouped skeletal elements recovered from Finnbogastaðir (FBS) and from 18th-19th c deposits from Tjarnargata 3c in downtown Reykjavík (TJR) and from 10th-11th c deposits from the rural farm site Sveigakot (SVK). The Tjarnargata 3 c deposits are definitely the refuse of a fully commercial fishery in large-scale production of cod for export (mainly as stockfish) and show a full range of skeletal elements with a predominance of bones from the head and jaws (Perdikaris et al 2002). The Sveigakot (SVK) cod bone collection comes from an inland site nearly 60 km from the shore, and lacks any jaw or upper head bones. The Sveigakot collection is made up entirely of vertebrae and the bones around the gill slit (mainly cleithrum) which are usually left in preserved fish to hold the body together (Barrett et al. 2001, Perdikaris et al 2003, Nicholson 1998). The depositional pattern of cod bones at Finnbogastaðir (FBS) appears far closer to the 18th-19th century Tjarnargata pattern, with a full range of cranial bones present, as might be expected in a site close to the shore.

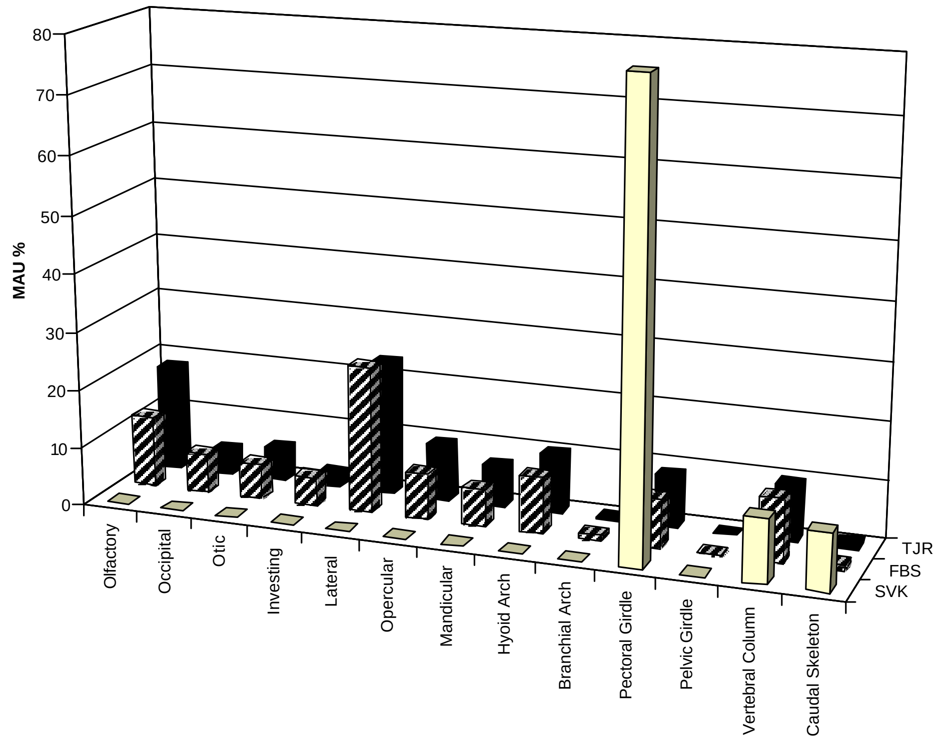
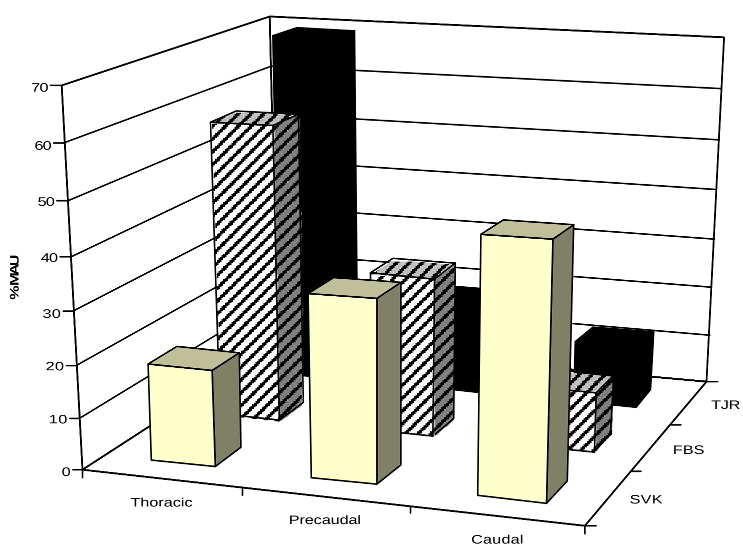


Figure 4

The distribution of vertebrae recovered can also shed light on the disposition of fish bodies once separated from their heads (a complete skeleton would show equal height bars for all vertebrae). Figure 5 again compares the same three sites. The consumer's site at inland Sveigakot clearly shows a surplus of lower



tail (caudal) vertebrae relative to upper vertebrae (pre-caudal and thoracic). The two early modern coastal sites show the reverse pattern of an apparent surplus of upper vertebrae and shortage of lower tail vertebrae normally exported in a preserved fish (either as dried stockfish or split salt fish). If the inland Sveigakot archaeofauna shows a "consumer's profile" (more lower body vertebrae, no head bones), both the Finnbogastaðir and Tjarnargata 3c archaeofauna show a "producer's profile" of more upper body vertebrae as well as many head bones. All sites were fully sieved to the same standard, so the patterning is not likely to reflect archaeological recovery.

Cod Length Reconstruction

Making use of regression formulae of Wheeler & Jones (1989) it is possible to reconstruct live length of many gadids from the measurement of preserved mouth parts (premaxillae and dentaries). Figure 6 presents the size reconstruction data for the cod at Finnbogastaðir. Both elements produce broadly similar patterns of distribution of reconstructed length, with the majority of specimens falling between 400 mm and 800 mm.

