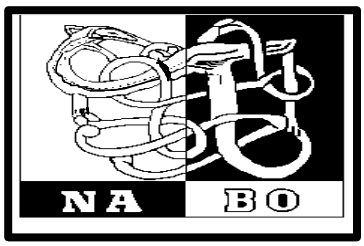

Report of Animal Bones from Selhagi, Mývatn District, Northern Iceland

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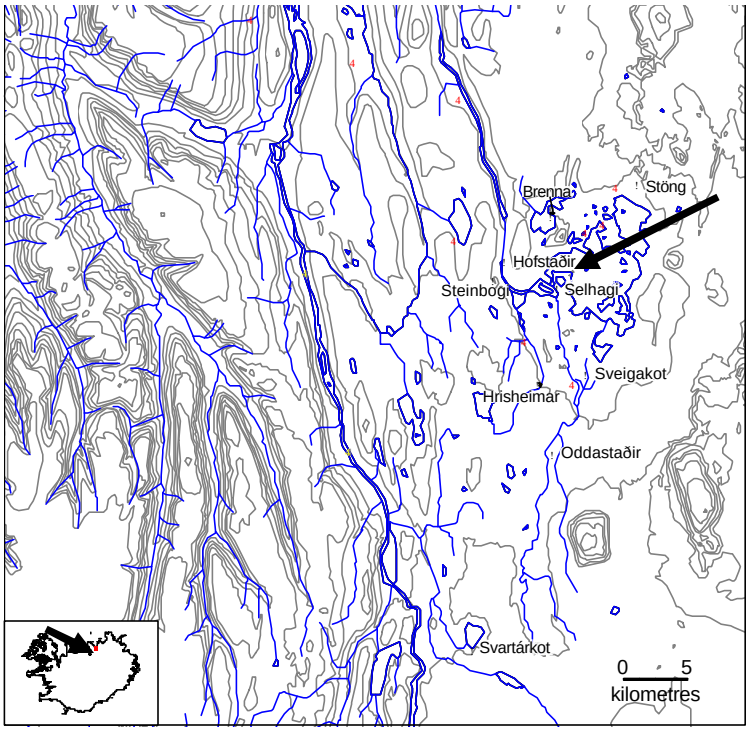
Abstract:

In 2001 the FSl / NABO project *Landscapes of Settlement in Northern Iceland* collected animal bones from a stratified midden deposit associated with the abandoned site ***Selhagi*** on the property of the modern farm Haganes. Selhagi is located in the lushly vegetated lakeshore zone and its environmental setting presents a strong contrast with the eroded uplands to the S of the lake where the early sites at Sveigakot and Hrísheimur are under excavation. Close to both major migratory waterfowl nesting areas and some of the best trout fishing in Iceland, the site would appear to be optimally located for exploitation of wild species. The Selhagi site had produced well preserved animal bone during small scale avocational excavations in the 1970's and the major objective of the 2001 FSl /NABO investigations was to map the site and locate possible midden deposits for further work. The fully turf covered site appears to be a small multi-roomed structure with clearly defined room depressions and an apparent mound of midden material to the NW of the structure complex. Coring within the structure indicated that it was abandoned some time before the widespread AD 1477 ash fall and shows the presence of the 1104 and 1158 tephras as well. The midden team carried out a small-scale (2 x 2 m) stratigraphic test excavation which found well preserved animal bone in clearly stratified midden deposits that were definitely capped by the AD 1477 ash fall and probably also by a thinner 1300 tephra. Two AMS radiocarbon dates on cattle bone from the same context in the upper midden produce a closely consistent one sigma range from late 11th to mid 12th century. At base, the midden deposits directly overly the local variant of the "Landnám" tephra of c. AD 871. It would appear that Selhagi has a long occupational history extending from settlement times to the later 12th to early 13th century. An analysis of the animal bones recovered indicate the normal range of domesticates (cattle, sheep, goat, pig), substantial amounts of freshwater fish (trout and charr), and a few migratory birds (duck and swan) as well as bird egg shell. More surprising is the presence of marine fish (cod family) and sea birds (Guillemot/Murre and Razorbill). Despite the lakeshore setting, the Selhagi archaeofauna thus far does ***not*** indicate any intensive exploitation of adult migratory waterfowl. This small initial sample does indicate that the site participated in a social and economic network that provided regular access to distant marine resources. While larger samples are needed to better understand possible trends through time, the present sample shows an apparent reduction in cattle relative to caprines (sheep & goat) from lower layers to upper that parallels a general reduction in domesticates relative to wild species. Further investigations at this promising site are needed to better document these apparent trends and better understand the economic changes at Selhagi during its period of occupation.

