Interim Report of Animal Bones from the 2003 Excavations at Gásir, Eyjafjörður, N Iceland

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Fig 1. Gásir 2003 – Gyrfalcon
Photo: Daniel Bergman Photography

Executive Summary

Archaeological excavations carried out in the summer of 2002 at the site of Gásir in Eyjafjörður near the modern city of Akureyri directed by Howell Roberts of *Fornleifastofnun Íslan*ds (Archaeological Institute Iceland, FSI) for *Minjasafnið á Akureyri* (Akureyri Museum) produced a substantial number of animal bones, whose initial analysis is reported here. Analysis has been carried out by Dr.s Jim Woollett and Tom McGovern, and Ph.D. students Ramona Harrison and Seth Brewington at the CUNY Northern Science & Education Center laboratories as part of the North Atlantic Biocultural Organization cooperative effort, with funding from the UK Leverhulme Trust. The 2003 excavations were part of a larger scale long term effort to investigate the remains of the early trading center at Gásir and to place the site in a regional and historical perspective. Investigations will continue at the site, and this report is thus only a working paper to be updated and replaced as more material becomes available for study. The total animal bone collection (archaeofauna) analyzed from the 2003 season comprised 5,067 fragments, of which 2,240 could be assigned to a taxon. Together with the faunal remains analyzed in the previous year, the total NISP 2002/2003 represents 3,088 out of a TNF of 7,168.

The species present include domestic cattle, sheep, goat, horse, and pig as well as seal, whale, bird and fish remains. It should be mentioned that the 2003 collection also contained a walrus tooth (context 101), dog bones (contexts 655, 662), arctic fox (contexts 101, 583, 617), as well as harp seal (contexts 617,684,730,756), and one **gyrfalcon** bone (context 756). Domestic mammal bones make up about half of the total speciated archaeofauna (ca 51%), fish being the next most common taxa (ca 43 %). There is a high abundance in cattle bone, with a caprine/cattle ratio of about 1.82 caprine bone for every cattle bone. The high percentage of cattle bone is similar to very high status late medieval sites in S Iceland (Víðey being most similar), with a majority of the faunal remains representing cattle/caprines butchered/consumed at an age of high quality meat condition. The presence of pig remains should be mentioned, since by late medieval times, Icelandic pigs are in general no longer present in the faunal assemblages.

While the domestic mammals amount to about half of the faunal assemblage, there is an almost equal amount of fish fragments present in the Gásir 2002/03 collection. Since the fish bones are not very well preserved, only a part of the elements was usable for analysis. From the 2003 fish remains, almost all analyzed elements are postcranial, with hardly any thoracic vertebrae present. This pattern suggests that the occupants were consuming some form of preserved fish rather than fishing themselves. Dog gnawing is visible on bones, and the 2003 excavation yielded 3 dog elements (contexts 655, 662) as further evidence for the presence of the species.

Butchery patterns include typical late medieval Icelandic patterns, except for a puzzling shortage of characteristic biperforated sheep metapodials, which may indicate the presence of non-Icelandic consumers. Further research questions center on the nature of provisioning of the site, context-specific bone associations and activity areas, bone and horn craft working, possible indicators of multiethnic foodways, and social status system.

Fig. 2 NISP categories

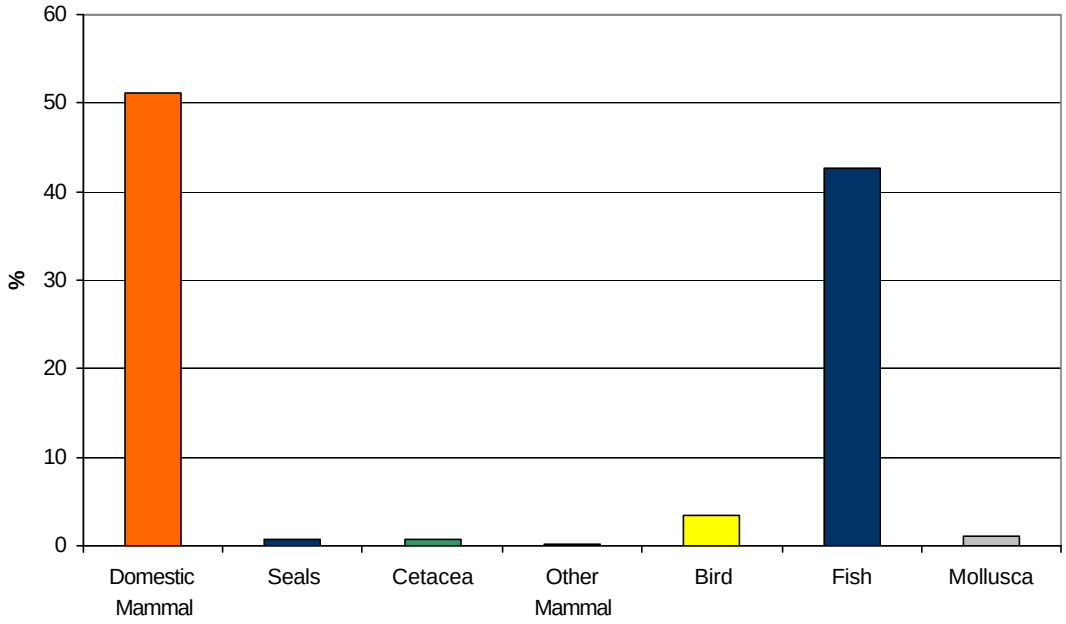
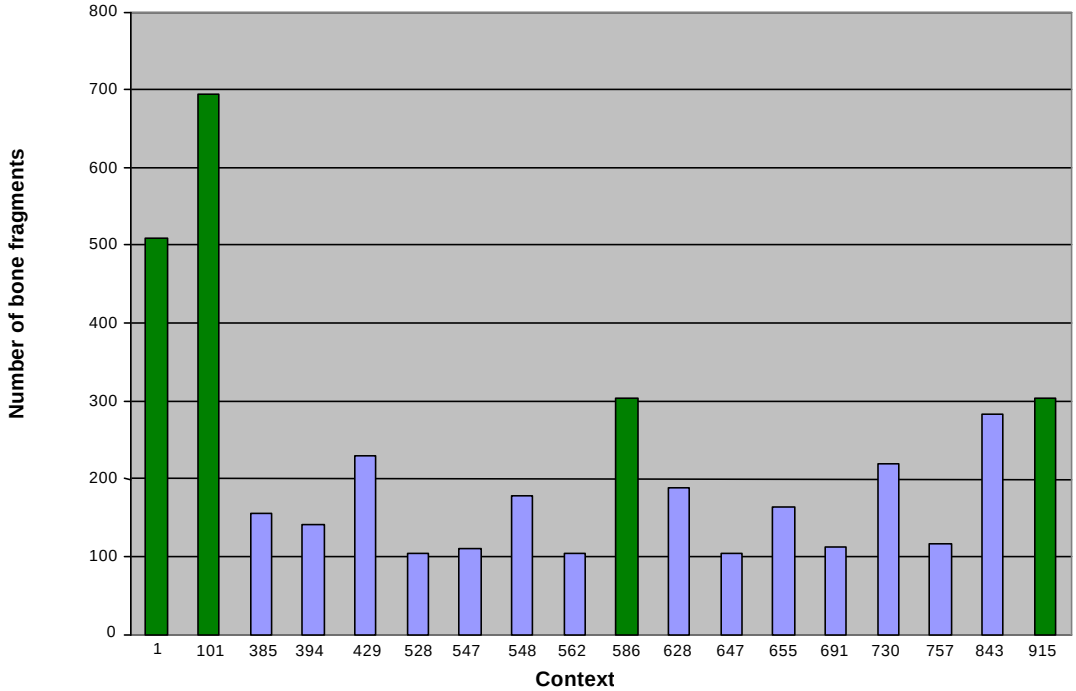