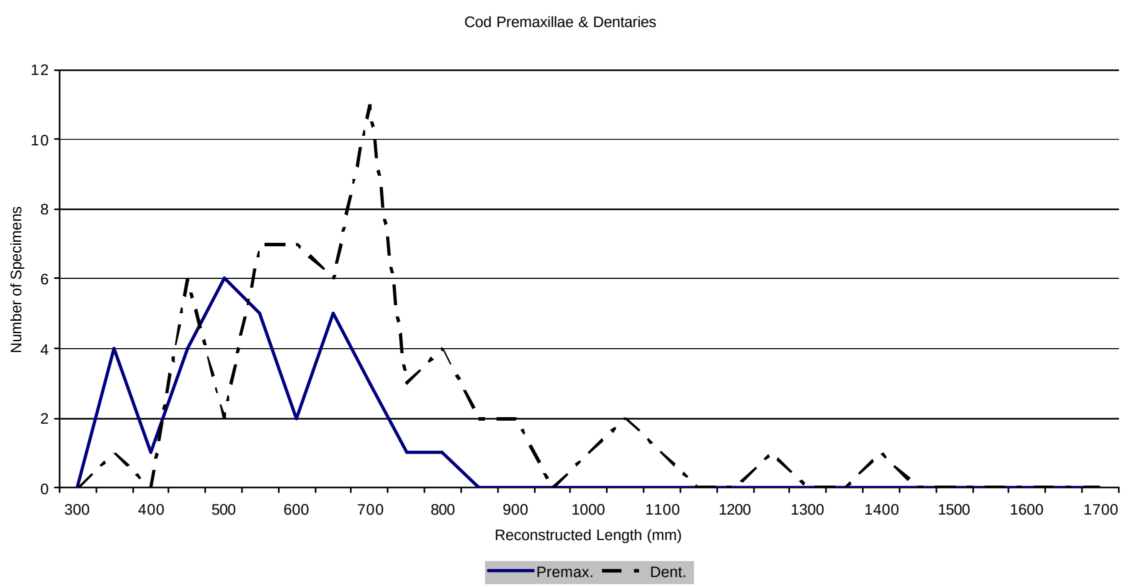


Figure 6

While a range of sizes of cod tend to be taken from the same waters with the same gear, only some size ranges cure well as stockfish. Figure 7 compares the length reconstructions based on cod dentaries for Finnbogastaðir, Tjarnargata 3 c, and the early modern layers of a small farm site *Miðbaer* on Flatey in Breiðafjord (Amundsen 2004), with the limits of the "stockfish window" indicated by vertical lines (x axis is rescaled with broader intervals to more realistically reflect the inherent limits of the reconstruction method). Fish much smaller than approximately 600 mm dry too hard, while fish much larger than 1100 mm tend to rot rather than cure. The fully commercial Tjarnargata 3 c cod reconstruction distribution peaks squarely in the middle of the stockfish window, the Miðbaer collection peaks clearly below the window, while the Finnbogastaðir reconstructions straddle the lower edge as well as including a few very large specimens above the stockfish window limits. If the Tjarnargata 3 c distribution typifies the zooarchaeological signature of selection for optimum stock fish production (with a by -catch of smaller individuals probably consumed locally) and the Miðbaer collection typifies a fishing strategy aimed almost entirely at local consumption, then the Finnbogastaðir distribution appears to fall between these poles. While the skeletal element frequencies from the Finnbogastaðir cod do suggest concentration of heads and dispersal of tail bones, the cod length reconstructions suggest that stockfish production for export can have been only one of many uses of this fish by the 18th c residents. Probably the best interpretation of these data would be as evidence of a mixed fishing economy aimed at both local subsistence provisioning and at small-scale stockfish production for export and local exchange.

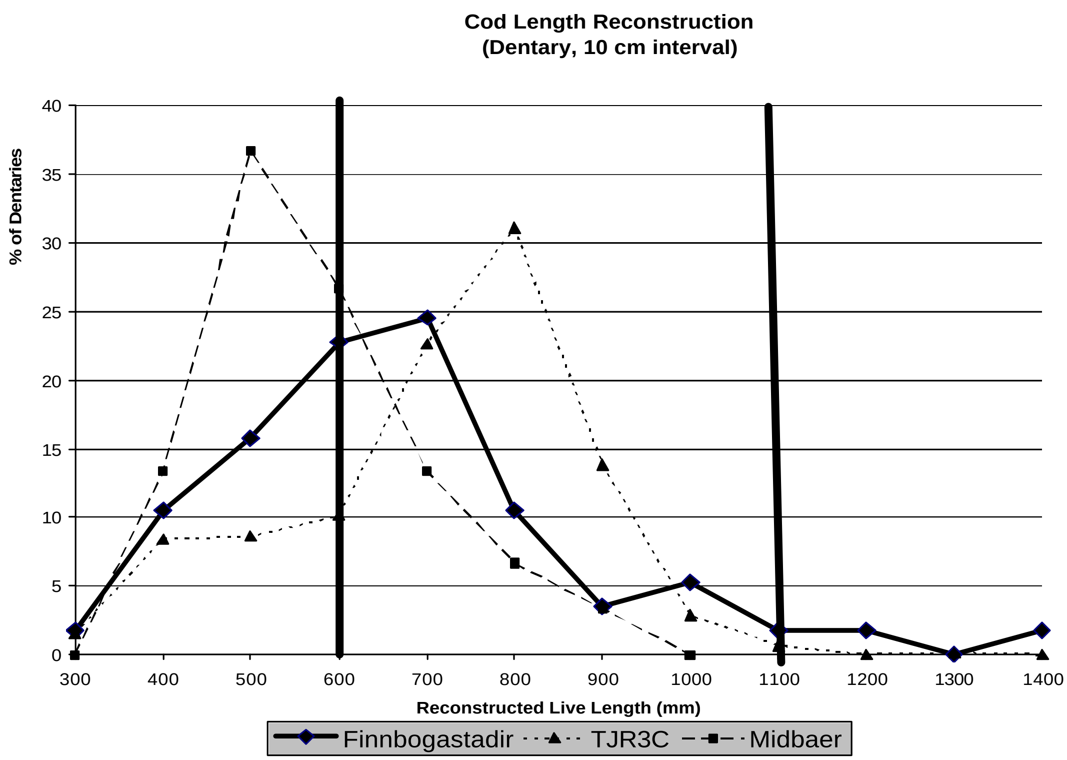


Figure 7

Historical Evidence

The written sources from the period of the deposition of the Finnbogastaðir archaeofauna are abundant and in some cases very detailed, giving actual numbers of domestic animals on farms and other relevant information about agriculture. Some records relate directly to the site of Finnbogastaðir during the period of deposition of the 18th c archaeofauna.