Acknowledgements: The authors would like to thank the international team of scholars participating in the *Landscapes of Settlement* project, a long term investigation of early human settlement in N Iceland, who have made the fieldwork so pleasant and productive since 1996. The support of the US National Science Foundation (Anthropology and Arctic Social Sciences programs), the National Geographic Society, PSC-CUNY grants program, and the Icelandic Science Council is gratefully acknowledged. This is a product of the NABO (North Atlantic Biocultural Organization) research cooperative and the CUNY Northern Science and Education Center. Copies of all zooarchaeological datasets are available on line at www.geo.ed.ac.uk/nabo or from nabo@voicenet.com, field reports are archived at the Archaeological Institute Iceland in Reykjavík.

KEYWORDS: Iceland, Mývatn, Zooarchaeology, Sustainable Resource Use

Selhagi Excavations 2001: The site of Selhagi is a small, multi-roomed ruin located on a lava platform at the edge of the outfall of Lake Mývatn near the juncture of the Kraká with the Laxá drainage (Figure 1 Map). The modern site area is lushly vegetated, with a thick moss, grass, and sedge groundcover and stands of angelica along the water. Large numbers of ducks (several species) are present in the watercourses immediately around the site (which is on a small island), and the small embayment directly NW of the site is a famous trout fishing spot. On the advice of the farmer of Haganes we shovel tested a small mound to the NW of the cluster of room depressions visible on the surface. Immediately we encountered the 1477 tephra below the modern turf (context 001), and below that a concentration of well preserved bones. We set up a 2x2 m unit with the shovel test in one corner (SW, corner is 400/800 in new grid), and deturfed. The unit (J) was cleaned down to the 1477 surface (5 – 8 cm thick here) over the whole surface, demonstrating that that the deposits beneath are intact. We cleaned the sides of the shovel test (which extends about 40-50 cm below the 1477 surface) to establish initial contexts, and then put two cores down through the base of the shovel test. Both cores penetrated about 1 m from surface, encountering continuous midden material. Both cores cut into the local Landnám tephra sequence at base, and in both cases bone and charcoal fragments are found directly above the LNL sequence. The cultural deposits reach close to the 1477 tephra (context 002), but are separated from it by a variably thick layer of medium brown largely sterile soil that varies in thickness from about 5 to nearly 15 cm (context 003). It would appear that deposition halted in this area at some period before the fall of the 1477 ash, but that it extends back to settlement times. Midden layers below the 003 tephra contain wood charcoal, ash, both burnt and unburnt animal bones, concentrations of smashed bird egg shell, and a few non-diagnostic artifacts (mainly small iron objects but including an obsidian flake and quartz pebble manuport). We were able to excavate stratigraphically six major layers (contexts 003-008), the 008



context resting directly upon the Landnám tephra sequence. Several patches of cream-light green egg shell were recovered from all contexts investigated in 2001, indicating egg collection was a significant activity throughout the period of occupation. Layers appear to thicken to the NW of unit J as the midden deposit moves downhill. We suggest a major expansion of this unit and a large scale investigation of the midden deposit in future seasons.

Figure 2 . Test pit J stratigraphy

Radiocarbon AMS analyses were carried out through the kind assistance of the Scottish Universities Research & Reactor Centre in East Kilbride (Dr. Gordon Cook director) as part of the NABO radiocarbon program. Neonatal (newborn to 3 month old) cattle bone collagen was used for two paired dates from the uppermost definite midden context 004.

Table 1 Radiocarbon Dates

Calibration Stuiver M. et al 1998 INTCAL98 Radiocarbon Age Calibration, *Radiocarbon* 40(3):1041-1083.