Fig 3. Contexts containing > 100 bone fragments
Green column: > 300 bone fragments



As the graph in Fig 3 indicates, the context producing the largest amount of bone fragments (in 2003) was 101. While in 2002 only one context (1) yielded a number of bone fragments above the minimum 300 mammal bone NISP (number of identified fragments = bones identified to a useful taxonomic level) threshold for full quantification recommended by the NABO Zooarchaeology Working Group (see green columns indicating 300+), the 2003 collection yielded three more such contexts. As can already be seen from the last two years of faunal analysis, a larger amount of excavated remains provides a better idea of the total amount of animal remains initially present on site.

Overview of Species Present

Table 1 presents the 2002/2003 Gásir archaeofauna, grouped into 2002 and 2003 fauna. 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), UNIM or unidentified mammal are small fragments that cannot be identified beyond this broad category. As opposed to the 2002 yield, dog bones are present in the collection, coinciding with characteristic canine tooth marks that are present on a number of bone fragments in the collection.

Table 1 Gásir 2002/2003 Aggregated Fragment Count

Taxon	*2002*	*2003*	*total*
Domestic Mammals			
Cattle (*Bos taurus dom* L)	255	296	551
Horse (*Equus cab. dom* L.)	5	5	10
Pig (*Sus scrofa dom* L.)	2	12	14
Dog (*Canis fam*. L)	present	3	3
Goat (*Capra hircus dom* L)	2	9	11
Sheep (*Ovis aries dom* L)	45	166	211
Caprine	296	487	783
total Caprine	343	662	1005
total Domestic	605	978	1583
Wild Mammals			
Harp Seal (Pagophilus groenl.)	0	4	4
Small seal	4	6	10
Seal species	5	2	7

total Seal	9	12	21
Small Cetacean	1	7	8
Large Cetacean	1	1	2
Whale species	0	8	8
total Whale	2	16	18
Arctic fox (Alopex lagopus)	0	4	4
Walrus (Odobenus rosmarus)	0	1	1
Birds			
Gyrfalcon (Falco rusticolus)	0	1	1
Mallard (Anas platyr.)	0	1	1
Eider duck (Somateria moll.)	0	26	26
Guillemot (Uria lomvia)	0	8	8
Puffin (Fratercula arctica)	0	2	2
Fulmar (F. glacialis)	0	1	1
Gull species (Laurus sp.)	0	1	1
Razorbill (Alca torda)	0	2	2
Bird species indeterminate	23	43	64
total Bird species	23	83	106
Fish			
Cod (Gadus morhua)	0	1	1
Haddock (Melanogr. aeglef.)	0	11	11
Atlantic Halibut (Hippoglossus. hipp)	0	2	2
Gadid sp	0	12	12
Fish species indeterminate	190	1,102	1,292
total Fish species	190	1,128	1,318
Mollusca			
Periwinkle (Litt. l.)	0	0	1
Clam (Mya sp.)	0	36	36
total Moll. Species	0	36	37

total NISP	848	2,240	3,088
Large Terrestr. Mammal	188	354	542
Medium Terrestr. Mammal	485	600	1,085
Small Terrestr. Mammal	0	8	8
Unidentified Mammal Frag.	580	1,846	2,426
total TNF	2,101	5,067	7,168

