



Skuggi in Hörgárdalur, N. Iceland:
Preliminary report of the 2008/2009 archaeofauna.

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Introduction

Skuggi is located in Hörgárdalur, ca. 20 km southwest of the medieval trading site Gásir in Eyjafjörður, N Iceland (figure 1). The site lies south of the river Hörgá that names the entire valley system and whose waters traverse the Hörgá Valley, or Hörgárdalur, to eventually drain into Eyjafjörður just slightly north of Gásir. Positioned on a little plateau at an elevation of about 170 m *asl*, Skuggi is a mid-to upper highland site and may have originated as a small farm, that may later have been incorporated into the larger landholdings of Staðartunga farm in the later middle ages. Staðartunga farm itself became eventually associated with the Möðruvellir monastery (Hreiðarsdóttir et al 2008:230).

In 2008, the author together with Þóra Pétursdóttir from FSÍ cored the Skuggi site and located and tested a medieval midden. In 2009, a larger scale midden excavation was carried out. The trenched midden and especially its underlying structure are remains of the original site settlement, with other structures possibly associated with later site activities mentioned in written sources (Hreiðarsdóttir 2008:233, some information in English in Harrison et al 2010).

Radiocarbon analysis dates the Skuggi midden deposits to ca. AD **970 – 1208**; Tephrochronology further aids in dating this site: All midden deposits are sealed by H1300, and most of them by H1407. The turf structure under the midden contains tephra layers deposited during the volcanic landnám eruption (LNS) that coincided with Icelandic settlement in AD 871.

The Skuggi midden excavation, directed by the author was the latest in a series of archaeological projects that are all part of a larger Eyjafjörður Ecodynamics program.

Research History

- 2001–2006: Gásir; Howell M. Roberts (FSÍ) excavation of the high medieval (13th and 14th centuries) trading site and its merchant's church (2004 and 2006, by Orri Vésteinsson, FSÍ) (i.e. Roberts et al 2002, 2006, 2009, Vésteinsson 2009, Vésteinsson in Roberts et al. 2006, 2009, Vésteinsson et al. in press, Harrison et al 2008, Harrison 2009, Harrison 2006).
- 2004-2006: Skriðuhreppur; Regional surveys by FSÍ staff members, directed by Elín Ó. Hreiðarsdóttir (Hreiðarsdóttir et al. 2008).
- 2006: Möðruvellir; Ramona Harrison (CUNY) and H M. Roberts, excavation of an evaluation trench into the Öskuhóll (Harrison and Roberts 2006, Harrison 2007). This project builds on work done by Orri Vésteinsson's expanded archaeological survey and site registration (Vésteinsson, 2001).
- 2007: Möðruvellir; R Harrison and H. M. Roberts, extension of the evaluation trench opened in 2006 (Harrison and Roberts 2007, Harrison. 2008a)
- 2008 – 2009: Gásir Hinterlands Project (GHP), directed by R. Harrison (2009) and H.M. Roberts (2008). Program of midden prospecting, testing and

excavation. Sites producing archaeofaunal remains: Möðruvellir (continuation), Skuggi, Oddstaðir, and Myrkárdalur; all in Hörgárdalur (Harrison 2008b, Harrison et al. 2010).

The **Gásir Hinterlands Project**, funded by a **Dissertation Improvement Grant through the US National Science Foundation** (OPP ARC 0809033, PI: Harrison), is aimed at improving our understanding of the interactions of local farming strategies affected by changing climate and ongoing human impact with medieval overseas trade and long distance exchange centered on Gásir. GHP also focuses on the long term human ecodynamics in this historically important part of Iceland, contributing to the reconstruction of a detailed historical ecology of Eyjafjord from first settlement down to modern times.

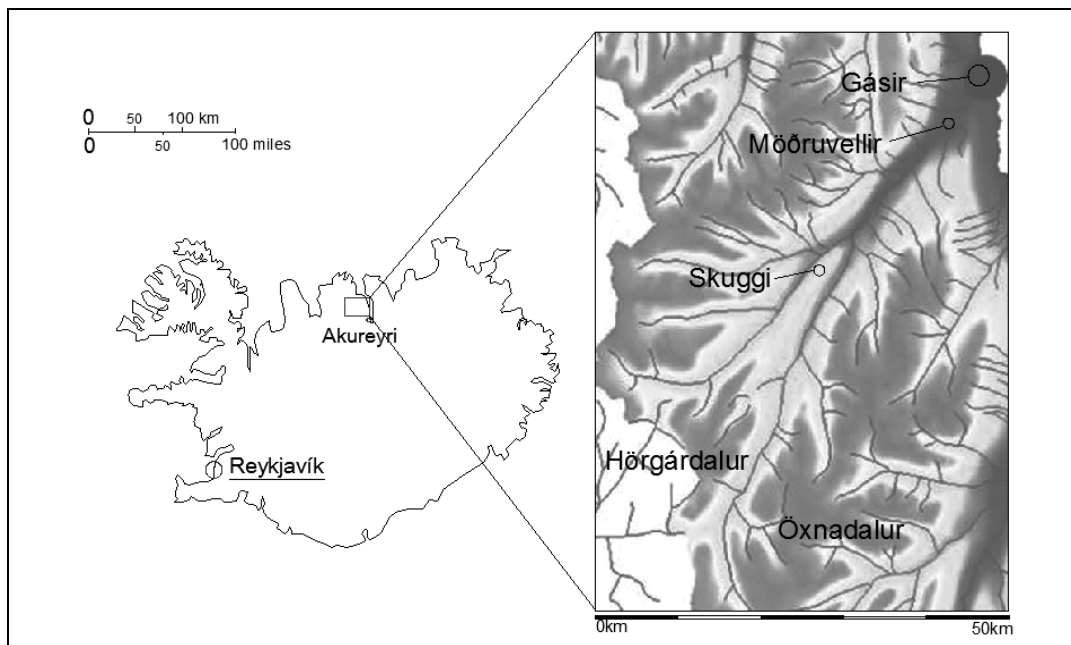


Figure 1. Map of Iceland, locating Skuggi, Möðruvellir in Hörgárdalur, and Gásir, located at a coastal inlet in Eyjafjörður.

Materials and Methods

All the midden materials were dry-sieved through 4mm mesh and where applicable materials were targeted for whole-soil sampling for post-excavation analysis, in accordance with NABO recommendations to study plant remains, industrial activities, and other aspects of the site formation process.

The faunal materials were processed at the CUNY Northern Science & Education Center (NORSEC) laboratories in New York City and Brooklyn. Recording and data curation followed the NABONE protocols followed for other archaeofauna from Iceland, Faroes, Greenland, and northern Norway (NABONE, 2009, see www.nabohome.org for downloadable version 9). Following widespread North Atlantic tradition, bone fragment quantification makes use of the Number of Identified Specimens (NISP) method (Grayson 1984). Mammal measurements follow von den Driesch, (1976) and von den

Driesch & Boessneck (1974), fish metrics follow Wheeler and Jones (1989) fish identifications follow FISHBONE 1.1 (2004, also at www.nabohome.org), bird identifications follow Cohen and Serjeantson (1996, 2nd Ed.), and Serjeantson (2009) and sheep/goat distinctions follow Boessneck, (1969) and Mainland and Halstead (2005), and Zeder and Pilaar (2010). Research on sheep/goat specimens from the AMNH Mammology Department further helped analyze and distinguish ovi/caprine mandibles when possible. Tooth-wear stage studies follow Grant (1982) and long-bone fusion stage calibrations follow Reitz and Wing (1999), with overall presentation of age reconstruction following Enghoff (2003).

Corvus corax analysis followed research of avian skeletons at the AMNH Ornithology Department.

Time and Place

Isotopic Analysis, Tephrochronology, and Phasing

Radiocarbon and tephrochronological analysis of mammal bones from Skuggi have resulted in several main occupation/activity periods or phases that will be used for intra-site comparisons where applicable.

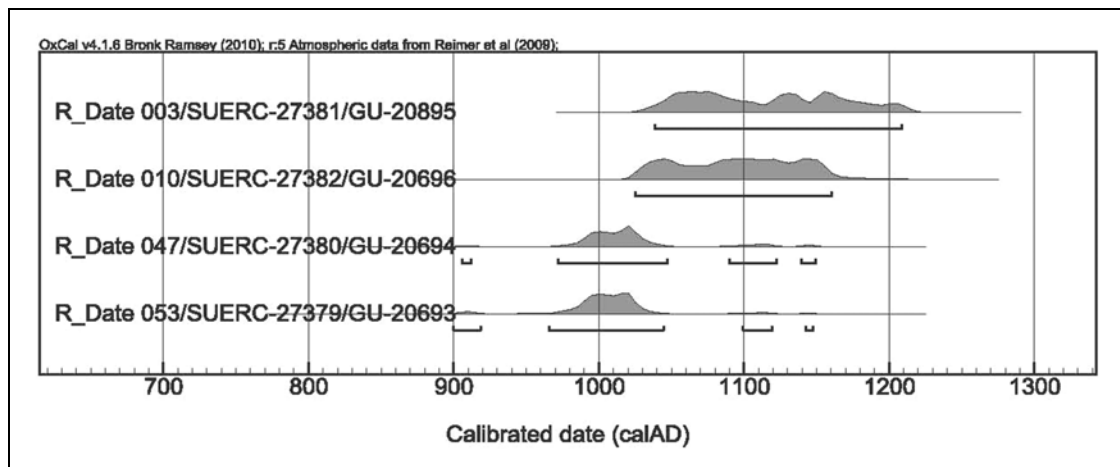


Figure 2. Skuggi Trench 1 Radiocarbon dates (<https://c14.arch.ox.ac.uk/oxcal/OxCal.html>, v. 1.6, Bronk Ramsey 2010, Atmospheric data from Reimer et al. 2009).

Figure 2 displays the calibrated **Radiocarbon** dates for the basal and upper layers of the midden from TR1. Context [053] is immediately overlaying structural collapse associated with the building's walls or roof and together with context [047] provides the midden basal layers. According to the calibrated C14 dates, these layers fall into the **later Viking Age period**.

Two deposits representing the upper midden layers are contexts [010], and [003], the latter one is the terminal midden layer encountered in TR1. As indicated by the calibrated C14 dates, these upper midden layers fall into the **early medieval period**.

Tephrochronology refines the dating process further, and the three different volcanic tephra layers observed at Skuggi are:

- H1300, seals all contexts in TR 1 midden.
- H1104, seals contexts below [003];
- LNS 871, in the structural remains under TR 1 midden.

The determination of the different occupational phases at Skuggi follows the various activity sequences encountered during the archaeological excavation. Absolute and relative means of dating include radiocarbon analysis, tephrochronology, and stratigraphy.