AMS C14 on extracted bone collagen from < 3 month old calves		13C/12C	radiocarbon	Calibrated	Calibrated
Lab Reference #	Context	ratio	age	1 Sigma	2 Sigma
AA49630(GU9732)	SLH1 01 004	-21.10%	960+/- 45 BP	AD 1020-1160	AD 990-1190
AA49631(GU9733)	SHL2 01 004	-20.80%	995+/- 45 BP	AD 990-1160	AD 970-1170

As table 1 indicates the two paired samples produced closely comparable calibrated radiocarbon one and two sigma date ranges. These suggest that the uppermost midden layers were being deposited sometime between the late 10th and late 12th centuries, a range quite consistent with the observed tephra. The lower layers of the midden deposit are not yet radiometrically dated, but the lowest cultural layer (008) rests directly upon the local Landnám tephra sequence. It would appear that these deposits span the period from first settlement down to ca 1150-1200, providing excellent overlap with contemporary midden deposits at the nearby sites of Sveigakot (whole sequence), Steinbogi (later phases), Hrísheimar (at least early phases), and Hofstaðir (at least early phases).

Laboratory Methods: Analysis was carried out in 2002-03 at Hunter College Bioarchaeology Laboratory by Thomas McGovern (mammals and birds),and fish bones were studied at Brooklyn College's Zooarchaeology Laboratory by Sophia Perdikaris. Extensive use was made of the major comparative collections of N Atlantic fish and birds housed at the CUNY laboratories, with some assistance from the collections of the American Museum of Natural History (for which the authors are very grateful). All fragments were sorted by family (mammal, fish, mollusca, bird) and all fragments were identified as fully as possible with current methods (no sub-sampling or restricted-element-range approaches were employed). All measurements follow the metrical standard of Von Den Dreisch (1976) unless otherwise noted, measurements taken with digital calipers (Mitoyoto CD 6BS) the 0.10 mm. Quantification in this report follows NABO ZWG recommendations by making NISP (number of identified specimens) the basic quantitative measure, as this simple counting technique has proven robust in numerous sampling experiments and is easily replicable across investigators. Basic data was recorded through the NABO Zooarchaeology working group NABONE system (7th edition, see NABO website www.geo.ed.ac.uk/nabo for updates and sample data sets) which combines Access database with specialized Excel Spreadsheets.

Overview of Species Present

Table 2 provides an overview of the present Selhagi archaeofauna (all contexts) including both identified (NISP) bone fragments and those that could only be identified by family and general size range. "Large terrestrial mammals" are cattle/horse sized fragments, "Medium terrestrial mammals" are sheep/goat/pig/large dog sized fragments, while "unidentified mammal fragments" are completely unidentifiable bits of bone scrap.

Table 2 Overview

Domestic Mammal	281
Bird	27
Fish	669
Mollusca	5
NISP total	982

Large Terrestrial Mammal	64
Medium Terrestrial Mammal	303
Unidentifed	1350
TNF total	2699

Table 3 provides a complete breakdown of the identified and unidentified fragments by context.

Table 3 All Identified Taxa

Contexts	Sh. Test	003	004	005	006	007	008	total
Domestic Mammal								
Cattle (Bos taurus dom.)		3	34	1	32	18	2	90
Goat (Capra hircus dom.)			1					1
Sheep (Ovis aries dom.)		7	6		6	5		24
Caprine (sheep or goat)		40	45	7	25	46	3	166
total Caprine		47	52	7	31	51	3	191
total Domestic		50	86	8	63	69	5	281
Bird								
Razorbill (Alca torda)		1						1
Uria sp.			1		2			3
Ptarmigan (Lagopus mutus)					3			3
Duck sp. (Anatidae)						1		1
Swan sp. (Cygnus sp.)						4		4
Bird sp.	1			1	13			15
Fish								
Atlantic Cod (Gadus morhua)			46	7	4	1		58
Haddock (Melanogrammus aeglefinus)			7	1	4			12
Ling (Molva molva)			1					1
Saithe (Pollachius virens)			8					8
Gadid			84	1	10		1	96
Arctic charr (Salvelinus alpinus)			25			1		26
Trout (Salmo trutta)			27	5	4	13	5	54
Salmonid		20	30	37	15	4		106
Fish sp		7	139	46	89	19	8	308
Mollusca								
Clam sp (Mya sp)			3		1			4
Mollusca sp					1			1
NISP total	1	78	457	106	209	112	19	982