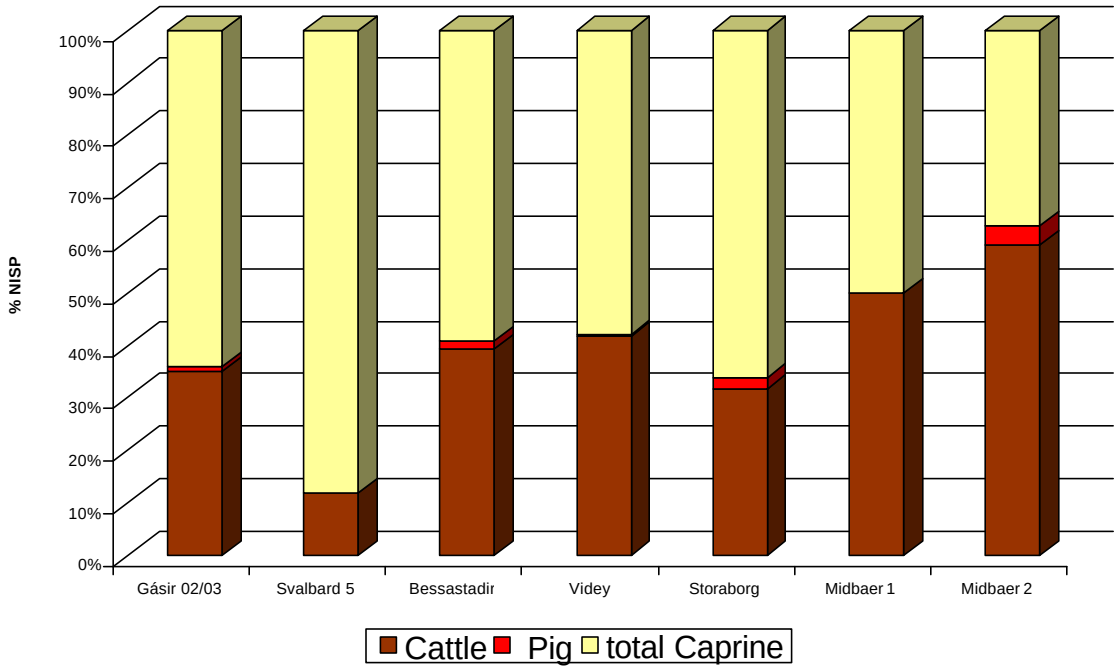
Table 2 presents the relative % of the domestic mammals for both 2002 and *2003* contexts. While in 2002 the abundance in cattle was almost as high as in caprines, 2003 shows a decrease in percentage of cattle bone vs. caprine bone. The total ratio deriving from two years of excavation: caprine/cattle = 1.82. Sheep/goat = 19.18.

Table 2 Gásir 2002 / 2003 Relative %
Domestic Mammals

Taxon	2002	2003	2002/2003
Cattle	40.87	30.27	34.81
Horse	3.85	1.23	0.63
Dog	0	0.51	0.19
Pig	0.32	0.31	0.88
Sheep	7.21	16.97	13.33
Goat	0.32	0.92	0.69
Caprines	47.44	49.8	49.46

A clear trend in all contexts is an abundance of cattle bone (almost all contexts have at least a few fragments) with a ratio of 1.8 caprine bones per 1 cattle bone. This high ratio of cattle to caprines can be compared to other late medieval (14th-early 16th c) Icelandic archaeofauna (figure 4).

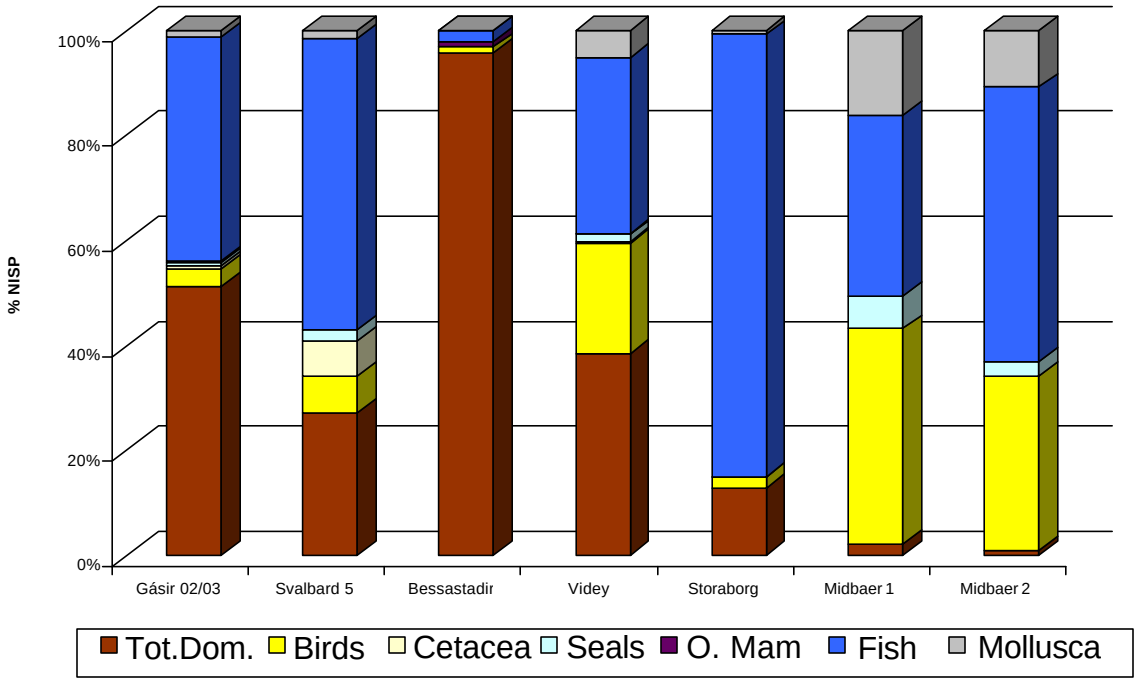
Fig. 4 Late Medieval Iceland
Major Domestic Mammals



In figure 4 Gásir is compared to roughly contemporary collections from Svalbarð in the NE (SVB 5, medium-high status farm with church), the elite manor at Bessastaðir (BES L) near Reykjavík, the monastery on Víðey in Reykjavík (VID LM), a middle ranking S coastal farm Storaborg (STB E) and two phases of a midden deposit associated with a small farm Miðbaer on the island of Flatey in Breidafjorð in the NW (Amundsen in press). The high cattle percentages for this small farm on Flatey are somewhat deceptive, as they reflect the extremely limited pasturage available on the island and a clear decision to use most available pasture for cattle raising (thus the graph actually reflects fewer sheep rather than more cattle). In general, higher percentages of cattle on most late medieval sites reflect availability of high quality pasture, high social status, or both. The closest matches with the 2002/03 Gásir domestic mammal pattern are in fact with the very high status manor of Bessastaðir in the SW, and the middle ranking S coastal farm Storaborg (STB E).