The earliest documentary records extend to the early Middle Ages. The farm Finnbogastaðir is named after the first settler Finnbogi rammi who settled in

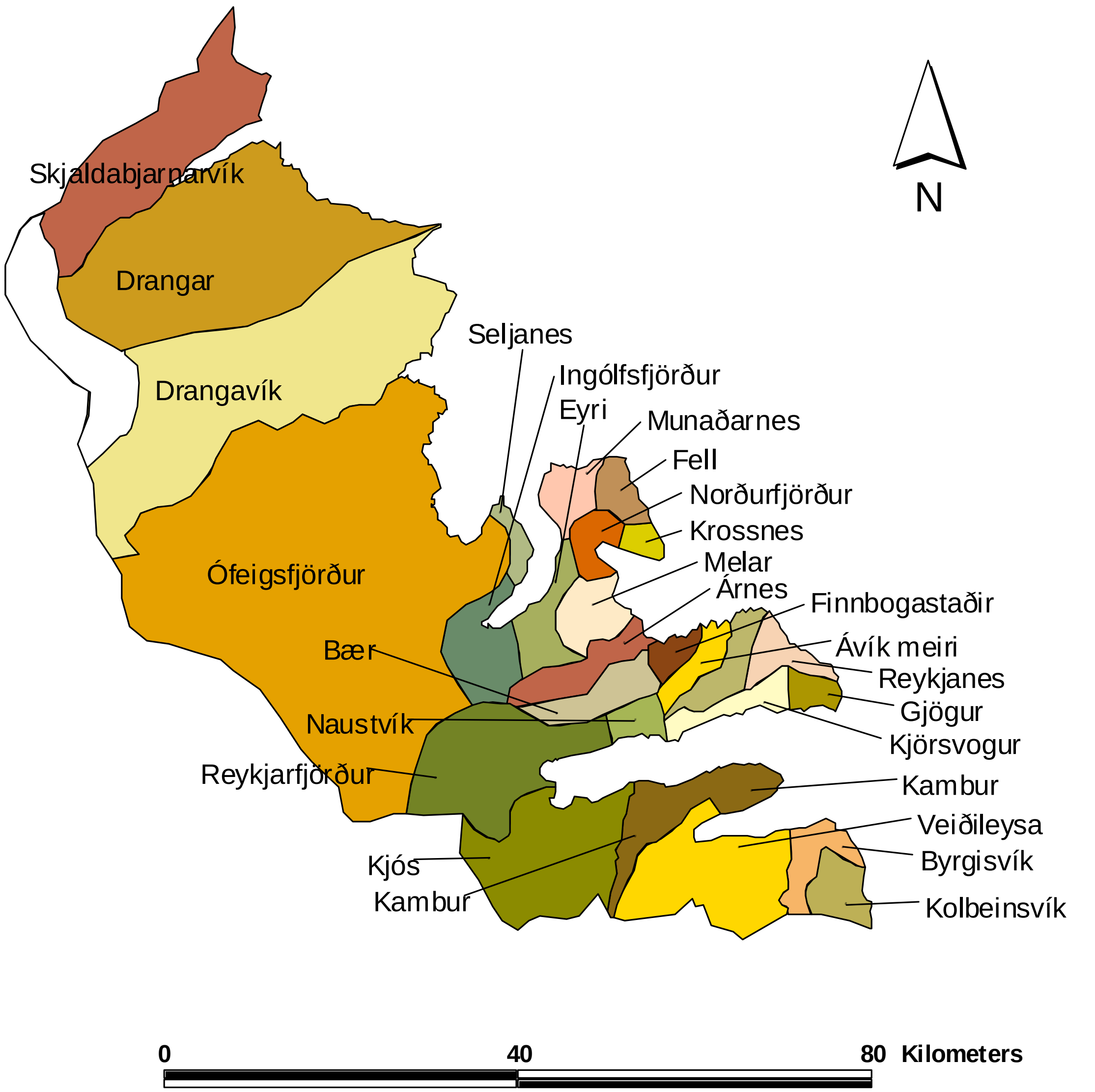


Fig.8 Farms in the Árneshreppur in the 18th cenury.

the area in the 10th century. "*Finnbogi became a chieftain and a ruler over those people, and everybody there liked him. He named the farm Finnbogastaðir where he lived and the farm was both large and magnificent. Finnbogi built a large church on his farm and hired a priest and he maintained everything that belonged to him in a good and proper fashion*." (Ísl.sag. IX., ed. Guðni Jónsson, 1953). Trans. Ragnar Edvardsson). Finnbogi had originally settled elsewhere in Iceland but moved to this area later (Ísl.sög. IX, ed. Guðni Jónsson, 1953). The reference to a church at Finnbogastaðir may suggest that Finnbogi had become Christian before he moved to the Árnes district and therefore his settlement in the area may be no older than late 10th century.

According to local legend the original site of the settlement farm of Finnbogi is not at Finnbogastaðir but at the next farm Bær (Örnskr.Finnbogast.). There are no references to a medieval church at Finnbogastaðir in the written sources except for the Sagas and no church ruins are visible at the site today. There are, however, ruins of a circular churchyard and a rectangular structure in the center at the neighbouring farm of Bær. It is quite possible that the original farm Finnbogastaðir was located were the farm Bær is now and was moved before the 14th century to its present location. Originally both farmlands belonged to the same farm and were divided into two sometime before the 14th century. In the 18th century the farm of Finnbogastaðir was valued 16 hundreds (old Icel. Monetary system) while Bær was valued 20 (Magnússon, Árni, 1940). This may also indicate that the Bær farm was the original farm and therefore valued more. It thus seems likely that the modern site of Finnbogastaðir sampled in 1990 is not the high status Landnám farm, but a later settlement.