- Phase I refers to the initial site settlement after LNS 871. The structure discovered under the TR1 midden contains these landnám tephra layers (fig. 5) and can be dated to the late 9th and early 10th c.
- Phase II refers to the basal midden layers from the Later Viking Age, with a calibrated one sigma range of AD966-1047. This phase can be dated to mid 10th - early 11th c.
- Phase III comprises the midden layers providing ca. mid-11th c. archaeological remains deposited during the transformation between the Later Viking Age and the Early Middle Ages.
- Phase IV refers to the upper midden deposits dated to the mid 11th – mid 12th c.; it has a calibrated C14 date of AD1025-1160 (1 sigma range). These deposits are from the Early Middle Ages.
- Phase V is the terminal occupation phase, with context [003] on above H1104 and below H1300 tephra layers. This layer has a calibrated C14 date of AD1038-1208 (1 sigma range) and provides the latest cultural deposits found at Skuggi.

Phase	Occupation Period	Dates	Dating evidence
I	Settlement Phase	late 9th and early 10th c	LNS 871 in structural turf
II	Later Viking Age	mid 10th - early 11th c.	cal. C14 AD966-1047 (1 sigma range)
III	Late Viking Age - Earlier medieval	mid 11th c	stratigraphy
IV	Earlier medieval	mid 11th - mid 12th c	below H1104, cal. C14 AD1025-1160 (1 sigma range)
V	Terminal occupation	mid-late 12th c	below H1300, cal. C14 AD1038-1208 (1 sigma range)

Table 1. Break down of the different occupational phases at Skuggi.

Table 2 lists results from all currently available isotopic analyses done on Skuggi fauna, including calibration of Radiocarbon dates, all with calibrated 1 sigma ranges, according to Bronk Ramsey (c14.arch.ox.ac.uk/oxcal/OxCal.html, v. 1.6, Bronk Ramsey 2010, Atmospheric data from Reimer et al. 2009).

Results from the stable isotopes analysis are part of a larger investigation of the local and regional variation in Nitrogen levels and a study of the Marine Reservoir Effect as observed in marine and also fresh water resources (Ascough et al 2006, 2010). In the Spring of 2010, 75 faunal elements from Eyjafjörður excavations were selected as part of a larger North Atlantic study on these issues, with funding provided by the National Science Foundation (NSF IPY Grant OPP ARC 0732327).

Site Code	Context	Sample reference numbers	Species	Bone	C14 BP	d13C	d15 N (cf)	Cal. AD 14C date \pm 1 SD
SKÖ	003	SUERC-27381, GU-20895	Ovi/ Caprine	Tooth	905 \pm 30	- 20.7	4.0	1038-1208 (95.4%)
SKÖ	010	SUERC-27382, GU-20696	Ovis aries	Tooth	940 \pm 30	- 21.0	1.3	1025-1160 (95.4%)
SKÖ	047	SUERC-27380, GU-20694	Ovi/ Caprine	Long bone	1015 \pm 30	- 20.3	1.2	972-1047 (86.1%)
SKÖ	053	SUERC-27379, GU-20693	Ovi/ Caprine	Long bone	1025 \pm 30	- 21.0	1.7	966-1044 (89.5%)

Table 2. Isotopic data from analysis of C14, d13C, and d15N, data made available by Dr. Gordon Cook and Dr. Philippa Ascough 2010, C14 calibration by Bronk Ramsey (<https://c14.arch.ox.ac.uk/oxcal/OxCal.html>, v. 1.6, Bronk Ramsey 2010, Atmospheric data from Reimer et al. 2009).

Skuggi in Hörgárdalur, Trench 1

Skuggi is located up-slope from the road down in Hörgá Valley. At an elevation of 170m asl, it is a 10 minute hike from Skuggabrú, the bridge leading the road across Hörgá. The slope levels out slightly in the area of the archeological ruins, but just south of it continues again uphill to Staðartunguháls, a peak belonging to the mountain range dividing Öxnadalur from Hörgárdalur (see fig. 1).

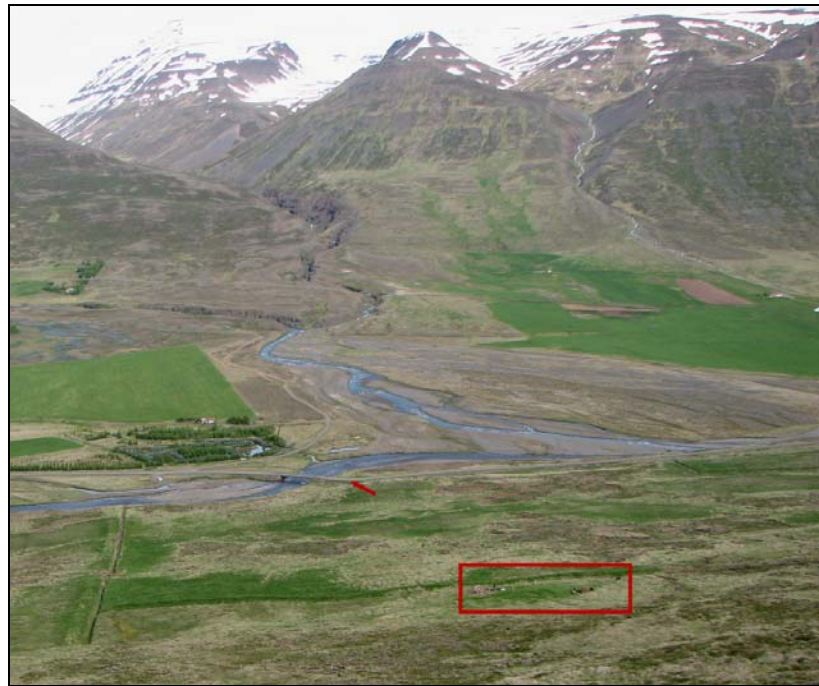


Figure 3. The Skuggi site (rectangle), located uphill from Hörgá and Skuggabrú (arrow). The picture also shows linear drainage ditches to the north and west of the site that were dug in the late 20th c. The mountains across the valley form part of its northern edge (facing NNE).

The survey plan outlines two structural remains and a potential midden observed at Skuggi during the 2004 Hörgárdalur survey (Hreiðarsdóttir 2008:232, cropped by RH). The midden labeled C maybe contemporaneous with at least one of the visible ruins and

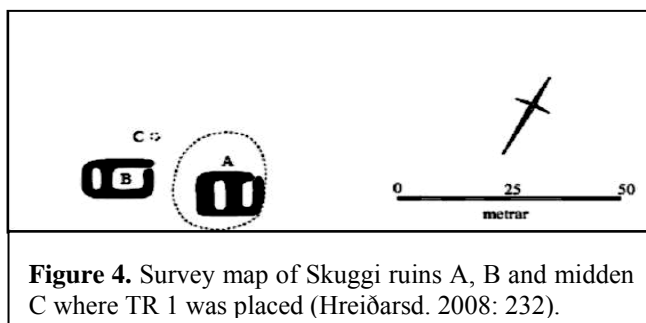


Figure 4. Survey map of Skuggi ruins A, B and midden C where TR 1 was placed (Hreiðarsd. 2008: 232).

its partial excavation has confirmed the presence of at least one structure below the refuse layers that may have accumulated over a 250 year time span. Future plans include an investigation of the ruins labeled A and B and the entire excavation of the structure filled by TR1 midden deposits.



Figure 5. Trench 1 (TR 1) at Skuggi. Left: crew members excavating (facing NNW); Right: Viking Age structural remains below midden (facing ENE).

All faunal remains recovered from Skuggi in 2008 and 2009 were collected from Trench 1 (TR1), a 4 m (N - S) by 3 m (E - W) trench that contained midden deposits that were about 1 m to 1,30 m deep. While most of the eastern and northern extent of the midden have been determined, the midden possibly extends at least two more meters to the west, and further to the south. A future expansion of the midden trench is planned.

Figure 5 is a close-up picture of the intact wall remains of the structure revealed by excavating midden layers in TR 1, containing the olive green and purple volcanic ash layers of the landnám tephras. Coring of the structural remains indicates placement of the structure immediately or soon after deposit of LNS 871 tephra.



Figure 5. Skuggi structure, eastern wall containing purple and olive green tephra layers from volcanic ash deposits remains intact. Wall in this close-up is 1.50 m long. Depth of the wall is not known because the structure is still filled with collapse from the roof. Picture faces east (Harrison et al 2010).

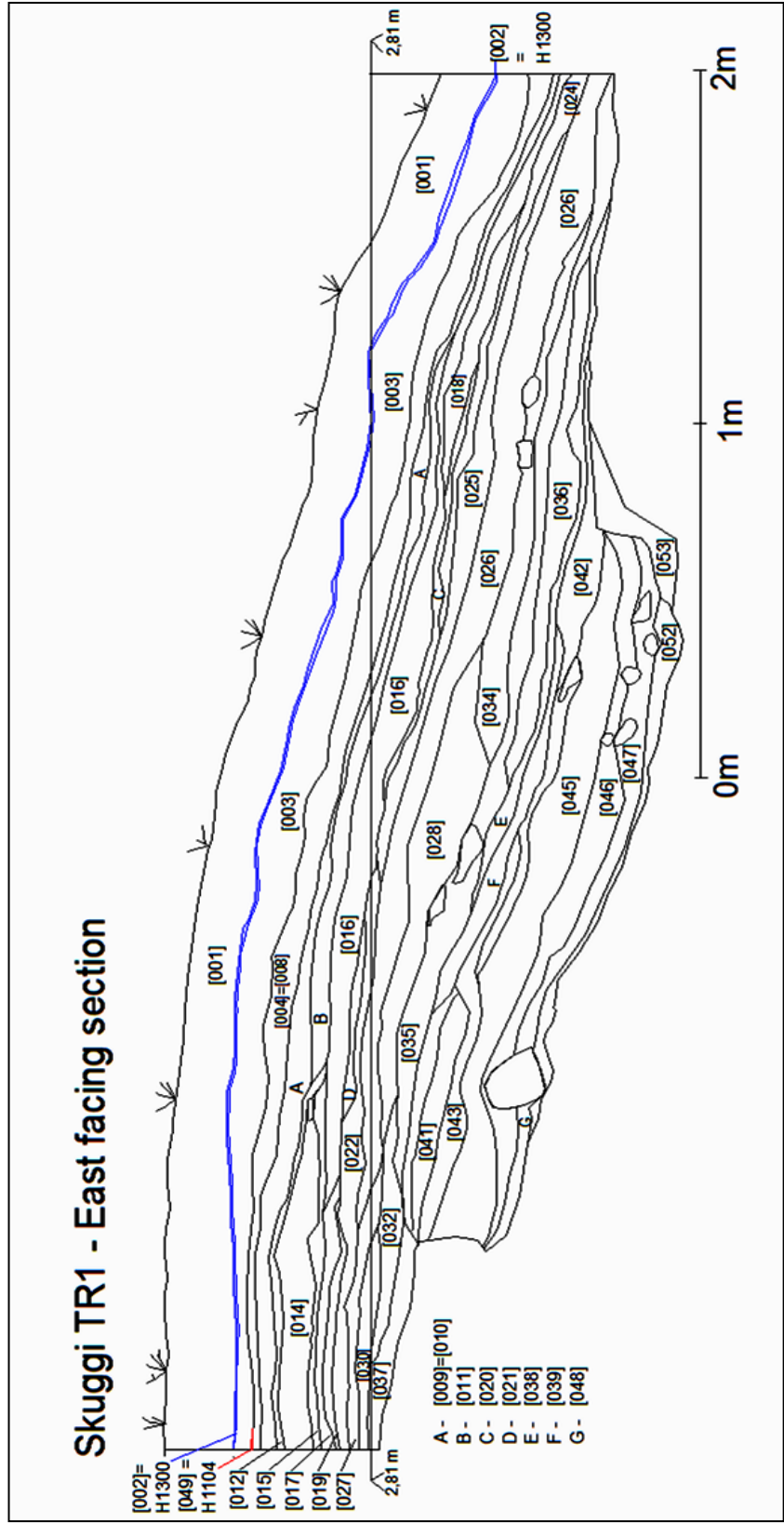


Figure 6. Skuggi, Trench 1. East facing section; tephra layers H1300 in blue and H1104 in red