Figure 5 makes use of the same comparative archaeofauna to present the larger picture of the whole collection, regionally comparing wild species and domesticates. From the complete NISP collection, it seems that the monastery on Víðey in Reykjavík (VID LM) offers the most resemblance in total distribution of faunal remains recovered.

Fig. 5 Later Medieval Iceland
Major Taxa

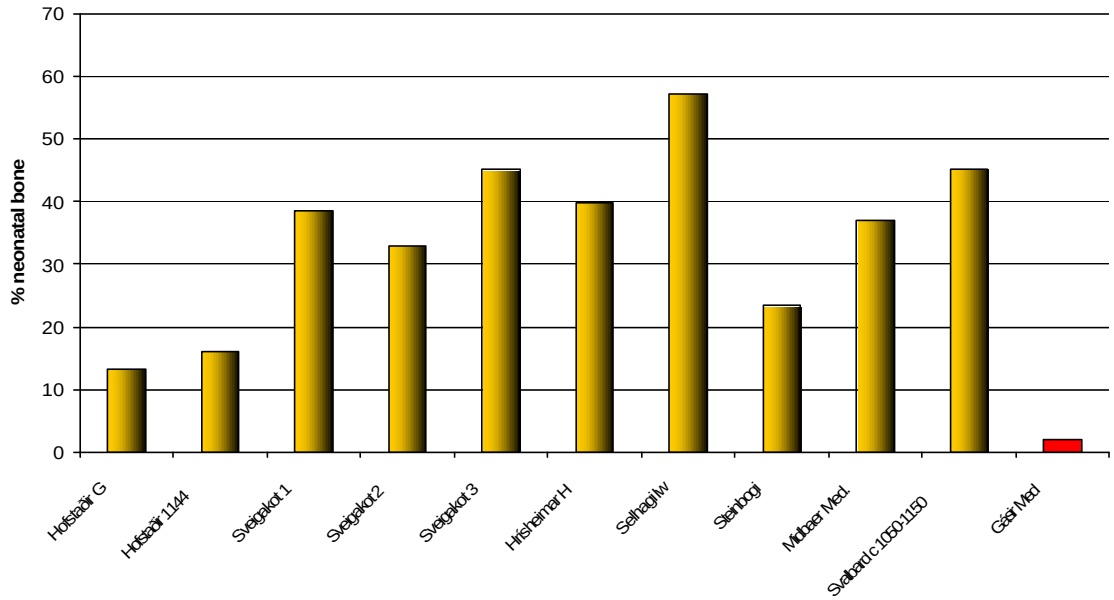


Reconstructing Domesticate Mortality Patterns

Cattle:

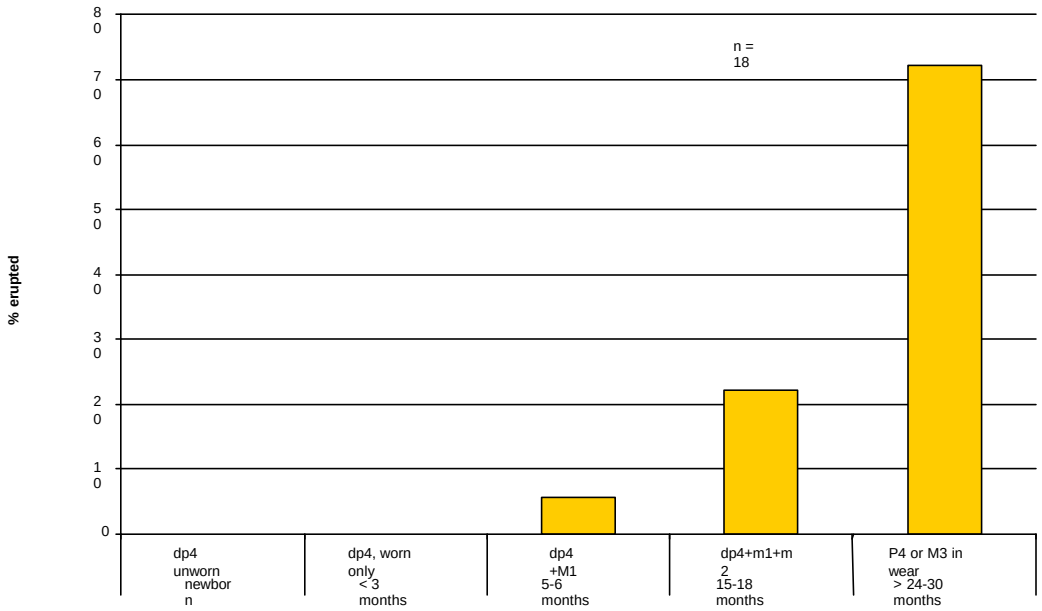
Figure 6 illustrates the relative percentage of neonatal (newborn) calf bones in a range of Viking-Medieval Icelandic sites, illustrating the normal range of variation from ca 15-50% of the total cattle bone count. This is generally interpreted as evidence of dairy herd management, with most milk being reserved for humans

