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Zooarchaeology and the Archaeology of Early Modern Iceland

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Abstract - This paper presents the bulk of existing early modern Icelandic zooarchaeological data together for the first time. The early modern period in Iceland was generally a time of great stress and hardship. These zooarchaeological data present a view of the responses to these hard times and suggest, contrary to a number of historical interpretations, that the people of Iceland often adapted to harsher conditions in dynamic ways. Given the growing effort in archaeology for this period in Iceland as well as the rest of the North Atlantic, these data are presented in the hope that it will stimulate further work and facilitate larger Atlantic comparisons.

Introduction

In recent decades, our understanding of the historical ecology and human ecodynamics of the North Atlantic has been dramatically improved by the work of multiple projects making use of the full spectrum of techniques of environmental archaeology (McGovern et al. 2007). While many of these projects have focused upon the complex and still incompletely understood environmental, economic, and political issues associated with first settlement (Landnám) in the Viking Age (ca. 700–1050 CE) or the complex interplay of human environmental impact and climate change during the Middle Ages (ca.1050–1500 CE), significant amounts of environmental evidence from the early modern period (ca. 1500–1850 CE) has also been collected in recent years. Many of the early modern collections have been excavated as side-products of investigations aimed at earlier periods or as the results of rescue and contract archaeological work, and only recently has this dynamic period become an active focus of research in its own right. At both the 2006 North Atlantic Biocultural Organization (NABO) meeting in Quebec City, QC, Canada and the 2008 meeting at Bradford, UK, there were articulate calls for a better organized and more systematic collaborative investigation of the past 500 years, and it is clear that there is widespread interest in the period across the region by both scholars and the general public. This movement in the North Atlantic is paralleled by similar calls for increasing collaboration between historical archaeology and environmental archaeology in North America (Mrozowski 2006) and in post-medieval archaeology in Europe (Ervynck et al. 2004, Melton 2004).

Zooarchaeology has already made major contributions to the understanding of human action and reaction in the face of climate and landscape change in Iceland (McGovern et al. 2001, 2006, 2007). Most of these publications have been focused on the Settlement Period, and while current projects explicitly target later periods for attention, it is still true that the Viking Age is far more visible in the historical and archaeological imagination than most later time periods in Iceland (Lucas and Snæsdóttir 2006, Vésteinsson 2004).

This paper seeks to respond to these calls by extending the stories of complex interactions between humans, environment, and historical process from the Viking Age and Middle Ages into the early modern period in Iceland—providing the sort of long-term "longitudinal" perspective advocated by Crumley (1994). This paper also aims to contribute to the continuing integration of historical archaeology in Iceland with the history of Iceland and the early modern North Atlantic by adding the data and perspectives of zooarchaeology to the investigation of the impacts of early modern climate change, volcanic eruption, epidemic disease, and the changing commercial and social connections between Iceland and the Atlantic world from the 17th–19th centuries (Lucas and Snæsdóttir 2006). Finally the most practical and immediate contribution may be to more fully publicize the early modern Icelandic archaeofauna analyzed to date; much of this material has not been formally published, and this is the first time it will be presented together for comparative purposes.

There have been a number of later historical sites excavated in Iceland (Fig. 1), but most of these projects, apart from excavations at Skálholt and Reykholt, were rescue projects, and many of the zooarchaeological reports exist as unpublished "grey literature" (for downloadable copies of these reports see the NABO website [www.nabohome.org]). Early modern excavations in Iceland have produced a disproportionate share of the total artifacts recovered from all periods, and a marked increase in artifact recovery as well as the occurrence of new types (glass, ceramics, pipes) regularly provides a working division between late medieval and early modern contexts (Vésteinsson 2004). The great increase in the circulation of material objects in the early modern period can be seen as one symptom of modernity in Iceland as elsewhere (Deetz 1977).