At present, none of the individual contexts provides enough bone to reasonably quantify beyond a simple species list, but if we provisionally aggregate the individual contexts (stratigraphic units) into two broad preliminary phases (analytic units), it may be possible to make some tentative statements about patterning and changes through time (inevitably subject to extensive revision with additional data). In this case we make use of a bedding angle change at context 005 to broadly divide the upper contexts (003, 004) from the lower contexts (006-008) while holding out the 005 layer as an intermediate divider. These aggregated contexts are presented in table 4.

Table 4 Aggregated Taxa

	Lower	Upper
Contexts	006-008	003-004
Domestic Mammal		
Cattle (Bos taurus dom.)	52	37
Goat (Capra hircus dom.)	0	1
Sheep (Ovis aries dom.)	11	13
Caprine (sheep or goat)	74	85
total Caprine	85	99
total Domestic	137	136
Bird		
Razorbill (Alca torda)	0	1
Uria sp.	2	1
Ptarmigan (Lagopus mutus)	3	0
Duck sp. (Anatidae)	1	0
Swan sp. (Cygnus sp.)	4	0
Bird sp.	13	0
total bird	23	2
Fish		
Atlantic Cod (Gadus morhua)	5	46
Haddock (Melanogrammus aeglefinus)	4	7
Ling (Molva molva)	0	1
Saithe (Pollachius virens)	0	8
Gadid	11	84
Arctic charr (Salvelinus alpinus)	1	25
Trout (Salmo trutta)	22	27
Salmonid	19	50
Fish sp	116	146
total fish	178	394
Mollusca		
Clam sp (Mya sp)	1	3
Mollusca sp	1	
NISP total	340	535

Domestic Mammals

All the major Icelandic domestic mammals are represented with the exceptions of pigs (not uncommon in some early Mývatn contexts) and horse, which normally makes up only a small percentage of even pre-christian contexts in Iceland. While no dog bones were found, marks of dog gnawing are present on several elements of other species. The closely related sheep and goat are impossible to distinguish on many elements and thus analysts make use of the more inclusive Ovis/Capra or "Caprine" taxonomic category to refer to both.

Table 5	% Domesticate NISP	
Contexts	Lower	Upper
Domestic Mammal		
Cattle	37.96	27.21
Goat		0.74
Sheep	8.03	9.56
Caprine	54.01	62.50
total Caprine	62.04	72.79

Where they can be clearly distinguished to species level, sheep at Selhagi appear to greatly outnumber goat (represented at present by a single bone in the upper layers). The sheep/goat ratio is strongly conditioned by sample size, and it is probably unwise to put much weight on these numbers at present.

However, the current Selhagi sample is large enough for slightly less speculative investigation of the ratio of all caprines to cattle bones. The ratio of caprine to cattle bones in the lower layers is one cattle to 1.67 caprine bones while the ratio for the upper layers is one cattle to 2.68 caprines. This shift from an approximate 1:2 ratio to an approximate 1:3 ratio suggests a relative increase of caprines to cattle through time. At present, these caprine/cattle ratios fall within the range of other known Mývatn area settlement period sites (Sveigakot range is 1:1.13 to 1: 3.2, Hofstaðir range is 1: 6.73 to 1: 2.55, Hrísheimar 003 is 1:3.98 see Tinsley 2000,2001, McGovern & Perdikaris 2002). Our usual assumption is that a high ratio of cattle to caprines tends to be associated with a combination of higher status and access to higher quality pasture, and it is possible that these ratios (based on modest sample sizes) reflect better access to wet meadow grazing, but again larger samples will be needed to go further.