Figure 6 Comparative Cattle Neonatal %



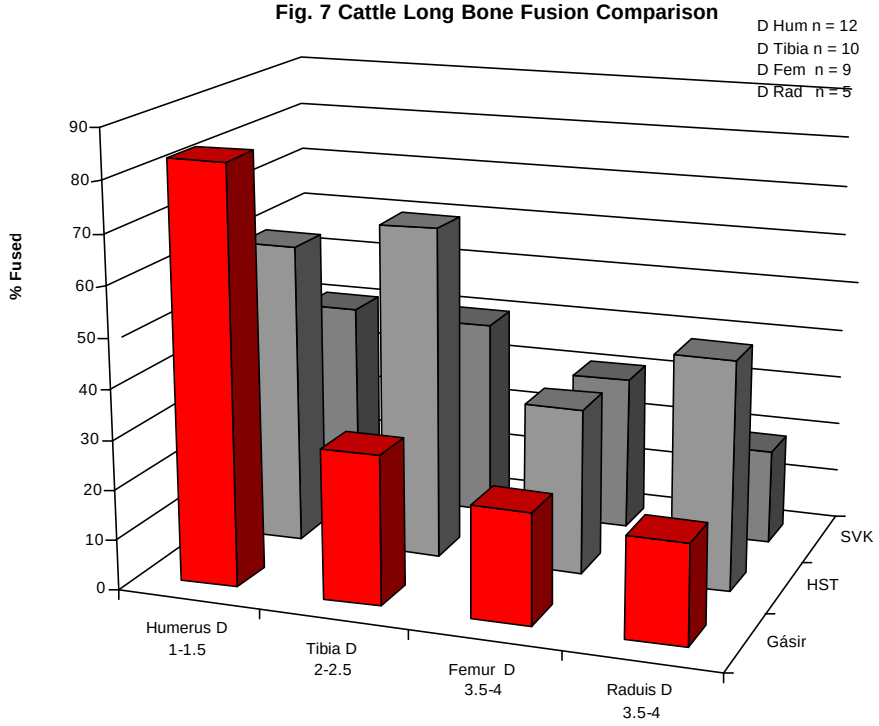
(Halstead 1998). The very low percentage of neonatal cattle bones at Gásir is thus very uncharacteristic of most Icelandic cattle collections, suggesting a different pattern of management or of consumption.

Fig. 6 Gásir Cattle Tooth Eruption



The Gásir 2003 excavation produced 18 cattle tooth rows that offer some insight into the site's food provisioning strategy. As can be seen in figure 6, in the majority of the excavated cattle tooth remains, the animal's death occurred either in the second year of life or as an adult. The shortage of jaws of usually common newborn or less than 3 month old calves is notable, and supports the impression provided by the overall low percentage of neonatal or very young juvenile cattle bones. If these old juvenile or young adult cattle are males, they have been raised at considerable expense in fodder (esp winter feeding). If they are females, they also have lived long enough to consume much fodder, but are only beginning their potential service as dairy cattle. In either case, in the context of a dairy herd these are very expensive animals to raise and slaughter at this stage in their lives.

Fig. 7 Cattle Long Bone Fusion Comparison



The cattle long bone fusion proportions (figure 7) indicates that at late medieval Gásir, most of the young cattle survived the stage of distal epiphysis fusion of the humerus, which occurs at around 1-1.5 years of age. There would appear to be considerable cattle mortality between ca 1-1.5 years and 2.5-3 yrs at Gásir, again suggesting kill off of large but not fully mature juvenile cattle as well as the presence of adults (note the different fall off of survivorship at Hofstaðir and Sveigakot).

These mortality patterns indicate not only that Gásir was not itself a dairy farm, but that it was not being provisioned with the most readily available surplus age classes generated by a normal Icelandic dairying economy: very young calves and elderly worn out milk cows. The 2002-03 cattle bone collection indicates that the site was instead provisioned with high quality young adult cattle meat by nearby farms. Since the farms were not sending their cast-offs to Gásir, but instead made major adjustments to their cattle herding strategy necessary to raise surplus animals to adult or near adult meat weight, it seems likely that the market at Gásir had a significant impact on agricultural practice in the surrounding district. The nature of this impact and the linkage of Gásir with its sustaining rural hinterland are potential research questions for wider investigation.

The Caprines:

Fig. 8 Gásir Sheep Tooth Eruption

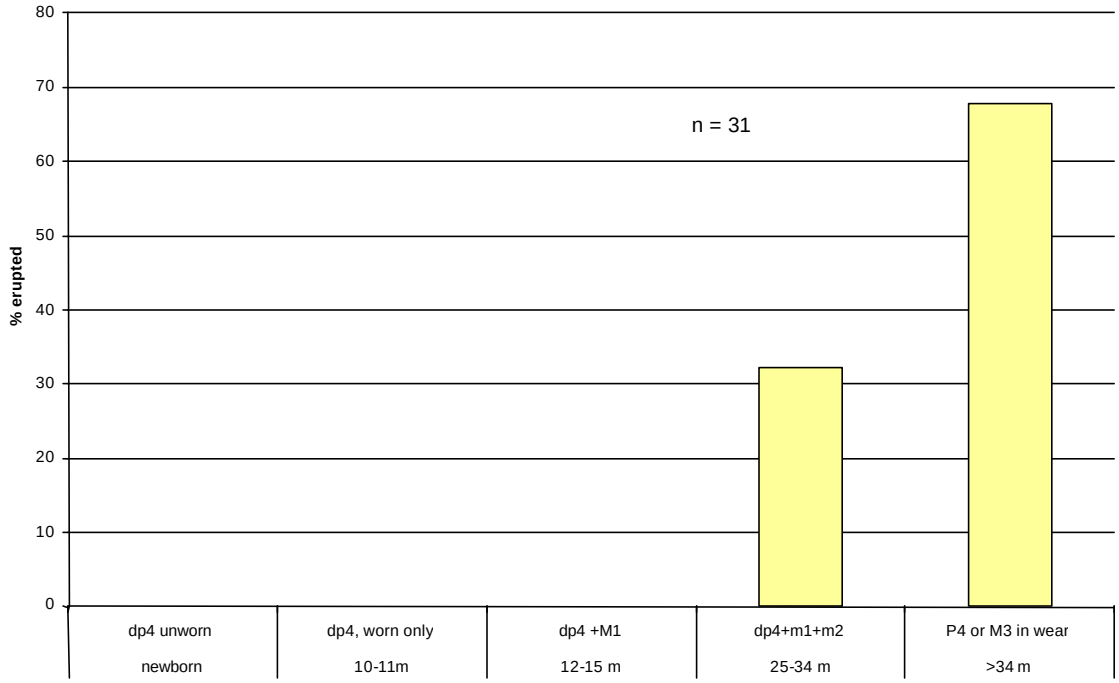
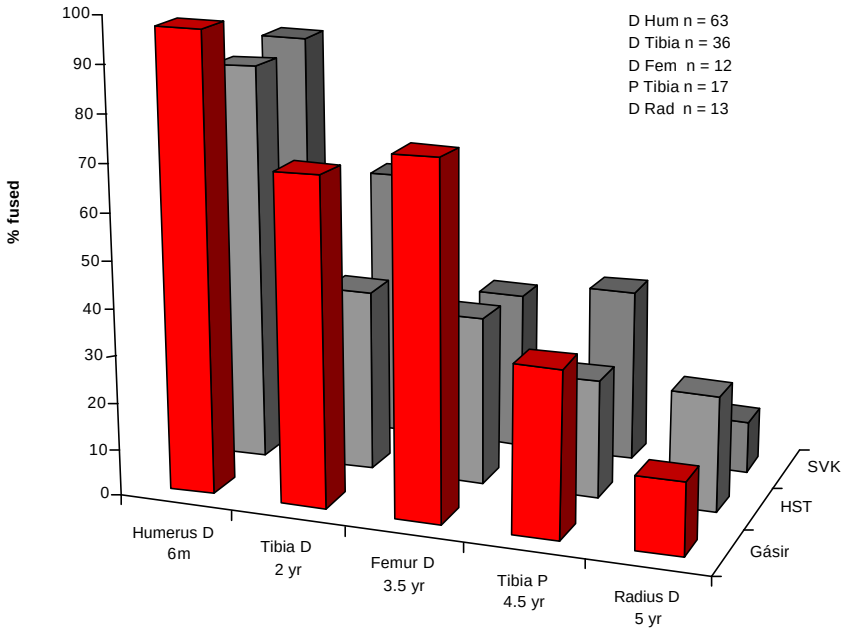