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Many of these excavations have also produced very large faunal assemblages, most of which have been analyzed, including the high-status sites of Viðey, Reykholt[1], Nesstofa, and Bessastaðir (Amorosi and McGovern 1993; Amorosi et al. 1992, 1994; Buckland et al. 1992). There are analyzed assemblages from the mid- to low-status farm at Finnbogastaðir in the northwest of Iceland and from the church farm of Svalbarð in the northeast of Iceland (Amorosi 1992, Edvardsson et al. 2004). There is an assemblage from the test-excavation of the site of Miðbær on the island of Flatey in Breiðafjörður, northwest Iceland (Amundsen 2004). From downtown Reykjavík, there are now analyzed faunal assemblages from three rescue excavations, Aðalstræti 10, Aðalstræti 14–16, and Tjarnargata 3c (Harrison et al. 2008b, Perdikaris et al. 2002, Tinsley and McGovern 2001). There is also a large archaeofauna from the southern coastal farm of Stóraborg (Russel et al. 1986). Finally, there is the ongoing analysis of the very large assemblage from the Bishop of southern Iceland's cathedral farm at Skálholt (Hambrecht 2007a, Hambrecht et al. 2006). The majority of these collections come from higher-status sites, and most come from the warmer (boreal) south and southwest of the island, while only two archaeofauna at present represent the sub-arctic north. Though the majority of the recent excavations were carried out using closely comparable NABO-recommended recovery strategies, some of the older collections were not from fully sieved excavations. Additional early modern archaeofauna from the West Fjords at Eyri and Vatnsfjord (Harrison et al. 2008a, Pallsdottir and Gorsline 2007), from Möðruvellir in Eyjafjord (Harrison and Roberts 2007), and from Skútustaðir in Mývatnssveit (Ewald and McGovern 2008) are now undergoing analysis, so the pace of research suggests that any conclusions presented here are perhaps fortunately unlikely to be long lasting (for downloadable copies of these reports see the NABO website). However, the currently analyzed Icelandic early modern archaeofauna already form a very substantial body of data which can begin to be applied to major historical and environmental issues of the period. While this paper is very much a first overview rather than a definitive summary of the zooarchaeology of early modern Iceland, it may serve to both report on apparent patterns and point towards areas for further collaborative work.