The digitized profile drawings in figures 6 and 7 present the trench's east and north facing sections. These profiles contain most contexts whose faunal remains were analyzed for this report. H1300 is visible in both profiles and marked in blue. H1104 was very faint and could only be picked up clearly in the SW corner of TR 1. It overlaid context [004=008] and thus all midden layers underneath. The appended Harris Matrix outlines tephras and contexts sampled for C14 analysis. The east facing section demonstrates the sloping of the terrain and cultural deposits towards the North.

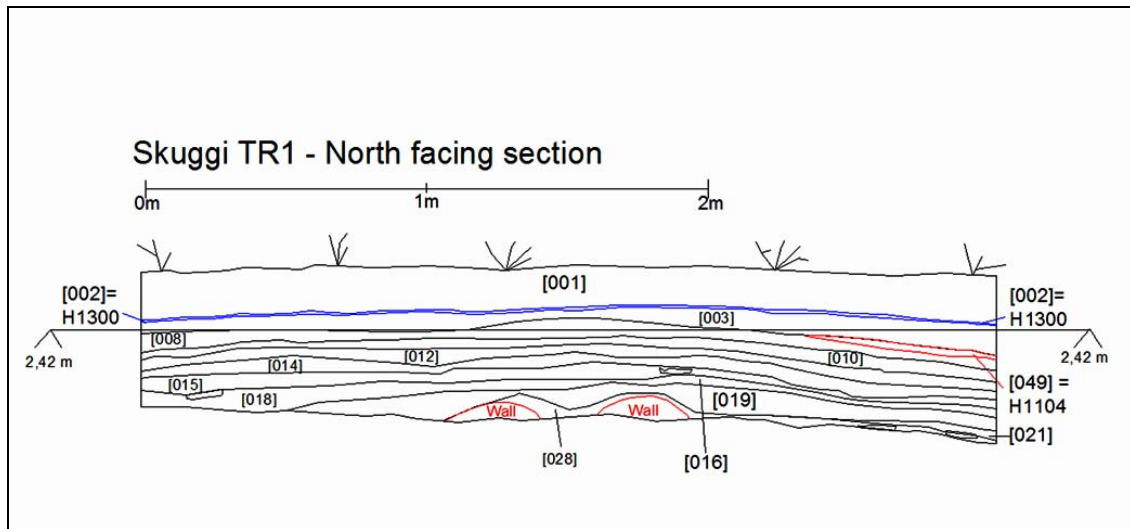


Figure 7. Skuggi, Trench 1. North facing section; tephra layers H1300 in blue and H1104 in red.

The Skuggi archaeofauna

This NORSEC report presents initial results from zooarchaeological analysis of the midden remains recovered from TR 1.

Although a total analysis of the Skuggi archaeofauna collected to date would have been preferential, time constriction forced the author to concentrate on selected contexts. Since the basal layers and the early medieval layers could be dated through radiocarbon method and tephrochronology, those were given priority.

To gain an idea of one aspect of the entire bone assemblage, *cattle and caprine tooth rows* were pulled from all contexts and analyzed for eruption and wear stage analysis.

The Total Number of Fragments (TNF) count is **8189**, with a Number of Identified Specimens (NISP) of **2187**

The bone preservation at Skuggi is good but varied in the most recent layers to excellent in the earliest layers.

Further division of the total NISP according to phase results in a NISP of 927 for **Phase II**, the Later Viking Age Layer.

Phase IV, the early medieval layer provides a NISP of 1005. Phase V, the terminal occupation layer had a **NISP** of 255. There are 74 analyzed specimens from Phase II that were analyzed, but these elements are all tooth rows and only included for a caprine tooth eruption comparison (fig. 14).

When possible, the archaeofaunal results were provided according to phase.

While the Phase II archaeofauna consists of predominantly domestic mammal remains, Phases IV and V display more diverse taxa distributions.

Caprine bones were by far the most numerous domesticates in all phases. **Cattle** bone numbers made up a small percentage and their proportion of the site mammal assemblage rose slightly in Phase IV, but declined again in Phase V. There were no *horse* elements analyzed from the faunal assemblage. A total of 9 **pig** bones were found in contexts [003], [009/010], [011], [018], [021], [035], [037], and [U/S] which has not yet been excavated and is right under [053], (associated with structural remains), and contexts [003], [006], [009/010], [011], and [047] contained a total of 47 phocid bones that could not be assigned to species.

The presence of **raven** (*Corvus corax* (L.)) in contexts [003], [009/010], and [011] is of interest as these birds are not regularly found in Icelandic midden deposits.

Early on, the small amount of marine **fish** bone attests to the site's inland location, although it rises in the medieval deposits and together with the seal elements could indicate an outside supply with marine species.

There were no **dog** elements in the archaeofauna, but gnawing marks left on many faunal elements are associated with presence of the species.

One long bone element shows potential **rodent gnawing**, but no physical remains of rodent have been found.

The Skuggi farm depended on mostly sheep/goats during the Later Viking Age, with a change to amore diverse species utilization during the early medieval phases, including birds, marine species, and domesticates. This change in site economy profile may indicate that Skuggi was originally run as a tenant farm specializing in sheep/goat herding and possibly grew into a larger establishment with a need to supplement its own supply of domesticates with wild species to cover the needs of the inhabitants. A second explanation for the increase in marine species could be that Skuggi became more connected to the larger region and profited from an exchange network, i.e. supplying meat, dairy, or wool in return for fish and seal products, and possibly other goods being moved inland from the coast.

Overview of Species Present

Table 3 presents the Skuggi archaeofauna as a Total Count. NISP (number of identified specimens) refers to all fragments that could be identified to a useful level. TNF is a count of all bone fragments (identifiable or not), MTM is “medium terrestrial mammal” (sheep-dog-pig sized), LTM is “large terrestrial mammal” (cattle-horse sized), MM is an “unidentifiable marine mammal” (i.e. whale, dolphin, walrus, seal), UNIM or unidentified mammal are small fragments that cannot be identified beyond this broad category. UNI or unidentifiable bone fragments simply indicate the existing degree of erosion.

Skuggi - TR 1 Element Count	Phase			
	II, mid 10th - early 11th c	IV, Mid 11th - mid 12th c	V, mid-late 12th c	Total NISP
Domestic mammals				
Cow (<i>Bos taurus</i> (L.))	84	42	11	137
Pig (<i>Sus scrofa</i> (L.))	1	2	1	4
Dog (<i>Canis lupus familiaris</i> (L.))	present	present	present	present
Goat (<i>Capra hircus</i> (L.))	17	3		20
Sheep (<i>Ovis aries</i> (L.))	62	10	7	79
Unidentified caprine	725	234	132	1091
Total caprine	804	247	139	1190
Total domestic	889	291	151	1331
Wild Mammals				
Small seal		2		2
Large seal		4		3
Unidentified seal species	1	32	8	42
Total seal	1	38	8	47
Unidentified whale species	1			1
Total whale	1			1
Total wild mammal	2	38	8	48
Birds				
Common Raven (<i>Corvus corax</i> (L.))		41	3	44
Small Passerines		2		2
Unidentified bird species	2	340	23	365
Total bird	2	383	26	411
Fish				
Cod (<i>Gadus morhua</i> (L.))		9	1	10
Haddock (<i>Melanogrammus aeglefinus</i> (L.))	3	14	1	18
Saithe (<i>Pollachius virens</i> (L.))		5	5	10
Cusk (<i>Brosme brosme</i> (L.))			1	1
Atlantic Halibut (<i>Hippoglossus hippoglossus</i> (L.))		2	2	4
Gadid species	5	68	3	76
Marine fish non-speciated	13	192	57	262
Total fish	21	290	70	381
Mollusca				
Clam (<i>Mya</i> sp.)	2	4		6

Mussel (<i>Mytilus edulis</i> (L.))	8	1		9
Unidentified mollusc species	3			3
Total mollusca	13	5		18
Total Number of Identified Species	927	1007	255	2189
Large terrestrial mammal	67	35	13	115
Medium terrestrial mammal	504	564	196	1264
Small terrestrial mammal			1	1
Uni. terrestrial mammal fragments	1451	2231	877	4559
Unidentified marine mammal fragments		14		14
Unidentified fragment	1	48		49
Total number of fragments	2950	3899	1342	8191

Table 3. Skuggi, Total TR 1 element count, with a NISP breakdown and TNF for Phases II, IV, and V.

Major Taxa

Figure 8 presents the major taxa utilized at Skuggi per occupation phase. During the Later Viking Age (Phase II), the people at Skuggi were consuming almost entirely domesticates, and predominantly caprines (88%). There are a few marine fish remains (2.30 % or 21 elements), and one whale and one seal element.

During the Middle Ages (Phase IV), 38 % of the total NISP were birds, followed by fish (29 %), and caprines (25 %). This phase saw a consumption pattern that relied almost equally on domesticates, birds, and marine species.

During Phase V, the terminal occupation phase dated to the mid-late 12th c, humans were relying more on their domesticates than in the previous phase, but were still supplementing their diet with fish, birds, and marine mammals. Caprines comprise 55 % of the total taxa assemblage from this phase, with fish at 28 %, and birds 10 %. No horse remains were recovered from these phases.