Figure 8 shows the pattern of tooth eruption in the sheep tooth rows (mandible and maxilla) from the 2003 excavation. Almost 70 % of the sheep were killed at an age of > 34 m, with full adult dentition in wear. Wear rates on sheep third molars suggest that few of these adult sheep were in fact old adults (further analysis is underway). The current tooth eruption and wear data for the Gásir caprines suggests provisioning with animals ranging from older adolescents to younger adults. Mandibular wear patterns thus far indicate the presence of substantial numbers of young to middle aged adults, without the higher proportion of highly worn teeth characteristic of old ewes or wethers (probably maintained primarily for wool production) characteristic of most larger Icelandic sheep mandible collections. Further analysis of caprine tooth eruption and wear will be carried out as sample size increases.

Fig. 9 Caprine Long Bone Fusion Comparison



The caprine (Sheep/Goats) long bone fusion comparison (figure 9) shows that the majority of caprines at Gásir were killed between 3.5 and 4.5 years of age. In comparison, caprines at HST (Hofstaðir) and SVK (Sveigakot) saw a slightly different mortality pattern, with higher culling in the first year and a generally higher proportion of older adults. Again, tooth eruption and wear and long bone fusion patterns suggest that most animals died as older juveniles or younger adults. Gásir was not being provisioned with worn out milking ewes or tough old wethers, but with sheep in their prime. Again, the implications for animal production strategies in nearby farms suggest some sort of specialized production.

Pigs

A considerable number of pig remains are present in the 2002/03 faunal collection. This is very atypical of late medieval Icelandic sites. By the 14th Century, the pigs had either disappeared from the Icelandic landscape or become very rare. Some of the bone fragments present could have formed portions of smoked or salted pork shoulder or hams, but some cranial fragments suggest that live pigs (native or imported) were present at Gásir.

Walrus

Fig. 10 Walrus tusk fragment

The walrus canine (tusk) fragment found in context 101 was most likely brought onto the site as an extracted but unworked tusk, as there is no evidence of butchered walrus post cranial remains or of the characteristic maxillary fragments remaining from tusk extraction so prevalent in Greenlandic collections (McGovern 1985). After the tusk was expertly extracted from the animal's jaw at some distant kill site (Greenland, arctic Norway, or just possibly on the drift ice north of Iceland) the tusk was brought to Gásir and the hollow end of the tusk root was cut off with a saw (probably a typical medieval shallow bladed backed bone working saw, as the cuts come from at least two sides rather than straight across). The solid tusk ivory was then either transferred elsewhere whole or further cut up for on site craft working. The tusk came from a medium sized adult walrus.

Whales

Whale bone fragments at Gásir fall into two somewhat overlapping categories- those showing signs of working as raw material for artifacts, and those suggesting provisioning with whale meat. Most fragments are the sort of small chips and cut offs indicative of craft work, but several rib fragments from small whales (pilot whale, narwhal, beluga) or porpoise are also interpretable as food debris (contexts 101, 223, 528, 547, 577). Three of these rib bones come from immature individuals (two from context 101, one from context 571). Late medieval cook books include many receipts for young porpoise to be served as high-status dishes, but porpoise and small whales have been consumed in most parts of the N Atlantic since prehistory.

Seals

Seal bones found at Gásir (contexts 101, 562, 674, 238, 282, 528, 617, 684, 730, 756) include both adults and newborn young (context 282). All four bones that could be identified to species level (contexts 617, 684, 730, 756) came not from the local harbor seals (*P vitulina*) still plentiful in Eyjafjord but from the ice-riding harp seal (*Pag. groenl*.). Harp seals are common in Icelandic waters only during periods of heavy drift ice, and have been associated with "little ice age" conditions in the NE (Amorosi 1992, Woollett 2004, Oglivie 1991). While widely consumed in most coastal communities in the N Atlantic, by late medieval times seal meat was usually distained in court cook books as "fit only for sailors". It is possible that the distribution of seal bones at Gásir may provide some hints at class and ethnicity.

Birds[1]

Table 3 presents the 2003 birds identified to species, grouped by family. The majority of bones come from eider ducks, common along the shore of Eyjafjord today. Guillemot and Puffin were regularly eaten in Iceland and much of Atlantic Europe. More surprising is the bone of a single Fulmar, a species usually thought to have arrived in Iceland in early modern times. This bone comes from context 101 (site clearing) and may represent a later (possibly non-anthropogenic) deposit.