The Jarðabók record

In the early 18th century the Danish king ordered a census to be taken and the collection of farm data for a land registry for all farms in Iceland. The main aim of the land registry was to better administer taxation upon Icelandic farms and to gain a general overview of the resources of the country. In the period between 1702 and 1712 two Icelanders Árni Magnússon and Páll Vídalín collected material from all parts of Iceland. The data for the land registry for the district of Árnes was collected in September 1706. The registry recorded 29 farms in the area, 5 farms were not occupied at the time. The church owned 7 farms, king 13 and 9 farms are privately owned (Magnússon, Árni, 1940 edition). Prior the 15th century the king did not own any farms in the district and most farms were privately owned except for few farms belonging to the church. By the reformation in the mid 16th century the king had acquired farms in the area as elsewhere in Iceland.

The Jarðabók register allows some broad inter-regional comparisons of prevailing stock raising practices. Table 7 compares the records for the main domestic animals (milk cows, milking ewes, weathers) and the number of these per farm from three districts Árneshreppur (NW), Reykjahlíðar (NE- valley near sea level), and Mývatn (NE- inland higher altitude). It seems clear that while all three districts kept the same mix of stock, both absolute numbers of animals per farm and the proportion of stock maintained differ across 18th c northern Iceland.

Table 7	Mývatn. 1712	Reykjahlíðar.1712	Árnes. 1706
Farms	18	61	35
Milking Cows	66	199	50
Milk ewes	962	2323	322
wether/old wether	680	1532	132
total	1708	4054	504
Major stock per farm	95	66	14

Not only do the farms in the NW keep far fewer domestic animals, but their mix is tilted much more heavily towards food production rather than wool production, with a proportionally higher percentage of milk cows and milking ewes relative to wethers. Sturla Friðriksson (1972) estimated that under conditions of traditional Icelandic agriculture (before the mid-19th c) it took the product of 9 ewes to sustain one adult, with 6 ewes equaling one cow. If we use these figures as a rough guide, it is possible to show that in the Árnes district the total number of animals could not possibly sustain the number of people actually living on the farms in 1706, but the number of domestic animals in the Mývatn and Reykjahlíðar districts should have been able to sustain the number of people that were living in the area in 1712.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
18	,514	,264	,238	6,522

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
18	Regression	427,615	1	427,615	10,053	,004
	Residual	1191,051	28	42,538		
	Total	1618,667	29			

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
18	(Constant)	7,427	1,714		4,334	,000
	COWS	2,131	,672	,514	3,171	,004

Table 8. Multivariate regression for the Árneshreppur.

Further analysis (table 8) indicates that only about 26 – 30 % of income for farms in Árnes in 1706 were based on agriculture while the ratio is much higher for Mývatn- and Reykjahlíðar districts, about 60% in 1712 (Edvardsson 2003). These analyses indicate that the people of Árnes district in the early 18th century could not live on agriculture alone and must have based their income on resources not fully quantified in the land registry or any other historical source.

Finnbogastaðir in the Jarðabók Land Register

In the 1706 land registry the Finnbogastaðir farm appeared as a fairly typical farm in its district, valued at 16 hundreds, which was a mid-range farm for the NW area. Compared to the rest of Iceland the farm would be classified among the poorer farms. The entry for the farm reads in full:

> "***Finnbogastaðir***
>
> *Farm value xvi*
>
> *Kings farm, one of the farms in Strandasýsla, which the lawyer Lauridtz Christiansson Gottrup holds for the king.*
>
> *Jón Magnússon from Reykjanes rents this farm*
>
> *Occupants are Sr. Bjarni Guðmundsson one half, Brandur Björnsson the other half.*
>
> *Rent of land is i (hundred) according to proportion. Is paid in money to Jón Magnússon at Reykjanes.*
>
> *Cow values are iiii, ii with each occupant. Rents are paid usually in butter, sometimes with something else.*
>
> *No duties.*
>
> *Timber for house building comes from driftwood, such as hrökkur (Type of driftwood that easily crumbles). Occupants have recently renewed the cow values without getting any compensation for it.*
>
> *Domestic animals are, with Sr. Bjarni iiii cows, i young cow, xxiiii milk ewes, xii castrated weathers, vii winter old, ii lambs, ii horses. With Brandur are i cow, v milk ewes. Of the priest's domestic animals there are i young cow and ix weathers at Árnes.*
>
> *The priests household consists of the couple, their children iiii and iiii workers (male and female). The household of Brandur are the couple and their vi children.*
>
> *Peat is not enough for fuel. Seal hunting is sometimes successful. Driftwood and stranding is quite good. The church at Helgafell has rights to the driftwood and stranding according to the church deed The rights are between Skarð and the river estuary, half of a whale stranding and also one third of a half. Men do not think that the church has ever received this, and people speak against it. Little beach-pasture for sheep, sometime during winter. A home base is there.*
>
> *Sand damages the homefield. Outfields are damaged by water, and mudslides have destroyed parts of them. The meadow-road is difficult to travel. Winter is very hard. Domestic animals are in danger from mudslides, creeks and bogs. In some places there is flood danger. Storms are frequent and houses and fodder are in danger from them. Wells are bad and often dry out.*
>
> *The occupant Brandur owns a boat, which he uses for fishing during summer when he can. Sr. Bjarni owns a ship at Árnes which he uses in spring for shark fishing at the fishing station at Gjögur. He owns another boat which he uses for fishing when he can. He owns a part of another boat with Sr. Guðmundur and it is used for shark fishing ut supra.*
>
> *Within the farmland there are ruins and a field boundary, where a farm seems to have been at some time, but no one knows about it. This farm can't be rebuilt.*
>
> *In another place there are ruins called Litlanes. These ruins used to be a farm according to people in the area. The river Árnes has now destroyed most of them. This farm can´t be rebuilt.* " (Magnússon, Árni, Vídalín Páll, 1940. Trans.Ragnar Edvardsson).