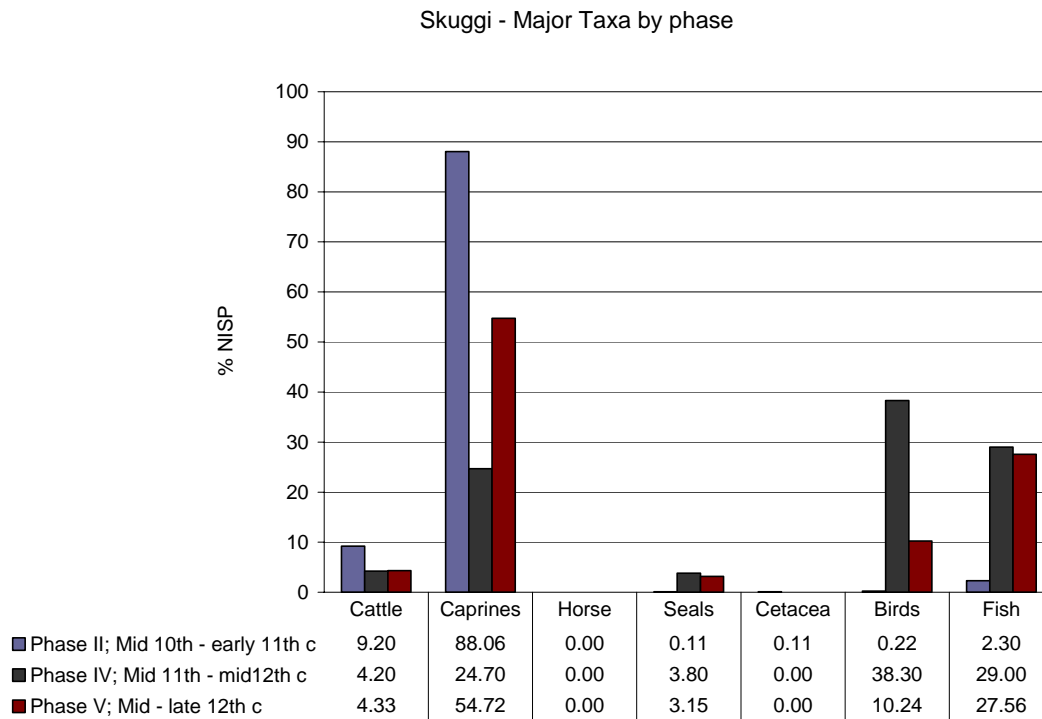


Figure 8. Skuggi – major taxa presented as NISP percentages.

Mammals

Figure 9 displays the domestic and wild mammal species proportion divided into phases. Except for a very small fraction of seal and whale (0.11 % each), the Later Viking Age (Phase II) mammal assemblage consists of domestic mammals. The caprine category makes up 81 % of the total assemblage, speciated sheep (*Ovis aries*) comprise 7

%, and goats (*Capra hircus*) 2 %. The cattle proportion amounts to 9 %, the Later Viking Age cattle vs. caprine ratio is 1:10.

The mammal distributions from the Middle Ages differ from Later Viking Age: the Phase IV mammal distribution pattern indicates the typical heavy reliance on caprines at 71 %, but sheep only account to 3 %, and goats to 1 %. At 13 %, the proportion of cattle bone is higher in this phase and the cattle vs. caprine ratio is 1:6. Seal species represent 12 % of the mammalian category and again suggest a reliance on marine species.

The terminal occupation layer (Phase V) contained a very high proportion of caprine remains. Caprines comprised 83 % of the total mammalian category, and another 4 % could be speciated to sheep. The cattle proportion at 7 % was lower than in the previous phases, representing a cattle vs. caprine ratio of 1:13. Although the seal percentage at 5 % is lower than in Phase VI, it still makes up a significant proportion of the total mammal category.

Pig elements were still present in this phase, as were in the previous ones.

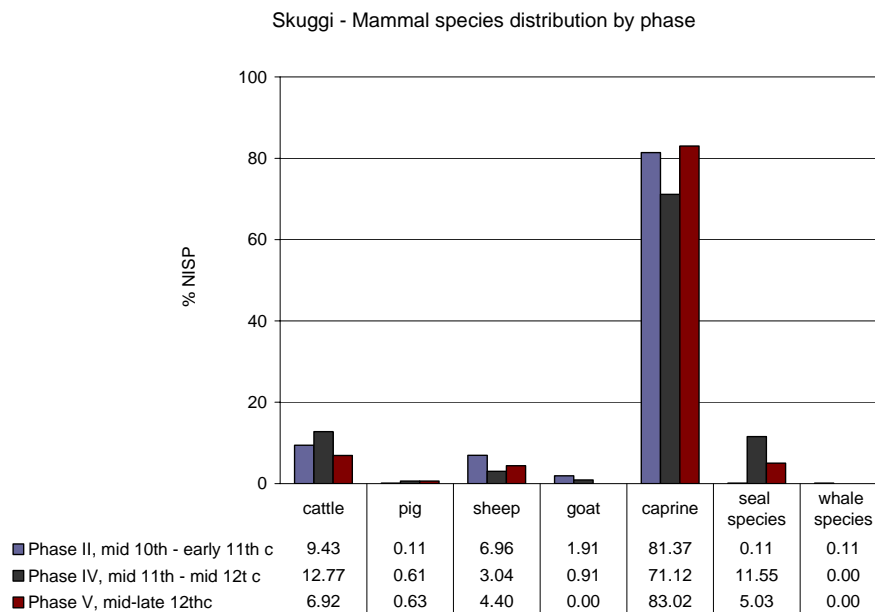


Figure 9. Skuggi – mammal species distribution by phase.

The mammal distribution per phase confirms the data provided by the total taxa distribution analysis. During the Later Viking Age, the people living on Skuggi land may have been able to supply their food demand by their own sheep and goats, with the occasional cow meat. During the Middle Ages, the Skuggi residents were diversifying their food provisions with marine mammals. The cattle vs. caprine ratios throughout the three phases remained well below the 1:20 known from Icelandic small scale farms after 1200 AD (McGovern et al 2007:41).

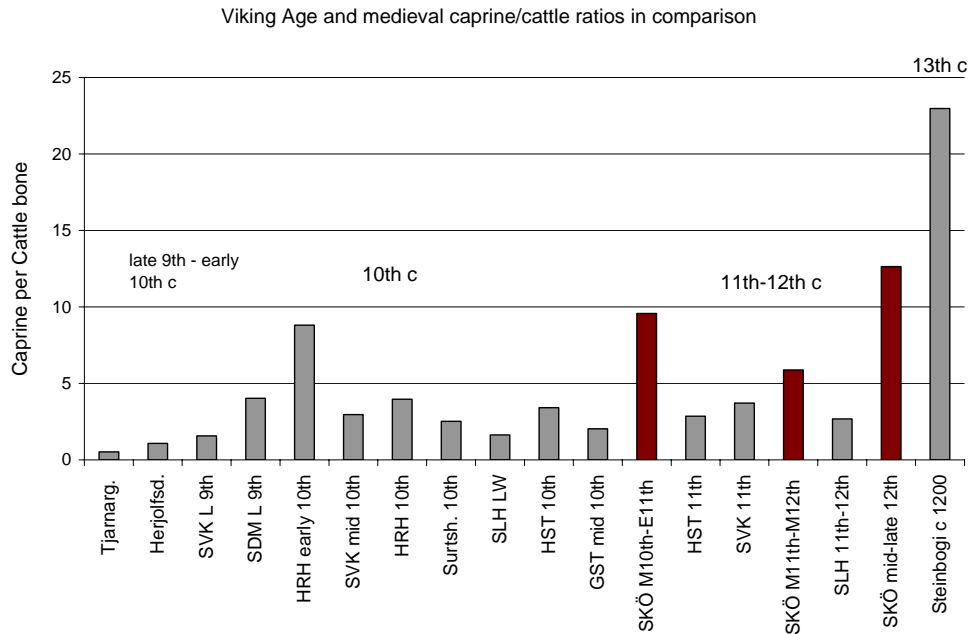


Figure 10. Comparison of caprine/cattle ratios from various Viking Age and medieval Icelandic sites.

When compared to sites of various established social standings, the Skuggi caprine/cattle ratios above somewhat resemble those of early medieval Icelandic farmsteads of low-middle social status. The generally high number of caprine bones per cattle bone at Skuggi may indicate that this was a farm concentrating on sheep/goat management for its economic purpose. The lower amount of caprine bones per cattle bone during Phase VI (mid 11th – mid 12th c) could indicate that there was a slight shift in farm organization that may have included higher focus on cattle for food production, before a distinct concentration on caprines took place in the mid-late 12th c at Skuggi.

Reconstructing Domestic Mortality Patterns

Cattle

The Skuggi cattle bone assemblage is too limited to allow for a long bone fusion analysis: There are a total of 7 elements available of the ends of distal long bones used in the long bone fusion and thus no coherent percentage of fused vs. non-fused long bones can be established. There are however 15 cattle mandibles from the total Skuggi archaeofauna that can be used in site assessment of age at death in cows.

Skuggi - Cattle tooth eruption comparison

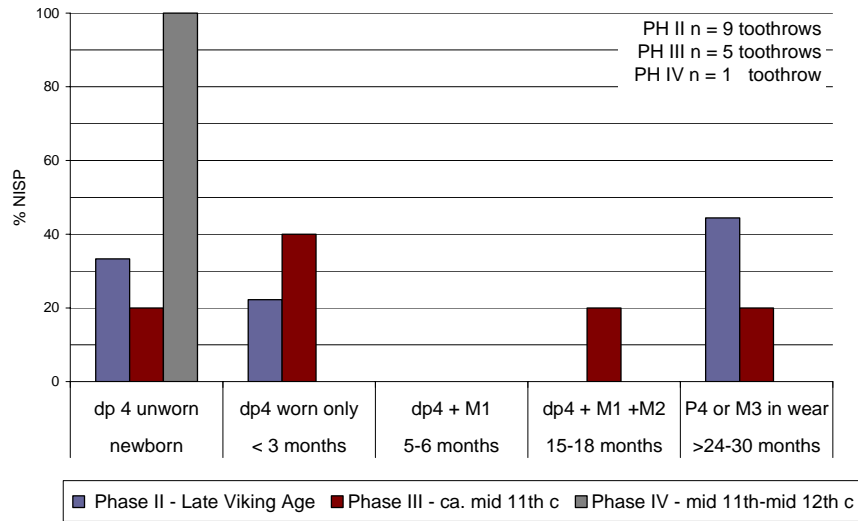


Figure 11. Skuggi cattle tooth eruption.

The Skuggi cattle tooth eruption analysis presents data from phases II, III, and IV. The latter phase comprise only one cattle tooth row.

The Phase II, or Later Viking Age cattle tooth eruption profile suggests that 55 % of calves did not survive their first winter, 33 % culled their first summer, i.e. as neonates. The remaining 45 % of cattle lived at least through their second winter and beyond.