Table 3: Identified Bird Species	Absolute #	%
Raptor	1	2.5
Gyrfalcon (Falco rusticolus)		
Migratory Waterfowl	27	67.5
Mallard (Anas platyr.)		
Eider duck (Somateria moll.)		
Sea birds	12	12
Guillemot (Uria lomvia)		
Puffin (Fratercula arctica)		
Fulmar (F. glacialis)		
Gull species (Laurus sp.)		
Razorbill (Alca torda)		
Total	40	100

[1] NB: Birds and fish from the 2002 excavation have not yet been identified to taxon. This work is underway and will appear in the next interim report. All the identified birds and fish taxa result from the 2003 collection analysis

Most exceptional is the find of a single gyrfalcon leg bone in context 756 which serves to dramatically confirm documentary accounts of falcon export via Gásir (figure 11).

Fig 11. Falco rusticolus, tarso-metatarsal bone

FISH

Since fish fragments make up a high portion of the total NISP at Gásir 2002/03, their role in the food provisioning strategy should be discussed, although analysis continues on the 2002 fish remains. As mentioned earlier in this report, most fish elements are fragmented beyond speciation, perhaps by the application of stone cod hammers used to tenderize dried fish in medieval times. Figure 12 thus lumps all identified gadid (cod family) fish in presenting the distribution of fish bones across the skeleton. The Gásir gadids (red) are compared to distribution of gadids from two 18th fishing sites (Finnbogastaðir in the NW and Tjarnargata 3c in Reykjavik) and 10th -11th c inland consumer's sites in the Mývatn region (Sveigakot and Hrísheimar).

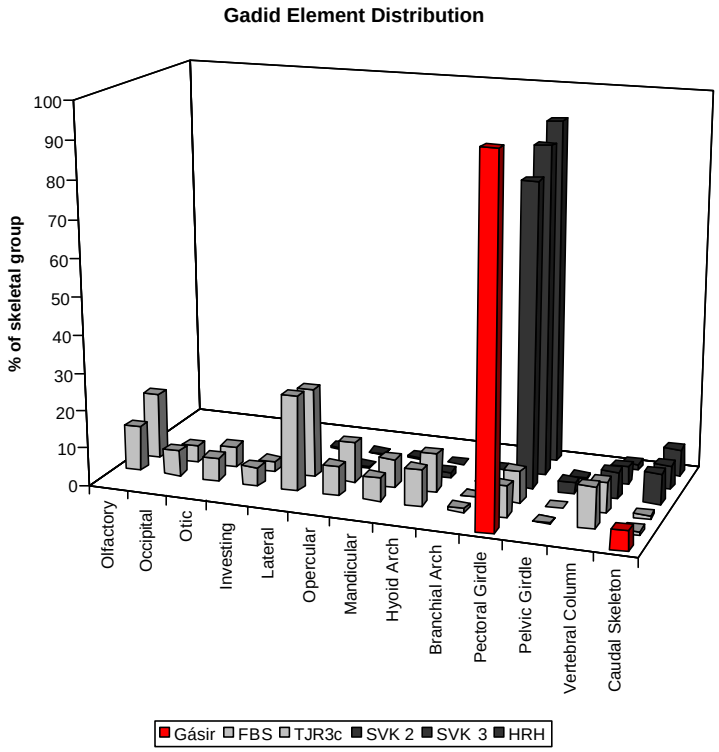


Fig. 12

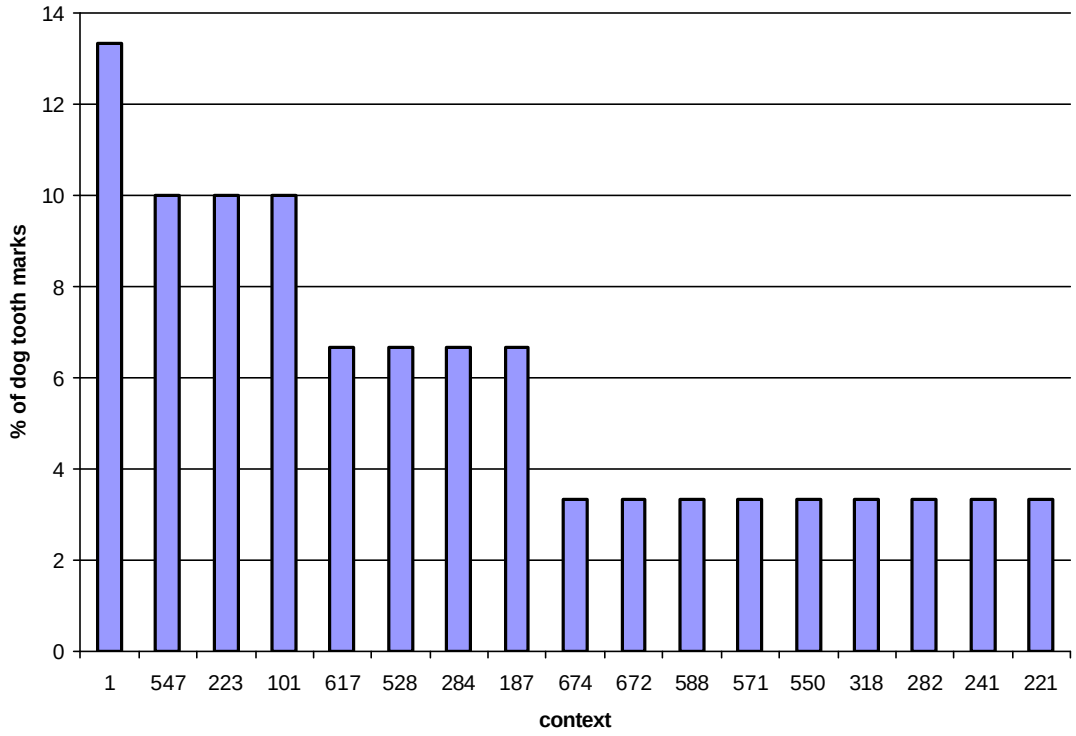
The Gásir gadid distribution, with its large number of cleithra (in pectoral girdle, usually left in the body of preserved fish) and caudal (tail) vertebrae, strongly resembles the pattern of the early medieval inland sites and differs strongly from the pattern of the two fishing sites with their heavy representation of head parts. It would appear that Gásir was being provisioned with some form of headless preserved fish, and that little active fishing or fish processing was taking place from the site.