The farm values are somewhat problematic as they were probably calculated at an earlier period, sometime around AD1100. From the period 1100 to 1706 a number of things have changed and some farms may have lost parts of their values. However, the sources indicate that the farm values for most farms have remained the same from their original calculation (D.I.I-IX). Cow value was the number of cows that ideally belonged to the farm. Statistical analysis of the farm values have shown that they were calculated from the number of domestic animals and all benefits that the farm had, driftwood, stranding, etc. (Edvardsson, Ragnar, 2003).

The Jarðabók entry reveals some patterns common to much of 18th c Iceland. A complex pattern of absentee land ownership was not unusual, in this case a four tiered structure extending from the actual occupants up to the King of Denmark, with a local farmer (Jón Magnússon from Reykjanes), providing oversight within the hreppur. Multiple tenant households within the same farm were also common in this period, with up to four sharing the same holding (not necessarily all occupying the same structure). The two tenant households occupying the farm at Finnbogastaðir in the late fall of 1706 were clearly of different economic (and probably social) status. The larger household was of Sr. Bjarni Guðmundsson, the local Lutheran priest. Sr. Bjarni maintained four servants (both male and female) as well as his wife and four children (it was not uncommon for poor tenants to have still more impoverished landless servants living in their households). Sr. Bjarni has a mix of milk cows, wethers, milk ewes, and two horses as well as younger cattle and sheep apparently being maintained over the winter with an eye to stock renewal. He also owned some additional stock maintained at the nearby church farm Árnes. The smaller household was that of Brandur Björnsson, who had only his wife and six children to support, but who also only had a single cow and five milk ewes. If we apply the Friðriksson provisioning formulae, both households appear to have had a provisioning shortfall: Sr. Bjarni had approximately 5.3 human rations to maintain his ten household members while Brandur had only 1.1 human rations to feed his family of eight. The households of early 18th c Finnbogastaðir, like the great majority of their contemporaries in Vestfirðir, must have relied on other resources to maintain bare subsistence. We are informed that seal hunting is sometimes successful and that both households have access to boats for fishing, but the register typically makes no attempt to quantify non-agricultural production.

Jarðabók and Zooarchaeology

The bone assemblage recovered from Finnbogastaðir corresponds in most respects with the information on stock keeping provided in the land registry. All animals mentioned in the registry are present in the assemblage and the ratio of cattle to caprine bones (1:9.96) in the archaeofauna matches the overall ratio of cattle to sheep in the registry (1:9.43). The seals mentioned in the entry appear as bones in the midden, and whalebones correlate with recorded (disputed) strandage rights. However the fish so dominant in the excavated archaeofauna are only indirectly mentioned in the Jarðabók account, and the documentary account provides no means to further investigate the marine resources that must have sustained the households of Sr. Bjarni and Brandur. The two types of evidence are complementary, and it may be more productive to synthesize their very different perspectives on the same economic strategies rather than to seek to privilege history over archaeology or the reverse. It will require a much larger bone sample than we now have to effectively reconstruct the sheep herding patterns so economically laid out in the land register, but even a relatively small archaeofauna such as the 1990 sample can quickly and effectively answer the question of the likely source of the missing resources that provisioned the early modern farmers of Árneshreppur- the sea. Our zooarchaeological evidence can also help fill in some of the missing pieces of the puzzle of how poor tenant farmers like Sr. Bjarni and Brandur managed to survive, especially if we add archaeological survey and landscape analysis evidence. Explaining the critical role of marine resources at this 18^{th} c tenant farm requires a broader, multi-disciplinary view of the contemporary social and environmental context.

Rural Poverty, Environmental Change and Strategies for Survival: By the 18^{th} century most Icelanders were tenant farmers, and many were extremely poor by any measure. The households of Sr. Bjarni and Brandur at Finnbogastaðir in 1706 may have represented two ends of a spectrum of relative wealth, education, and access to the wider world of enlightenment Europe, but both were certainly poor and struggling tenants. However, the two households on the Finnbogastaðir farm in the fall of 1706 (18 people in all sharing the same small site) were by no means the poorest of the poor. These were the landless paupers and sporadically employed migrant farmhands who caused such official concern and inspired often draconian legislation aimed at controlling the potentially dangerous wandering poor (who tended to have the highest mortality during times of famine, Vasey 2000). Most tenant farmers had single year leases, and would frequently move between farms (either voluntarily or driven by eviction). When a farmer moved a specified number of cows and sheep stayed at the farm for the next tenant, along with any improvements to farm buildings, pastures, or other immovable property. Tenants were formally required to maintain houses, fences, and farm buildings at their own expense. However, maintenance of structures on farms became a problem after 1700 because tenants moved so frequently that they considered it a waste of time and energy to rebuild farm buildings they could never own and would only briefly inhabit. Only minimum repairs were made to turf structures (which require annual maintenance and large scale rebuilding every 25-30 years), which caused many farms to become increasingly neglected and fall into ruin, prompting negative comments from Danish officials and improving great farmers (see Hastrup 1997 and Durrenberger & Pálsson 1989). Many tenant farmers in Iceland had to fulfill certain duties in addition to rent payments (usually in made in money and in kind, as at Finnbogastaðir) including different forms of labor service (Sr. Bjarni and Brandur were fortunate to escape these requirements at Finnbogastaðir). In the NW, tenants often had to man boats that belonged to the owner of the farm. In other places there were ferry duties, or other required services. Failure to meet all obligations of rent and service led to eviction, which usually resulted in the breakup of the household if not starvation.