Butchery Marks: Table 6 presents the distribution of butchery marks on the domestic mammal bones. As at Hofstaðir, Hrísheimur, and Sveigakot, many heavy chopping marks left by axes or heavy cleavers were evident, probably mainly reflecting primary dismemberment of the animal carcasses. Splitting longitudinally was the dominant method of bone marrow extraction, and the later (post ca 1100) Icelandic practice of biperforation of the caprine metapodial was not seen in the collection (see discussion in Bigelow 1984). Chopping marks in the Selhagi collection are mainly on horn cores, while splitting was applied widely

to long bones. At present there is no clear indication of change through time in patterns of butchery at Selhagi.

Table 6	Butchery Marks	
Species	Chopping	split
Cattle	3	5
Goat	1	
Sheep	3	3
Caprine	2	22

Age at Death: Standard measures of the age of death of domestic mammals (used to reconstruct herding strategy) include the fusion of long bones (epiphyseal fusion), eruption and wear of teeth, and the presence of newborn (late fetal or neonatal) animal bones. All of these approaches are strongly subject to sample size and a meaningful analysis will require a much larger sample size, but a few observations may be noted here. Table 7 presents the fetal (newborn) and neonatal (less than 3 months) bones recovered based on size and fusion state.

Table 7	Mammal Age			
NISP	Fetal	neonatal	adult and older juveniles	total
Cattle		51	38	89
Caprine	8		158	166

As in most Icelandic collections, cattle show the highest percentage of neonates, almost certainly reflecting a dairy economy (see Halstead 1999 for discussion).

Only five mandibles retained tooth rows suitable for eruption and wear analysis. These were scored according to the widely used method of Grant (1982) and the results are presented below in table 8. Both adult and immature individuals are represented in this small sample.

Table 8 Caprine Tooth Wear and Eruption (after Grant 1982)

taxon	context	specimen	dp4	P4	M1	M2	M3	Mean wear
Caprine	004	SLH 14		n				
Caprine	006	SLH 9	g		c			
Caprine	006	SLH 8	n					
Sheep	004	SLH 12	m		g	D	crypt	
Caprine	004	SLH 13					f	

Metrical Data

Very few domestic mammal elements were measurable, far too few for any valid analysis. These data will be included in a larger study of domestic stock in

the Mývatn region, and are presented here for archival purposes (measurements in cm).

Table 7 Metrical Data (after Von den Dreisch 1976)

			specimen	Bd	GL	GB
Sheep	006	Calcaneus	SLH 7		5.46	1.87
Sheep	006	Calcaneus	SLH 6		5.36	1.61
Sheep	007	Distal Metatarsus	SLH 2	2.19		
Sheep	007	Distal Humerus	SLH 1	2.84		

Birds

Table 8 presents the breakdown of bird remains from the 2001 Selhagi contexts. In addition to the bones listed, concentrations of egg shells were present in all contexts.

Table 8 Bird NISP

	NISP		upper		Intermed.		Lower	
Scientific names	Engl. Common	Sh. Test	003	004	005	006	007	008
Sea Birds								
Uria sp.	Murre or Guillemot			1		2		
Alca torda	Razorbill		1					
Non-Migratory Terrestr.								
Lagopus mutus	Ptarmigan					3		
Ducks								
Anatidae	Duck Sp.						1	
Swan								
Cygnus sp.	Swan Sp.						4	
Aves sp.	Bird sp.	1			1	12		
	total	1	1	1	1	17	5	0