During Phase III, at ca. AD1050, fewer calves seem to have been culled immediately or very shortly after birth, but a total of 60 % did not live through their first winter. Another 20 % were about 1 – 1½ years old at time of death, and 20 % were older than 2 years.

This age at death profiles strongly indicate that the Skuggi cattle herd was managed for dairying purposes and agree with the cattle neonatal data from phases II, IV, and V, presented below.

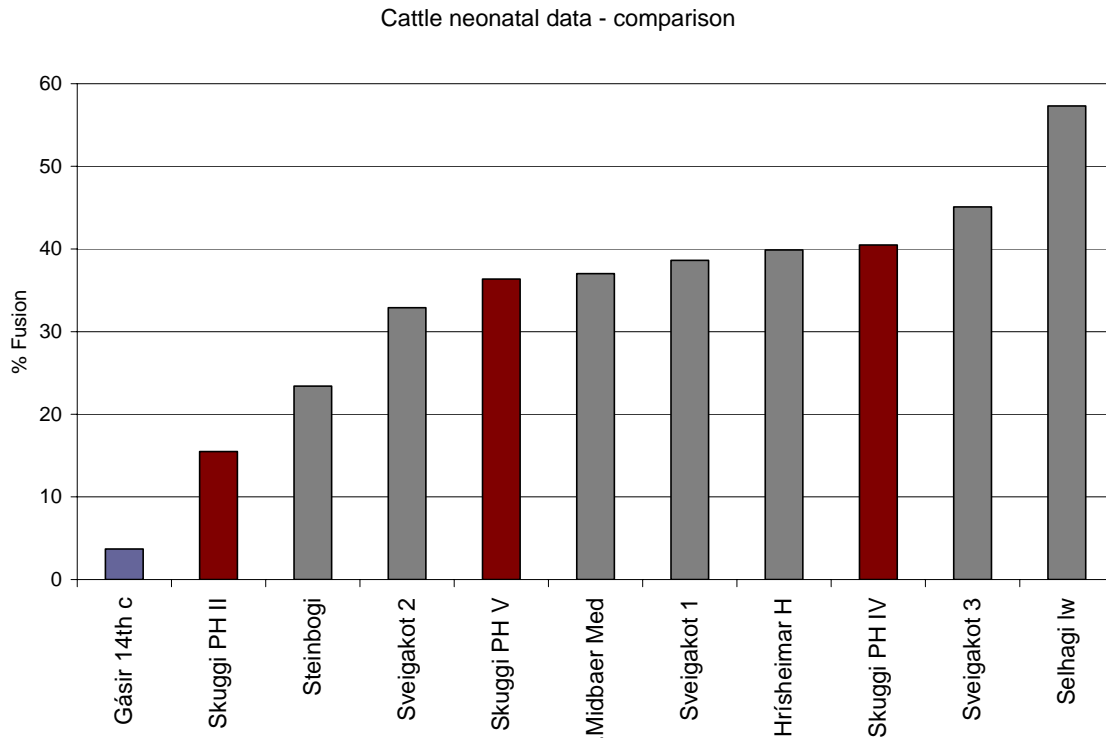


Figure 12. Skuggi cattle neonatal data compared to other Viking Age – Medieval sites from N Iceland.

Figure 12 shows a relative percentage of neonatal (newborn) calf bones in a range of Viking-Medieval sites from N Iceland (data courtesy of McGovern, NABONE database). A range of ca. 15-50 % neonates among the total cattle bone count is generally interpreted as evidence of dairy herd management, with most milk being reserved for humans (Halstead 1998). Unlike the very low percentage at Gásir attesting for the special cattle profile on that site, the Skuggi neonatal percentage resembles the one of a more typical farmstead and may indicate that at least a portion of the Skuggi cattle were used for dairying purposes. Analysis of more cattle elements is necessary to provide a better idea on cattle use at Skuggi, especially because the lack of long bone fusion data may bias the age at death data towards a younger age. In Phase II, the Skuggi cattle neonatal percentage is quite low, while in Phases IV and V, during the Early Middle Ages, the percentages increase to about 35-40 % of neonatal cows culled at Skuggi.

Caprines

The Skuggi caprine collection is better suited for a phased age at death profile than the cattle collection. Although the assemblage would also profit from more elements, an initial caprine long bone fusion analysis in figure 13 illustrates a difference in the caprine culling strategy from the Later Viking Age to the Early Middle Ages.

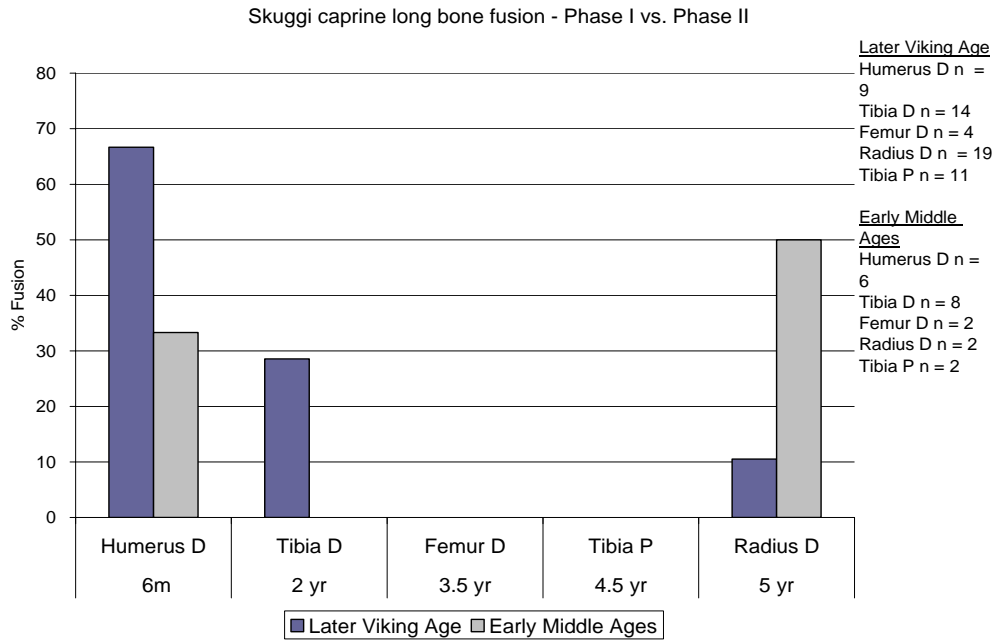


Figure 13. Caprine Long Bone Fusion Comparison

The Later Viking Age (Phase II) caprine long bone fusion data indicates that less than 30 % of the Skuggi sheep and goats survived until their second year, and that only about 10 % lived to be five. In the early medieval phases (VI, V), half of the Skuggi caprines seem to have survived until their fifth year which means that there may have been a shift towards keeping more adult sheep for potential wool management.

The intra-site caprine tooth eruption analysis illustrated in figure 15 makes use of mandibular and maxillary tooth rows of sheep/goats from all contexts and allows for a thorough comparison of caprine age at death during Later Viking Age (Phase II), mid 10th c (Phase III), and Early Middle Ages (Phases IV and V) at Skuggi.

Skuggi - Caprine tooth eruption stages by phase

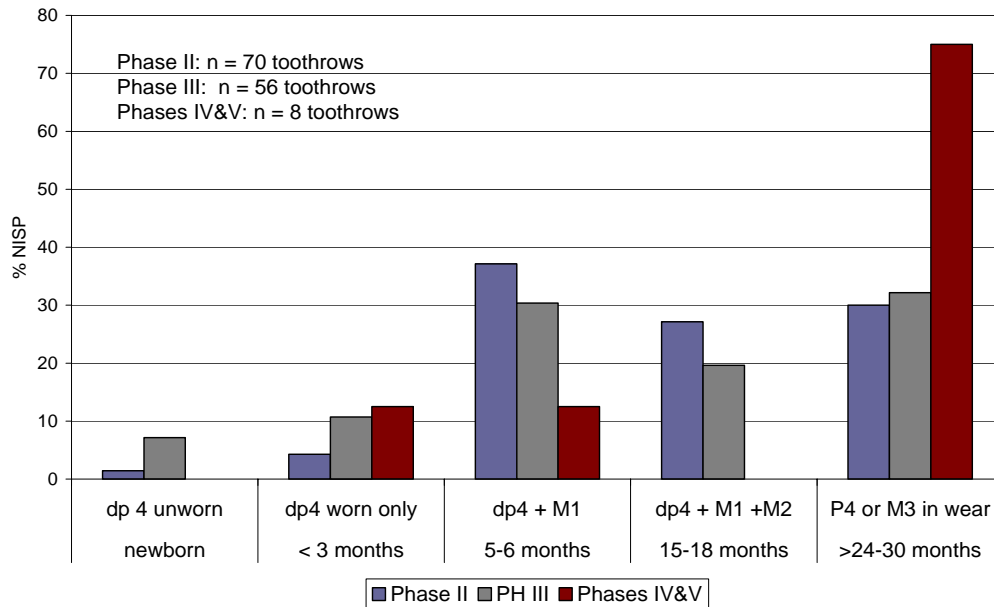


Figure 14. Skuggi Caprine tooth eruption comparison.

The Viking Age (Phase II) caprine age at death profile somewhat agrees with the long bone fusion study: The data suggests a culling of about 35 % of sheep/goats after their first summer, but only about 5 % being butchered at neonatal stage, with close to 60 % of the sheep/goats from phase II surviving their first winter; about 30 % lived to be older than 2 - 2 1/2 years.

At around AD 1050 (Phase III), about 15 % of the newborn caprines were culled, and about 30 % after their first summer. The caprine tooth eruption analysis indicates a circa 50 % first winter survival rate, and just above 30 % of the sheep/goats living beyond 2 years of age.

The data for the early medieval phases (Phases IV and V) is far less abundant, but provides a somewhat different culling pattern. About 13 % of the caprines from the upper midden layers were slaughtered before their first summer, and another 13 % after their first summer. More than 70 % were culled after they had turned 2 years old.

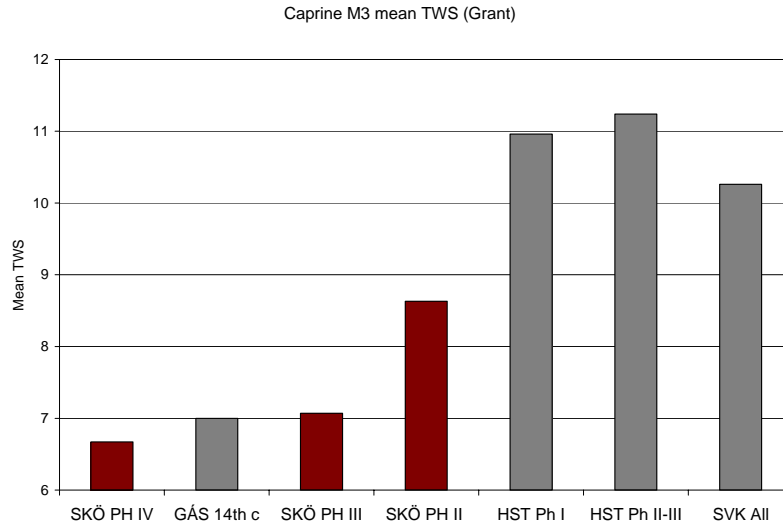


Figure 15. Caprine M3 mean TWS (after Grant 1982).