By the 18th c, tenant households needed to produce cash (or its equivalent in store credit) as well as food in order to survive. Rent payments often required money as well as butter (as at Finnbogastaðir), and the small collection of imported ceramics and single kaolin pipe fragment recovered in 1990 suggest the occasional purchase of the imported luxuries so regularly denounced (as unsuitable for the poor) in contemporary sermons. Woolen clothing and bedding were also household requirements that may not have been met by local production. Several 18th c sources (esp. Skúli Magnússon (1784)) allow a rough calculation of the amount of wool needed to provide for the needs of an individual and many sources provide closely comparable estimates of the washed clip of Icelandic sheep (Orri Vésteinsson pers com 2003). While such calculations cannot be precise, a comparison of the estimated household woolen requirements vrs probable production provides some grounds for assessing the situation of the 18th c households at Finnbogastaðir (table 9).

Table 9 Jarðabók Finnbogastaðir

Household	Sheep fleeces needed for household consumption	wethers	ewes	total adult sheep
Sr. Bjarni	48	21	24	45
Brandur	38.4		5	5

While Sr.Bjarni may have been able to clothe his household from his own flocks (or come close most years), Brandur faced an insoluble shortfall. Neither tenant could have relied upon surplus wool production to generate significant cash income. Note that Brandur's household kept no wethers at all, and thus seems to have forgone specialized wool production entirely. Thus small tenant farmers needed to generate some surplus above the bare nutritional needs of the household to purchase goods they did not produce themselves and fulfill their many social obligations. Like many members of small-scale societies in the modern circumpolar north, these 18th c farmers needed a multi-stranded strategy for household survival that included elements of both a cash and subsistence economy.

In addition to harsh social conditions, Icelandic small farmers like the tenant families at Finnbogastaðir also were confronted by changing climate and geomorphologic challenges to agriculture (Ogilvie 1984 et seq). Three well dated recent sea cores taken just off shore from central Árneshreppur (off the farm Gjögur mentioned in the Jarðabók account above) by teams led by John Andrews and Anne Jennings (INSTAAR, U Colorado) support other paleoclimate evidence in indicating a prolonged cold interval in this district from 1650-1920 AD, based on carbonate accumulation and stable isotopic variations from benthic foraminifera (Andrews pers com 2003, Jennings et al 2001). By the 18th century erosion had also seriously begun to affect farmland all over the country. As both the brief *Jarðabók* notices and the longer accounts in the annual sheriff's letters of the 17th-18th c indicate, pastures and sometimes entire farmsteads were being lost to rapid wind erosion, destabilization of slopes, and sudden hydrological changes in river and stream regimes: landslides, floods, and denuded pastures are common complaints in most of the quarters of Iceland (Ogilvie 1984a, 2001). Many scholars somewhat devalue the accounts of property damage in the land registry as they suspect that the farmers were complaining and not giving an accurate description of their farmland because the registry was to be used for tax purposes. While farmers and tenants certainly had an incentive to stress any factors likely to reduce taxes, a range of paleoenvironmental studies indicate that adverse landscape changes were indeed widespread and that cooling climate did reduce pasture productivity and the amount of winter fodder that could be secured. The NW was also affected by sea ice in both winter and (in many years of the 18th c) in summer as well (Ogilvie and Jónsdottir 2000). Both the documentary and paleoenvironmental record starkly reveal the host of challenges facing small farmers in 18th c NW Iceland; the coping strategies they employed to survive are less well understood.

From the standpoint of a tenant farmer in 18th c NW Iceland, many agricultural practices advocated by enlightenment improvers (drainage ditching, field flattening, intensive manuring, more elaborate hay storage facilities) were complete wastes of scarce time and energy. Not only would most of the improvements serve to enrich the landlord (and probably generate a rent increase for the tenant) but their benefits would almost certainly be lost to the improving tenant due to eviction within a year or two. In addition, steadily worsening environmental conditions in the NW and widespread loss of pasture area and reduction of pasture productivity was increasingly making agricultural intensification a losing proposition for all but the richest farmsteads in the most protected locations. Instead of putting more effort into agriculture, NW tenant households would have been better served by an intensification of exploitation of wild resources. In the Árnes area most farms had access to abundant driftwood and stranding and some had access to salmon and trout rivers. However, as the Finnbogastaðir Jarðabók entry above indicates, by the 18th c most of these access rights had been acquired by a variety of distant secular and ecclesiastical land owners (note that strandage rights were mentioned as a point of conflict in the Jarðabók account). Sealing (from the zooarchaeological evidence directed at harbor seal pupping beaches) could provide small farmers with both rich meat and salable pelts, but a major intensification of sealing effort would be likely to simply drive the local harbor seal colonies to extinction or cause them to relocate in less accessible areas. The same problem limited the potential for expansion of sea bird exploitation. Gathering of mollusks (especially mussels) was a low risk, low investment strategy which could be pursued by children and the elderly, but which produced only a small volume of low value meat (shellfish were traditionally regarded as famine food in many areas of Iceland). While a range of wild food certainly supplemented the demonstrably inadequate household provisioning provided by agriculture, the only area which would be likely to repay intensification of effort by both producing more food for the tenant household and potentially providing a salable product would be fishing for gadids or sharks.

Marine Landscape Archaeology, Environmental Archaeology, and Economic History

The statistical analysis of the land registry data and the analysis of the bone data when placed in the context of coping strategies of a severely stressed local population may explain why fish, especially the Atlantic cod, was the main element in the economy of the farm as reconstructed by zooarchaeology. As suggested by the element distribution patterns and size reconstructions, Atlantic cod probably played a "dual" role for the farmers at Finnbogastaðir. The larger portion of the catch would be for domestic use and a small portion would be sold at markets to generate the cash income needed by these fisher-farmers. The nature of the shark fisheries is less clear from the zooarchaeology due to problems of preservation and attrition, and a single archaeofauna (from what is essentially a limited test trench) cannot shed much light on the cultural landscape and the spatial organization of resource use. Additional excavations aimed at better understanding the nature and layout of fishing stations combined with regional landscape survey may allow a better understanding of the processes behind the formation of the archaeofauna sampled at Finnbogastaðir in 1990.