Craft working: The horse remains are mostly comprised of loose teeth and foot/lower leg fragments. It should be noted that context 220 and context 101 yielded 70% (7/10) of the horse bone assemblage present at the site. The nature of preserved horse bone fragments indicates craft working activities rather than horse meat consumption, since the elements found were mandibular, maxillary, or lower limbs. Whale bone: except for the porpoise-size whales, the majority of whale bones found at Gásir bear marks that derive from bone working. The one large whale element collected in 2003 represents a particularly good example. for craft working, since it has been drilled.

Gnawing: tooth marks of carnivores (almost certainly dogs in the Icelandic context), rodents, and occasionally humans are regularly found on bones in

North Atlantic archaeofauna. Archaeofauna from Norse Greenland are by far the most gnawed, with up to 30 % of bones on some sites showing carnivore tooth marks (McGovern 1985). Icelandic bone collections are far less heavily marked by gnawing, though some bones from urbanizing Reykjavik show dog and rodent gnawing on the same bones (suggesting a multi-tiered scavenging hierarchy, Perdikaris et al 2001). The Gásir 2002/03 collection does show carnivore (presumably dog) gnawing, and the distribution by context is shown in figure 13.

Fig. 13 Gásir Dog tooth marking %



Note that while a low number out of the total bone assemblage are gnawed, there are some contexts have a high percentage of gnawing. Did dogs have access to some areas but not others? Are some species' bones (and some skeletal elements) more likely than others to show gnaw marks?

Foodways and Ethnicity:

Beginning around AD 1150-1200, a technique for extracting the marrow from the metapodials (lower leg bones) of sheep and goats spread into several N Atlantic communities, including the Shetlands, Faroes and Iceland (but not Greenland). The biperforation technique involves opening two circular holes at each end of the long bone and sucking out the rich marrow (Bigelow 1984). This marrow extraction technique avoids bone splinters in the marrow produced by the earlier Viking age pattern of longitudinal splitting, and has the advantage of retaining a

very usefully shaped bone nearly intact for tool use. By the later medieval period, nearly all sheep metapodials in all Icelandic archaeofauna were biperforated, and split metapodials are exceedingly rare (by early modern times a folk belief held that splitting metapodials at meals would cause live sheep to break legs in the same place). In England and Continental Europe, this technique remained unknown, and late medieval diners continued to split sheep and goat metapodials in the old fashion. Table 4 presents the proportions of split vs. biperforated caprine metapodials from the 2002/03 Gásir collection (including drilling to err on the safe side), documenting the overwhelming use of splitting rather than biperforation in marrow extraction. In an Icelandic farm site of the 14th-15th century one would expect to see these proportions reversed. Does this low frequency of biperforation reflect non-Icelandic ethnic origins of the residents of Gásir?

Table 4: Caprine Metapodials				
	Biperforated	Split	Other	total
count	9	48	2	59
%	15.25	81.36	3.39	

Conclusions and Further Work

The 2002/03 archaeofauna from Gásir serves to demonstrate its considerable potential for zooarchaeological research in Iceland, and suggests a number of areas where zooarchaeology may usefully contribute to a better understanding of this complex site. While the current sample is but a beginning, we are already able to lay out some areas for productive further collaboration and to propose some broader questions for general consideration.

As noted above, close integration of the animal bone data (element representation, species present, taphonomic signatures) with the excavation program can aid in the interpretation of specific features and in some cases may aid in establishing sequences of use and abandonment. Fortunately modern software makes such contextual integration straightforward, and this will certainly increase as the project moves ahead.

Beyond the basic archaeological issues associated with individual contexts and phases, zooarchaeology can contribute to some of the larger questions concerning the role of Gásir in Iceland's history.

- **Provisioning**: How was the settlement at Gásir provided with food? As the site was definitely not primarily a farm or fishing station, it needed to be supplied from outside sources. From historical data we can hypothesize many sources of supply, but the current bone sample suggests that dried fish, cattle and sheep meat played a major role in provisioning the settlement. While it is unclear at the moment if cuts of meat were imported to Gásir, it is now certain that at least some animals were brought to the site whole and probably slaughtered nearby. The current lack of calf and lamb bones suggests that the settlement did not in fact constitute a normal dairy-oriented, wool producing late medieval Icelandic farm.
- **Integration with Rural Economy**: What impact did the specialized settlement at Gásir have on the rural economy of the surrounding area? How did the presence of relatively wealthy consumers affect the economic decision making of local farmers of different wealth and rank? Thus far the archaeofauna does not suggest that the site was being entirely provisioned with cast off by-products of the normal farming economy (very young animals and very old ones) but with older juvenile and young adult cattle and sheep. Further investigation of age profiles of animals brought to Gásir will be important, and the sampling of a contemporary farm midden in the same district would provide important comparative information.
- **Ethnicity and Foodways**: In many respects the Gásir archaeofauna is very atypical for late medieval Iceland: cattle consumption comparable to rich manors in the SW but without the clear dairying profile characteristic of these elite farms. In the details of butchery and consumption of animals there are messages about foodways and ethnicity: does the butchery pattern of sheep at Gásir reflect the dining habits of native Icelandic or foreign consumers?
- **Seasonality**: If enough different seasonal indicators can be collected, it should be possible to contribute to discussions of seasonal vs. year round occupation. While the current sample is small, we may wonder if the shortage of new born calves and lambs (almost exclusively born in May) reflects an arrival of most of the occupants later in the summer?
- **Status**: Hopefully, future excavation work will produce more indicators of status and hierarchy systems present at the site. The gyrfalcon and seals provide an initial idea of the socially diversified group of people present at late medieval Gásir.

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