Figure 15 presents the caprine tooth wear data in a different way, with only a mean of worn mandibular M3 teeth used. All teeth used from Skuggi show a M3 TWS mean of 7 – 9, indicating presence of mature animals, whose M3s are in wear, but not heavily worn, indicating young adults, comparable to the Gásir caprine M3 TWS (Harrison 2009). The Skuggi tooth wear data indicates a presence of substantial numbers of young to middle aged adults, without higher proportion of highly worn teeth seen in the Mývatnssveit collections at Hofstaðir and Sveigakot (i.e. McGovern et al. 2004, McGovern and Perdikaris 2002).

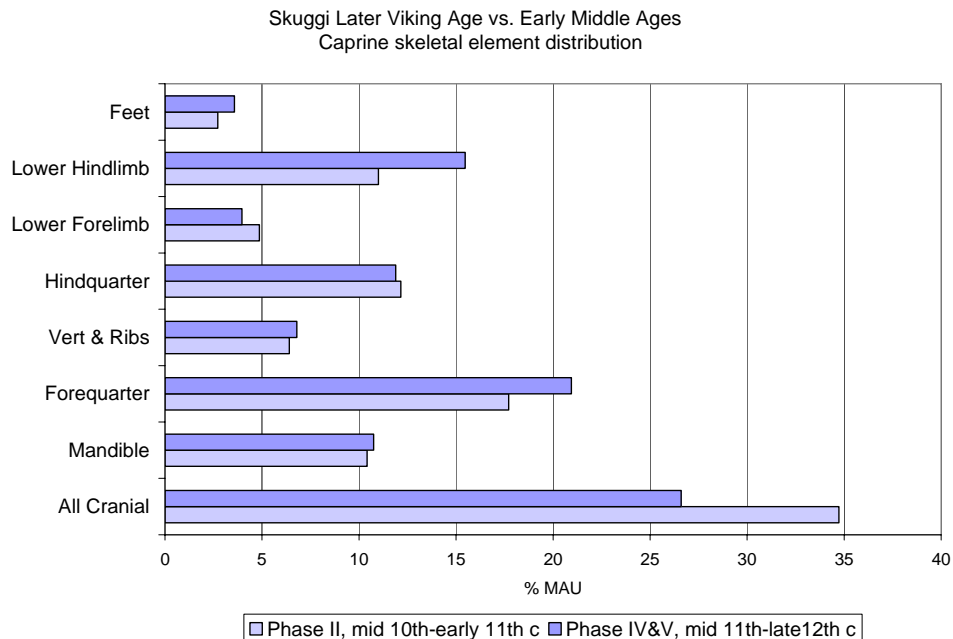


Figure 16. Caprine skeletal element distribution per phase.

Figure 16 illustrates the proportions of meat bearing elements present at Skuggi by phases.

There is a similar caprine skeletal distribution in both time periods, although there were many more cranial elements in the Viking Age deposits than in the medieval ones. In general, the Viking Age deposits bear a higher percentage of bones that are more sensitive to taphonomic influences than the medieval deposits. This fits within the overall observation that the upper layers show a generally poorer preservation of bone than the lower ones.

The lack in vertebral and rib elements derives from NABONE practice of generally not placing these elements into family or species level, but rather to assign them to either MTM or LTM categories.

The overall skeletal distributions indicate on site slaughter of the consumed elements, especially in the Later Viking Age phase, where butchered occipital, atlas, and axis elements were recovered.

Horse

No horse bones could be identified from the contexts analyzed so far. It is possible that there were elements from this species among the archaeofauna, but none of them were well enough preserved to be placed in a more specific category than LTM.

Pigs

The Skuggi faunal collection contained 9 pig (*Sus scrofa*) elements, predominantly maxillary teeth. The 2 metapodials found in context [021] can easily be from the same individual.

There was only one pig element from the Later Viking Age, and that was actually from the context associated with building collapse material under context [053].

Context	Phase	Species	Bone	NISP
003	Phase V	SUS	Mandible	1
009/010	Phase IV	SUS	Molar, maxillary	1
011	Phase IV	SUS	Incisor, mandibular	1
018	III	SUS	Molar, maxillary	1
021	III	SUS	Metapodial	2
035	III	SUS	Molar, maxillary	1
037	III	SUS	Ulna	1
U/S	Phase II	SUS	Phalanx 2	1

Table 4. Skuggi pigs by phases.

Dogs

Although there were no dog elements recovered from the Skuggi midden, dog tooth marks on numerous bones indicate the presence of the species on site.

Context	dog tooth marks	possible dog tooth marks
003	4	2
004	4	
005		1
006	2	
007		1
009/010 (group 009/010)		1
010 (group 009/010)	7	3
011	9	1
039		1
046		1
047	1	2
Total	27	13

Table 5. Dog tooth marks and potential dog tooth marks context.

Table 5 lists the contexts containing bones with dog gnawing marks. Phase IV clearly has the most dog gnawing marks, indicating that dogs had potentially easier access to the bone materials from this time period than in others. Figure 17 only lists elements that definitely displayed dog tooth marks, with ribs and long bones being the elements most frequently gnawed by dogs in this assemblage.

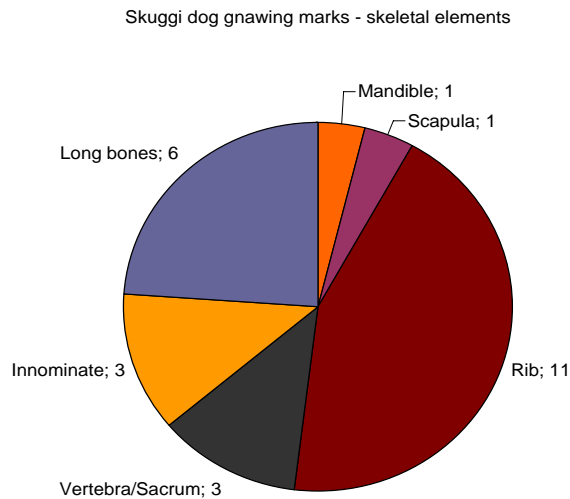


Figure 17. Number of identified elements displaying dog tooth marks.

Wild Mammals

Whale

Only one unidentifiable chopped whale fragment from context [047] was found in the Skuggi archaeofauna. This was likely a tool rather than indicative of on-site whale consumption.

Seals

A total of 47 seal elements were collected from TR1. This number is likely to increase with further analysis. None of the elements were distinct enough to be assigned to species level. Apart from a femur of a very young seal present in context [047], the entire Skuggi phocid assemblage was found in the medieval deposits. Although none of the seals could be speciated, most of the elements are of Harbour Seal (*Phoca vitulina* (L.)) size. The four large phocid elements could be from grey seal (*Halichoerus grypus* (L.)). Both seal species give birth to their young on Iceland's sandy beaches along coastal strips.

While harbor seals were predominantly netted in spring, the grey seal was killed during the fall (Kristjánsson 1989:447). The element of young seal from context [047] could thus be a potential indicator for seasonal seal hunt. Many of Iceland's religious institutions had sealing beaches, i.e. Múnkaþverá monastery at the southern end of Eyjafjörður. There used to be a series of known seal hunting areas along Eyjafjörður (Kristjánsson 1989:315).

Three seal elements found in context [011] displayed clear butchery/working marks: a proximal seal radius and one carpal (Trapezium) of a large sized seal bore butchery marks, and one skull fragment was debris from bone working; the rest of the seal bones did not bear any knife, chop, or impact marks.

Figure 16 displays a NISP of phocid elements found in Trench 1. Context [011] with 26 elements was the most numerous in seal bones, followed by [003] with 8, group [009/010] with 6, context [006] with 3, and only one element in [047].

The majority of seal skeletal elements are represented here, indicating the site was supplied with seal meat cuts from most elements and not only flippers.

If seal oil was to be transported to the site also, it would have been easier to keep an animal intact and only butcher it on site. Seal oil was used for lamps but also for insulation.

Seal skin was often made into shoes, rope, outer garments and other items, and from the Middle Ages on, manuscripts were at times bound in seal skin (Kristjánsson 446-448).

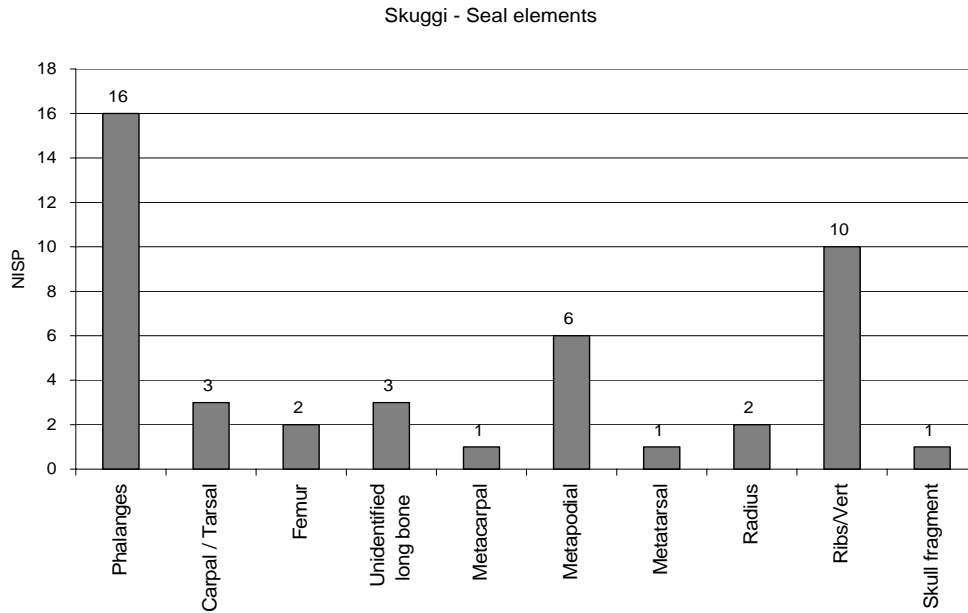


Figure 18. Phocid skeletal elements - NISP.

Rodent (?)

No rodent skeletal elements were found in the Skuggi archaeofauna. One long bone fragment from context [011] however displayed possible rodent gnawing.