Archaeological surveys and excavation on farms and fishing sites in the Árnes and neighboring Kaldrananes districts have shown that there is a regularity in the location of fishing sites in the landscape. All farms in both areas, except for those located inland have a *heimræði* (home base, i.e. fishing directly from their farms). Both districts have *verstöðvar* (fishing station) located somewhere within the boundaries of their districts. In the 18th century the Árnes district had a fishing station at Gjögur but prior to the 18th century two other *verstöðvar*, Akurvík and Ávík, were located in the area. It is interesting to note that all stations in the Árnes district are in a close proximity, in a radius of 6 km from each other. In the Kaldrananes district the main *verstöð* in the 18th century was at Skreflur but earlier another had been at Sauratún about 1 km south of Skreflur.

Farmers fishing from their *heimræði* would mainly catch smaller cod and other species which were not suitable for stockfish production but were for good for domestic use. The location of the *heimræði* was not that important for the fishing economy of the district but for the the farmers on the poorer farms the heimræði and the ready access to inshore fishing provided were often the determining factors between life and death. Heimræði were usually located anywhere along the shoreline were topography provided a safe landing and minimal shelter.

The location of a *verstöð* was more important as they were probably more specialized sites aiming more at optimizing access to target species and to deep water fishing in general. These *verstöðvar* were thus key elements in any strategy of large scale intensification of marine resource use, and especially for reliably producing the fish products that were more suitable for commercial purposes. Deep water fishing was focused on catching the larger sized cod which could be used for stockfish production and at shark fishing which was caught mainly for shark liver. Stockfish and shark liver oil were probably both the most important exchange items within the Árnes district and generators of cash income as both could either be sold at a market or stored at a farm for later use. Long term storability of stockfish and shark liver oil (up to several years) also provided a bit of flexibility to the domestic economies of NW farmers, allowing them to "bank" particularly successful catches against hard times.

Cultural Seascapes and Marine Catchments:

The sea provides as many constraints to free movement as the land, and is not well understood as a wet version of the locational geographer's theoretical uniform featureless plain. Added to the usual issues of geodesic and pheric distance, least effort constraints, and movement costs is the overwhelming role of hazard reduction in any marine sea-use strategy. Most fishermen died young in the 18th-19th c and the trade is still one of the world's most dangerous occupations. Wind and weather effects are highly variable in NW Iceland, but some recurring patterns will tend to condition access to the deep sea from different potential terrestrial landing points. Any *verstöð* had to be located as close to the deep water fishing grounds as possible so boats could reach the fishing grounds and return in the shortest time as possible. In the 18th c most fishing was carried out by small crews rowing 4 or 6 oared open boats. Exposure and fatigue (especially in winter fisheries) would take a steady toll on the crews, who were regularly described by 18th-19th c foreign visitors as exceptionally hardy but generally poorly clothed and equipped by contemporary British or Continental standards. Transit time to deep water fishing was important not only for least effort considerations but also for hazard reduction- prolonged survivability of these small open boats (on return voyage usually heavily overloaded and in winter subject to icing) attempting to ride out a gale on the open sea would be minimal and the only viable option open to a crew caught offshore by bad weather would be to run for a *verstöð* landing. Heavy surf and directly onshore wind would make any landing a dangerous "one chance" affair, and would greatly limit the ability of users of the *verstöð* to launch boats at all. Peninsula locations often provide more options for landing and recovery under different weather conditions than spots deep in a bay or fjord (like the *heimræði* of Finnbogastaðir). The ideal location for a *verstöð* thus would involve proximity to deep water, and an ability to successfully launch and recover boats from a variety of bearings in a variety of wind and surf conditions. These marine locational factors may regularly outweigh the considerations of terrestrial cultural landscape, and a good *verstöð* location need not be at a good farming location.