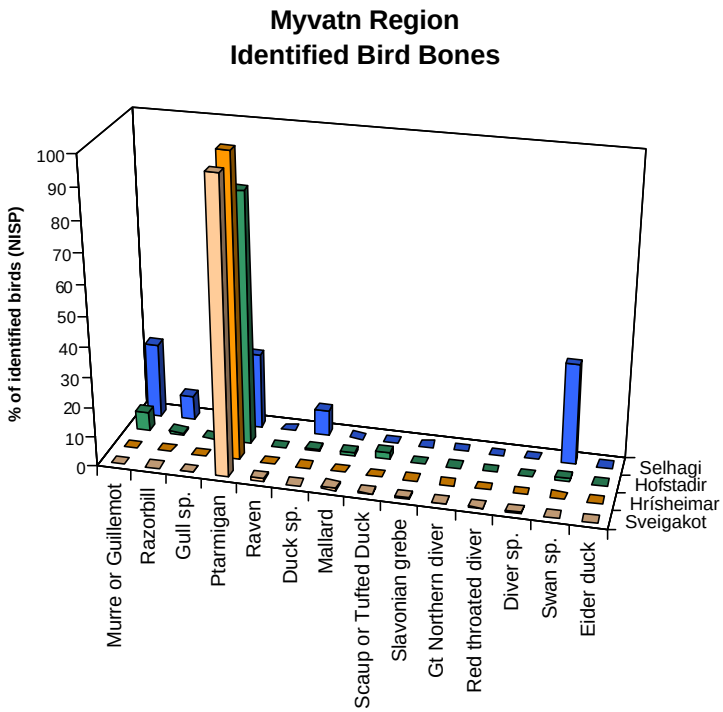
The Selhagi bird remains present several surprises, particularly given the lakeshore location of the site:

1) Despite the proximity of tens of thousands of annually nesting migrants and their young in the immediate area, bird bones make up a very small fraction of the total sample. This is by no means a bird hunting station.

2) The bird bones present are not dominated by ducks or other migratory water fowl. Ptarmigan (grouse) and sea birds are at least as common as the nearby freshwater birds.

3) The egg shells cannot yet be identified to species level, but they could all be from migratory ducks.

4) This pattern of possible duck egg shells but few or no duck bones is apparently widespread in the Mývatn area in settlement and early medieval times. Figure 4 below illustrates the present distribution of identified bird bone at Hofstaðir, Sveigakot, Hrísheimur, and Selhagi. Note that Ptarmigan bone absolutely dominates three of four, and that none have significant numbers of migratory waterfowl bones (though all have produced egg shells in quantity).



We suggest that this pattern is strongly suggestive of a sustained yield exploitation of eggs combined with some sort of social prohibition on taking nesting adults. The current pattern of local level bird conservation in the Mývatn region thus appears to have deep historical roots. This pattern raises interesting questions about the social organization of landscape and allocation of rights to

"natural capital" in the Settlement Period and early Middle Ages, especially in light of the very different long term outcome of pasture management strategies.

Fish

As in the other Mývatn area archaeofauna, the Selhagi fish are split between freshwater salmonids (trout and charr) and marine fish (gadid family) imported from the sea coast over 60 km to the north. Table 9 presents the fish data for Selhagi as percent of NISP.

Table 9 Fish Taxon %

Contexts	Upper	Lower
Cod	18.55	8.06
Haddock	2.82	6.45
Ling	0.40	0.00
Saithe	3.23	0.00
Gadid	33.87	17.74
total Gadid	58.87	32.26
Charr	10.08	1.61
Trout	10.89	35.48
Salmonid	20.16	30.65
total Salmonid	41.13	67.74

Figure 5 illustrates the relative abundance of these species in the two phases, indicating a major shift in emphasis between lower and upper contexts. In the lower contexts, salmonids dominate (ca 70% of identified fish), while in the upper contexts the proportions are nearly reversed. Despite the site location on one of the most productive trout fishing locations in Iceland, marine fish and charr dominate the upper layers.