Birds

Skuggi Bird species			
Scientific Names	English Common Names		
Non Migratory Terrestrials		NISP count	% All Birds
<i>Corvus corax (L.)</i>	Common Raven (at least 4 MNI)	44	10.71
Terrestrials			
Passerines		2	0.49
AVSP		365	88.81
<i>total AVSP</i>		411	100

Table 6. Skuggi - Bird Species

The only bird elements that could be speciated were those of Common raven (*Corvus corax* (L.)) (Table 6).

Two very small ulnas belong to the very large group of Passerines found in Island, either present year round or as seasonal guests (i.e. Hilmarsson 2000). The 365 bird elements that could not be assigned to a species or family were mainly long bone fragment shafts, but also phalanges and badly preserved ends of bird long bones.

Only two bird elements were recovered from the Later Viking Age phase.

The 44 raven elements are distributed among 3 contexts from phases VI (contexts [010] and [011]) and V (context 003).

Context [003] contained 3 elements that could be assigned to this species, context [010] from group [009/010] contained 5, and context [011] with 36 elements contained the largest number of raven bones in the assemblage. There were several other bird elements in all of these contexts that may be from this species, but their distinct skeletal landmarks are no longer present and they were thus placed in the AVSP (unidentified bird elements) category. Figure 19 shows one ulna shaft fragment on the bottom left, two mandibles to the right, and a proximal coracoid on the top left. A third mandible was found in context [003]. Since there are many more



Figure 19. Various Common Raven (*Corvus corax* (L.)) elements found in context [011].



Figure 20. Long bone elements of Common raven from context [010].

phalanges than long bones or other elements present in context [011], the two mandibles are probably the best indicators for a minimum number of individuals (MNI). Context [010] from group [009/010] and context [003] each contain skeletal elements of this species that may represent only one individual per context.

The raven elements present in the medieval phase is a bit of a surprise, and surely ptarmigan (*Lagopus muta* (L.)) would have been a terrestrial Icelandic bird expected to be found among food remains. Common ravens are home to this area of Iceland and live there year round (Petersen 1989). Bones of this species have been found in other Viking Age and medieval assemblages and while they were more frequently found in graves they seem to have been occasionally consumed (Maltby 1979:73; Reichstein and Tiessen 1974:123, 144; Bond and O'Connor 1999:398, 392-93; Wigh 2001:29), killed for use of their feathers in ornaments or tools (Enghoff 2003:33, Serjeantson 2009), and at times also raised

as pets, killed as pests, valued for their intelligence, but also well-known for their scavenging habits (Serjeantson 2009).

It seems possible that ravens were consumed at Skuggi, because some of the long bones are broken/chopped in a way that could indicate disarticulation of these elements for consumption purposes. Figure 20 displays some elements that could possibly be the remains of a raven consumption. The photo shows three proximal femoral and two distal tibiotarsus elements; all from context [011]. Alternatively, taphonomic factors could have destroyed the long bones and only left behind the tough joint fragments.

Fish

Marine Fish

The total fish assemblage analyzed so far consists of marine species. Even though the Hörgá is known as Char and Trout fishing river, no fresh water fish were found at Skuggi so far (http://www.nat.is/nateng/angling_in_north_iceland.htm).

The Later Viking Age marine fish assemblage contained 21 total fish elements, with 3 speciated to Haddock (*Melanogrammus aeglefinus* (L.)), and 5 elements placed in the gadid category. Presence of these elements suggests occasional consumption of marine fish at Skuggi.

The Skuggi medieval fish assemblages also consisted of marine fish, with 360 elements present in early medieval layers (Phases IV and V). Of those, 10 could be speciated to Atlantic Cod (*Gadus morhua* (L.)), another 10 to Saithe (*Pollachius virens* (L.)), 15 to Haddock, and 1 to Cusk (*Brosme brosme* (L.)). A total of 71 elements were assigned to the gadid family, and four could be speciated as Halibut (*Hippoglossus hippoglossus* (L.)).

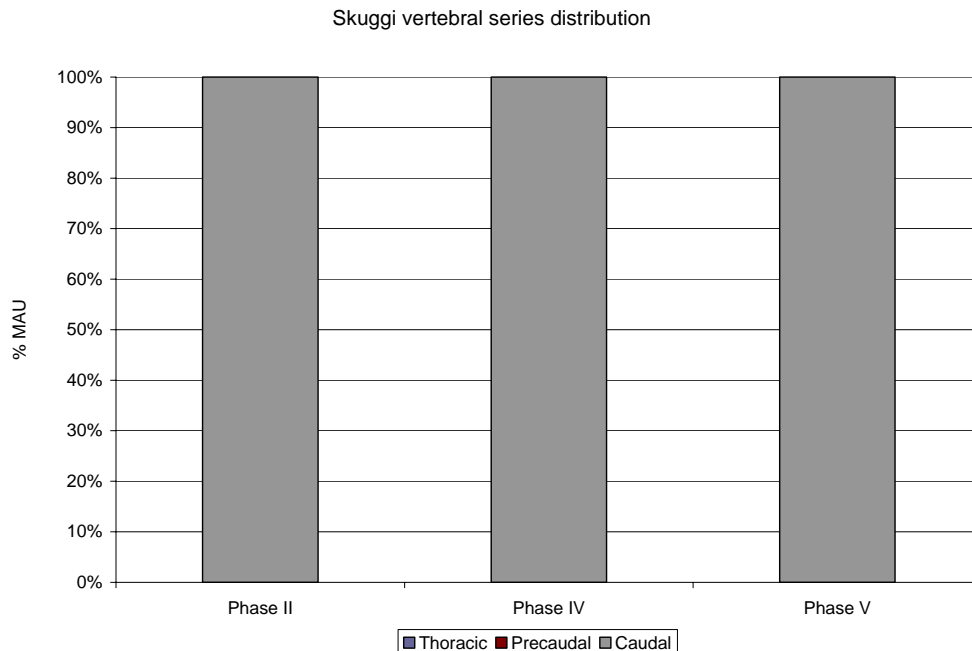


Figure 21. Skuggi gadid vertebral series distribution.

The Skuggi gadid vertebral series distribution analysis indicates that only the caudal vertebrae made it to the site. Since the Skuggi gadids that were speciated were predominantly Haddock, the likely processed fish product would be *klipfisk* (Perdikaris & McGovern 2008:76).

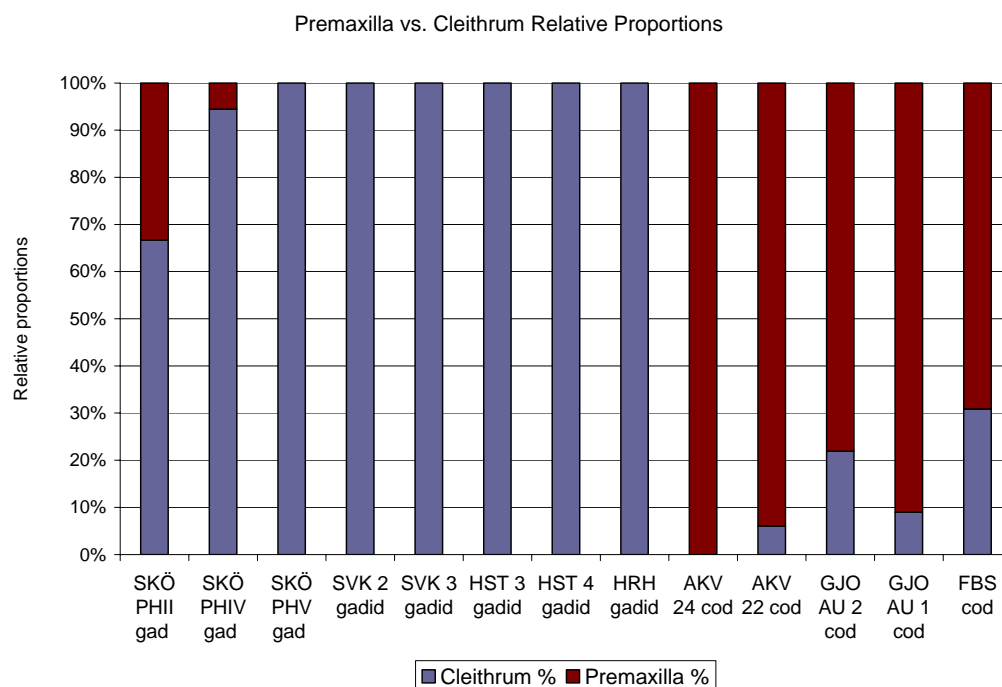


Figure 22. Gadid premaxilla vs. cleithrum relative proportions.

The graph in figure 22 indicates that far more gadid post-cranial bones than cranial elements were present in the Skuggi faunal collection, especially in the medieval phases (i.e. Perdikaris and McGovern 2008, McGovern et al. 2009). Premaxillae usually are found with fish skulls in processing sites such as Akurvík, Finnbogastaðir, and Gjögur in the Westfjords. Cleithra frequently travel with a processed fish product to consumer sites such as the Mývatnssveit sites of Hofstaðir, Hrísheimar, Sveigakot, and also Skuggi in Hörgárdalur.

The distance between Skuggi and the ocean is about 20 km, and the site's gadid skeletal profiles so far suggest a supply with a processed marine fish product (gadid species and Halibut) rather than a fresh fish brought to the site and processed there.

Craft working

There were several elements in the faunal assemblage that show traces of craft working. Especially long bone fragments of either MTM (sheep/goat) or LTM (cow/horse) were often used for bone tool making.

Several bone fragments could be determined as bone working debris, i.e. bone pins, bone needles, bone combs, were found in the analyzed faunal materials from contexts [009/010], [011], [046], and [074]. Table 7 displays the different worked bone elements. All the elements listed there were either MTM or LTM long bone fragments. Several other elements are still under analysis.

Context	General finds number	Species	Bone	Count
009/010	III	MTM	Long bone	4
011	VIII	MTM	Long bone	1
046	V	Caprine	Metapodial	1
046	IX	Caprine	Metacarpal	1
046	n/a	MTM	Long bone	1
047	n/a	LTM	Long bone	1

Table 7. Skuggi bone working debris.



Figure 22.
Bone artifact
context [046].

The two bone pins found during excavation were from contexts [035], finds number 56; and [036], finds number 74; from Phase III, or the mid 11th c. Since the faunal remains from these contexts have not yet been analyzed, it cannot be determined whether there were associated bone working debris elements in the context.

Contexts [011] and [047] contained worked fragments of what appears to be antler; both elements are still under analysis.

A bone artifact fragment from context [046] was recovered during faunal analysis and assigned finds number I. Figure 22 shows the white burnt, incised bone artifact. This could be a bone comb fragment, possibly made from antler rather than mammal long bone.