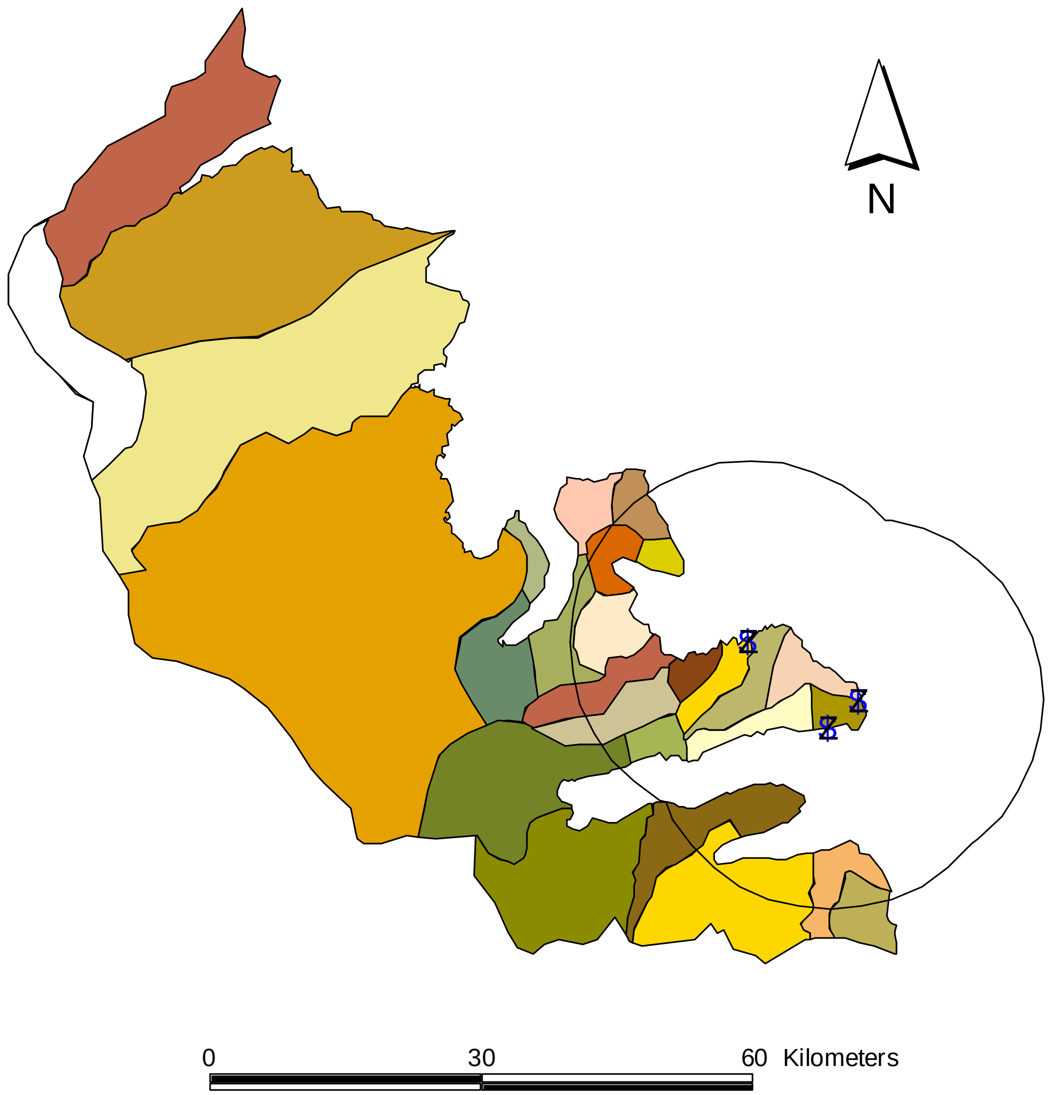


Fig. 9 Location of Verstöðvar in the Árnes district with 20 km catchments around them.

The *verstöðvar (pl.)* in the Árnes district in fact all clustered in a relatively small area at the end of the Reykjanes peninsula (figure 9). The area west of the Reykjanes peninsula was probably the richest area for both shark and large cod fishing in the early 18th century. Marine catchment circles around these fishing stations, with 20 km as the average distance for a boat with six oars on a single fishing trip, provide some scale. Sizes of boats in the Northwest varied from small boats with two oars to large boats with eight oars. The most common boat in the Northwest was the boat with six oars (Kristjánsson, 1980). The determining factor in locating a *verstöð* in Arnes district thus does appear to follow the broader model. About 80% of the farms in the Árnes district, including the Finnbogastaðir farm, would therefore be too far away from the best deep water fishing grounds, and their local farm fishing stations would have been hazardous bases for extensive off short fishing. During the fishing seasons many accounts describe farmers and farmhands moving to the *verstöð* to get access to the deep water fishing.

In the 18th century the poorer farmer Brandur at Finnbogastaðir had a small boat which he used for inshore fishing “when he could”. The richer occupant of the farm Sr. Bjarni owned several boats. One boat was used for fishing from the farm itself for domestic use, another specialized in shark fishing at the Gjögur *verstöð* and Sr. Bjarni also owned part in a third boat which was also used for shark fishing. This suggests that one of the Finnbogastaðir farmers was mainly subsistence fishing while the other was fishing on a larger scale, both for commercial and domestic consumption. The farmer at Reykjanes and primary tenant of Finnbogastaðir and other local farms, Jón Magnússon, owned three boats and part in other boats on different farms. In total he owned 7 boats. Two of his boats were used for shark fishing and one for general fishing, he also received a portion of the catch from the boats that he owned with other farmers. Most farmers in the Árnes district were fishing for subsistence but the three richest were also fishing for commercial purposes, and access to boats and *verstöð* stations (along with rent income and labor service) were clearly key elements in the strategies of these (still rather poor) local magnates.

The 18th century land registry also suggests that some form of specialization was taking place in the fishing industry in the area. Many farmers in the Árnes district owned boats that were specially outfitted for sharkfishing. At the Gjögur fishing station 9 boats were stationed there in 1706, six of them were outfitted for shark fishing and 3 for general fishing (Árni Magnússon, VII.). Three of the farmers fishing from Gjögur are not local farmers. Two of them come from the Kaldrananes district and one is from another district further away. These farmers were at Gjögur for sharkfishing or deep water fishing as their farms were probably located too far from deep water fishing grounds.This indicates that the fishing industry in the area was more aimed at shark fishing and that the *verstöð* at Gjögur was specialized in shark fishing with cod fishing playing a lesser role. Unfortunately shark bone is not well preserved and therefore it is impossible to make full use of zooarchaeology to assess its importance for the local economy. The specialization of verstöðvar (pl) is an important question. There is a strong possibility that the location of a verstöð in the landscape was the result of what species fishermen intended to catch from that particular site, a question that requires further collaborative investigation.

From the archaeological and historical data we can draw some conclusions about the early 18th century economy of the area. While the traditional domestic stock still played a role in subsistence and rents were still partly paid in butter, it is clear from both the zooarchaeology and a close reading of the available documents that the most important species for most of the people of the Árnes district were cod and shark with agriculture playing a lesser role. As the statistical analyses of the Jarðabók register demonstrate, poor tenants (like Brandur and his family) were very dependent upon marine resources to support their families and to buy necessities they could not produce themselves while at the same time they were largely restricted to fishing from scattered *heimræði* or as crewmen in boats owned by others. Middling tenants like Sr. Bjarni had more options open, both in terms of stock raising and in the ability to access larger boats operating from better fishing locations. The three richest farmers (like Jón) were in some ways mini-entrepreneurs, owning many boats and shares in others. These greater farmers thus had a wider social niche breadth and were paricipating in both inshore fishing, taking smaller sized cod species and offshore fishing, taking larger sized cod and shark. They would have had enough surplus products to trade with other farmers or to sell at markets, acquiring the imported tablewear, tobacco, and other minor luxuries documented by the artifactual record. Strategies for survival and for coping with the environmental, economic, and social stresses of the 18th century thus varied among the different levels of society in Árnes, but all involved intensification of fishing and a notable flexibility in combining terrestrial and marine resources and negotiating the different options and constraints of both the cash-based and subsistence based portions of local and regional economy. A combination of documents, artifacts, animal bones, and locational archaeology applied to landscape and seascape allows us a glimpse of the complexities of the coping strategies of the farmer-fishers of early modern Vestfirðir, and may indicate the potential productivity of such interdisciplinary research in Iceland.

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