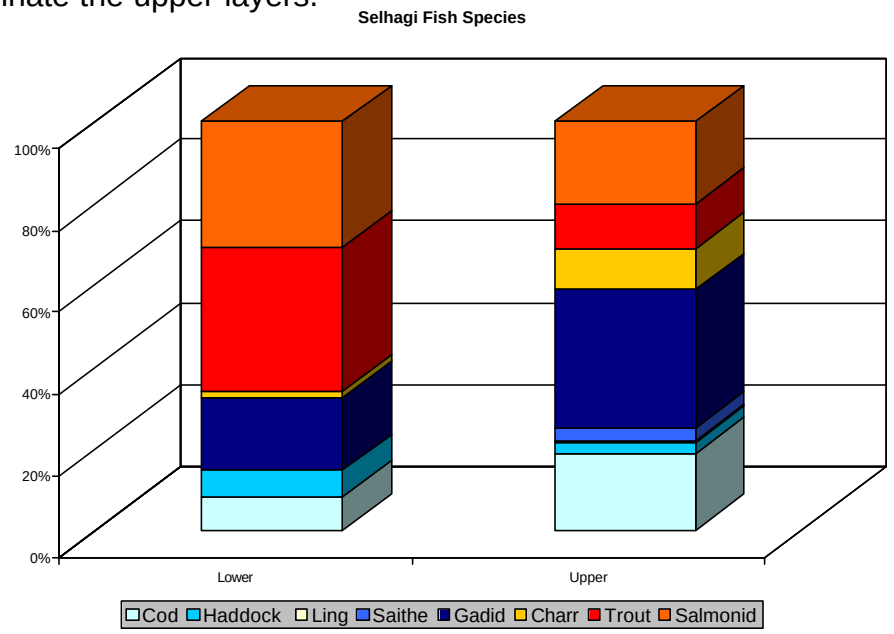
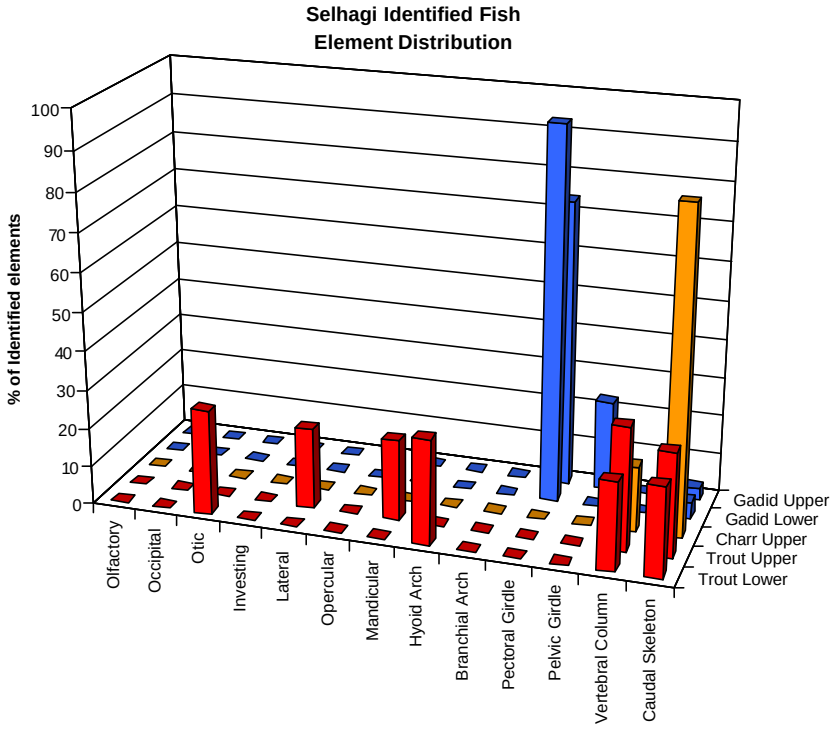


Figure 6 presents the element distribution for the salmonid and gadid fish, with salmonids broken down into charr and trout. As has been observed in other Mývatn archaeofauna, there is clear indication that the gadids were imported from the sea as headless prepared fish, while the trout probably entered the site as whole animals represented by the full range of body parts. As figure 6 indicates, there is a suggestion that Charr may also have been treated differently from trout, possibly arriving as in least partially processed (smoked??) form. Larger sample sizes will be required to more fully assess patterning within the freshwater fish skeletal elements, but the contrast with the marine fish is very clear.



Changing fish proportions at Selhagi appear to be more than simply artifacts of sample size (though larger samples are urgently needed), and they raise questions about possible changes in trout population in the upper Laxá in medieval times. Further research is indicated, but it is clear that the fish as well as the birds of Selhagi present clear exceptions to our expectations based on modern species distribution. The Selhagi archaeofauna may serve to underline how fully Viking

and medieval farms in this region were integrated into wide-ranging social and economic networks, and how little they resemble the wholly self-sufficient, ruggedly independent farmsteads of historical legend.

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