Butchery

The generally well preserved Skuggi faunal collection contained many elements that clearly were butchered for food consumption.

Due to the better preservation conditions in the Viking Age phase, the ratio of butchered elements detected in Phase II vs. in Phases IV, V is 2 (1.73):1.

The 42 (25%) of metapodials, or lower leg bones that showed butchery traces, were all split. None of the Skuggi metapodials bore the bi-perforations typical for later medieval North Atlantic faunal assemblages (not in Greenland). The practice of drilling holes into the top of a



Figure 23. Chopped sheep atlas/axis from context [052].

metapodial epiphysis and one right above the distal epiphysis by knife to suck out the marrow while leaving the bone intact for artifact production or children's toys started around AD 1150-1200 (Bigelow 1985).



Figure 24. Butchered elements. Left: Split cattle metapodials context [047]. Right: split caprine tibia, elements refitted from context [046].

Burning

Only about 12 % of the Skuggi bones showed burning. Thereof, white burnt bones whose organic materials are no longer present made up 8,5 %, black burnt bones 2,5%, and 0,6 % of the bones were scorched. Figure 24 presents the percentage of burnt bone per context. Although only two contexts from the Later Viking Age contained burnt faunal elements, these two contexts, [047] and [052], had a higher percentage of burnt fragments than the early medieval contexts. Phase IV and V contexts have a lower proportion of burnt elements, not exceeding 10 % of the total bone assemblage per context. The two phase II midden layers possibly contain a proportion of burnt bone and other fire place cleaning contents: context [052] was described as midden layer containing wood ash, and [047] as containing peat ash.

Except for group [009/010] that was described as midden layers containing a combination of peat ash and charcoal, all the other early medieval deposits listed in the graph were described as containing only charcoal, but no peat ash or wood ash.

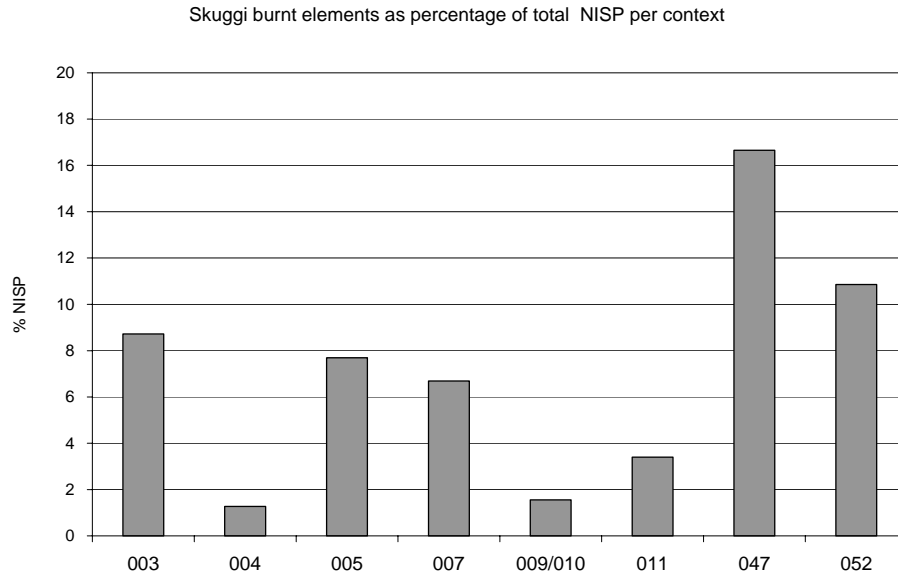


Figure 25. Percentage of burnt bones per context.

Fragmentation

Phase IV and V contexts display a relatively higher fragmentation rate than Phase II contexts. This result agrees with the observation that the Viking Age bone collection at Skuggi is in better condition than the one from the Middle Ages.

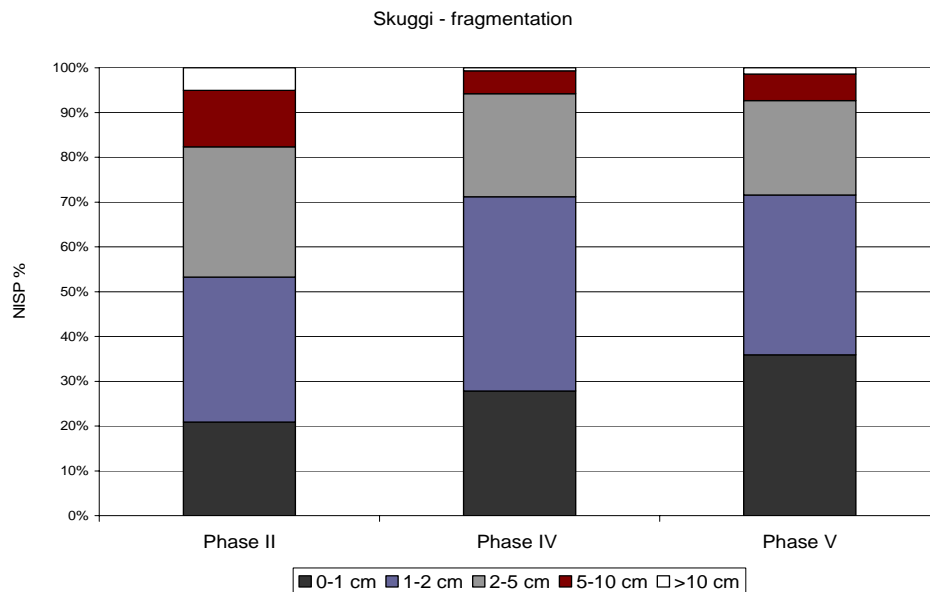


Figure 26. Percentage of bone fragmentation by phase.

Conclusions and more questions

Analysis of the basal and most recent midden layers from Trench 1 at Skuggi provides a preliminary account of how the people managed their animal resources during the Later Viking Age and the Early Middle Ages. With help of calibrated radiocarbon dates, tephrochronology, and stratigraphy, the midden deposits could be divided into four phases: II, III, IV, and V; with an additional phase I assigned to the earliest cultural remains on site: the structure underneath the midden containing the tephra layers labeled as LNS 871.

The archaeofauna indicates changes in the site economy over time, with the early layers containing almost only domestic mammals, and the most recent layers indicating use of birds, fish, and also seal besides domesticates for consumption. This potentially suggests an early site use as tenant farm that later was provided with external food resources, suggesting connections to the larger rural economy, but also site supply possibly controlled Staðartunga and Möðruvellir.

By providing information on the late 10th, 11th and 12th centuries, the Skuggi archaeological remains and especially its archaeofauna contribute to the establishment of an early medieval Eyjafjörður socio-economic baseline. The data available from Skuggi can be used for direct comparison with several sites from Mývatnssveit in the NE of Iceland, thus contributing to a larger regional study of Later Viking Age and early medieval North Iceland.

With other sites from the GHP project still under analysis, data from the entire Hörgárdalur settlement history will soon be available to be used not only in a wider comparative approach covering long term Eyjafjörður Ecodynamics, but also contributing to a study of northern Iceland and even the entire North Atlantic region.

The Skuggi archaeofauna raises some questions and thoughts for further research:

- Caprine husbandry: Skuggi, although domesticates consist of predominantly caprines throughout all the phases, the cattle never disappear, and the sheep numbers do not seem to rise to a point where an exploitable surplus of wool was produced. The goat elements are indicative of meat and dairy economy. From the caprine age at death reconstructions including the M3 Tooth Wear Stage analysis, it becomes clear the caprines at Skuggi did not live to as high an age as for example those at Sveigakot where surplus wool production took place (McGovern et al. 2009).
- Birds: Is there a curious absence of Ptarmigan at Skuggi because not the farmers themselves but somebody else had the right to hunt these birds? If the Skuggi farmers had been able to hunt these terrestrial fowls, surely their bones would have reflected such in the archaeofauna. Would Staðartunga reserve the right to catch these birds?
- Seals: The bone of a young seal from context [047] could be a potential indicator for seasonal seal hunt. Many of Iceland's religious institutions had sealing

beaches, i.e. Múnkaþverá monastery at the southern end of Eyjafjörður. There are many known seal hunting areas along Eyjafjörður (Kristjánsson 1989:315). Could Möðruvellir as a large manorial farm have had rights over sealing and were the people at Skuggi involved in the seal hunt, maybe as a labor payment?

- Fish:
 - The complete absence of freshwater fish at Skuggi is puzzling, since there are char and trout in the Hörgá. Could the fishing in the Hörgá and other rivers have been restricted to certain people?
 - The Skuggi gadid skeletal element pattern suggests a supply of the site with headless gadids that also lack their cervical and pre-caudal vertebrae. Gadids and also halibut most likely reached Skuggi in processed form, and the gadid vertebral distribution pattern and the premaxilla vs. cleithrum distribution analysis indicate a *klipfisk* product (see Perdikaris and McGovern 2008:76).
 - Who supplied the Skuggi farm with these fish products and what was exchanged in return? Possibly milk, butter, and meat?

- Power and Status: The artifacts (artifact specialists' analysis in Harrison et al 2010:43-55) or lack thereof found in TR1, together with Skuggi's size and location along a north facing and thus shaded (*Skuggi* - shadow) mountain slope, seem to all point to a relatively low social status. Skuggi may have always been bound to a manorial farm, located on Staðartunga land which was connected to the large manorial and later ecclesiastical farm and monastery at Möðruvellir (Hreiðarsdóttir et al 2008:230).
 - Once Skuggi was abandoned some time after the H1104 tephra fall, but possibly 100 years before the H1300 tephra fall, were the sheep kept in a winter shelter called Klausturhús, located less about 500-750m northwest from Skuggi?
A site catchment comparison between Skuggi and Klausturhús indicates that the two sites had access to much of the same natural resource area and would have been competing for pastureland had they co-existed in time. It seems more reasonable to understand Klausturhús as a site replacing Skuggi as a sheep shelter with only enough humans present to tend to the animals.
Klausturhús was owned by Staðartunga (Hreiðarsdóttir et al. 2008:239).
Cores from the Klausturhús site were taken in 2008 and lack of household refuse midden and the presence of sheep dung midden materials in the cores suggest usage as animal shelter rather than small farm (Harrison 2008b:15).
 - If there was a shift towards a more seasonal caprine herding on the land during the 13th c, where were the surplus products going? Could they have been part of the tithe Staðartunga owed to Möðruvellir?

- Once there was an exploitable surplus production of sheep wool established in the area, was the surplus pooled at Möðruvellir to be exported? Möðruvellir was clearly instrumental in the Gásir trading enterprise and may have coordinated a concentration of goods from Hörgárdalur.
- Did Möðruvellir have control over the whole valley, or were there other manorial farms that took part in the economic exchange?

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Appendix: SKÖ Harris Matrix.