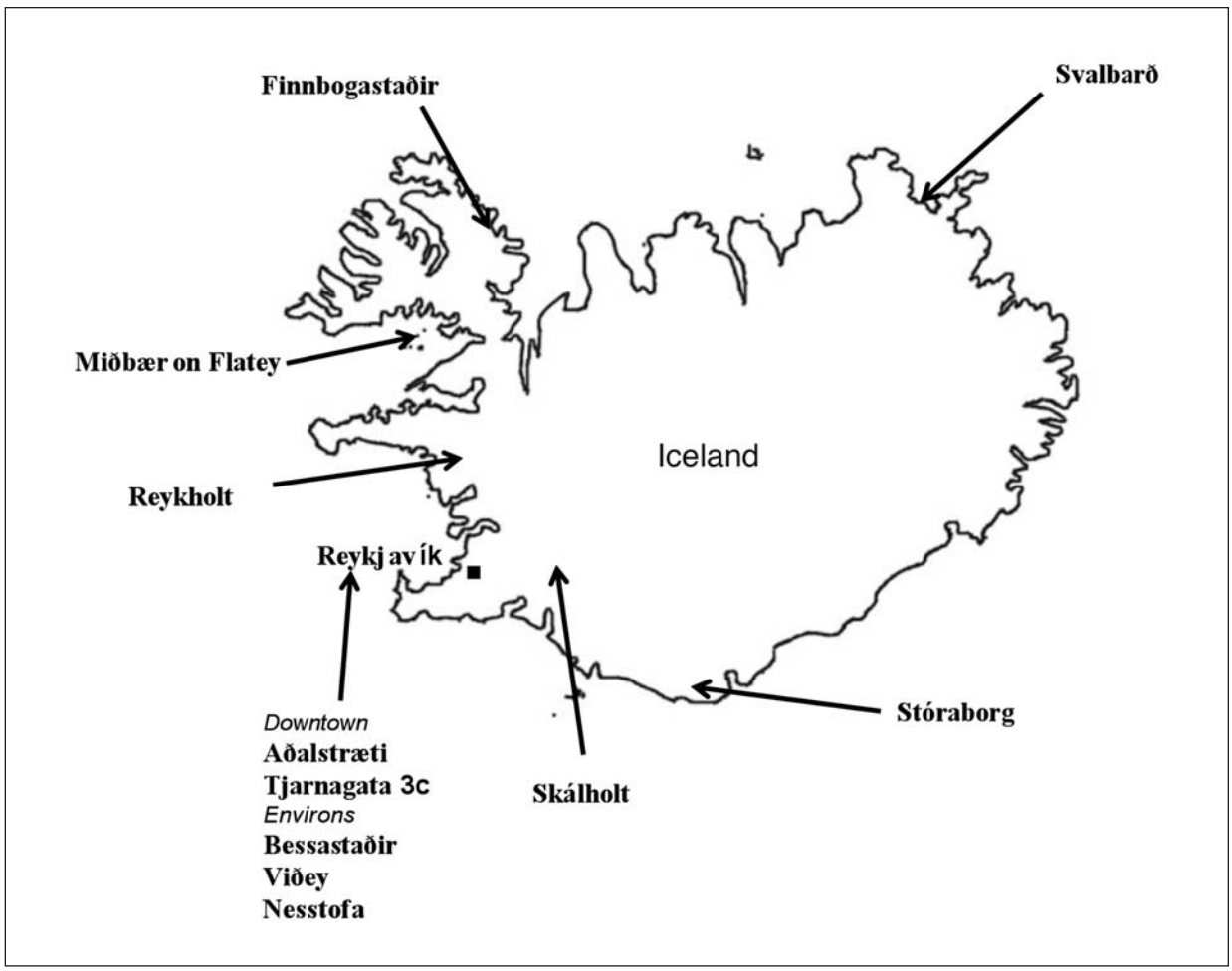

Figure 1. Locations of the excavations with significant early modern components in Iceland.

Early Modern Iceland: A Historical Overview

One of main themes of historical work on early modern Iceland is hardship. Early modern Iceland suffered from the effects of adverse climate change, catastrophic volcanic eruptions, accelerated soil erosion, and epidemic disease—all exacerbated by strict mercantilist policies set by the Danish colonial authorities. These policies kept the prices of Icelandic imports artificially low, restricting access to wealth to middling Icelandic producers, hindering local economic development, and reducing flexibility and resilience in the face of adverse environmental change (Gunnarsson 1983). Alongside these external economic restrictions was a land-ownership structure that greatly favored a few of the most powerful families and the Danish colonial authorities, and created pervasive patterns of short-term tenancy and actively discouraged permanent fishing communities or other sources of non-agricultural employment (Eggertsson 2005, Gunnarsson 1983, Lárusson 1967). The climate in the period from 1600–1800 was at times quite cold and unfavorable to agriculture, but was probably not a uniformly harsh and continuous "Little Ice Age." High-resolution proxy climate indicators in sea and ice cores combined with increasingly detailed historical documents make clear that—while storminess increased significantly in the late 15th–early 16th century, sea ice from East Greenland became a common summer as well as winter phenomenon, and glaciers advanced in many parts of Iceland—variability rather than simple cooling was probably the greatest problem (Ogilvie 1992, 1996). Rapidly changing conditions (annually and from decade to decade) limited farmers' ability to predict the coming season's impacts on hay field productivity or effectively and sustainably schedule the use of highland pastures, and the ranges of variability experienced may have increasingly invalidated the centuries-long experiences of Icelandic farm managers encoded in the laws (Dugmore et al. 2007; Ogilvie 1992, 1996). Eggertsson (1996, 2005) has proposed that such uncertainties in the early modern period made it necessary for small farmers and tenants to gamble on raising the largest number of animals possible without making any capital improvements (as communal hay-management custom, short-term leases, as well as animal leases made it very hard to see a return on long-term investments), with predictably adverse results for the long-term sustainability of pastures and soils. This gamble was stacked against the social, climatic, and political odds, and Icelandic farmers had an increasingly hard time in the period from 1600–1800, with tenancy increasing and many complaints raised as the number of landless paupers exceeded the buffering capacity of local community organizations (*hreppur*) to absorb failing farmers and their dependants. The Icelandic land-owning classes also felt the pressure in the form of diminishing returns from their land-based income (Larusson 1967).

There were epidemiological, tectonic, and volcanic impacts upon the Icelandic population at the same time as climate change and institutionalized inequality were taking their toll. Iceland was subjected to mass mortality from recurring smallpox epidemics, which killed as much as 26% of the population in 1707–1709, 7.2% in 1762–63, and 3.4% in 1785–87 (Vasey 1996). Declining mortality levels may reflect the transition from a "virgin ground" epidemic in the early 18th century to a more typically European pattern of endemic smallpox produced by more continual exposure (see Vasey 1996 for discussion). Sheep were hit with an epidemic later in the 18th century that was only put under control through the killing of all animals in affected districts (Lárusson 1967). Thus, both human labor supplies and the source of marketable wool products were subject to unpredictable but drastic reductions due to epidemic disease in the same time period.

Iceland is a volcanic island that lies on the Atlantic crustal rift zone, which runs down the middle of the island. Volcanic activity is fairly routine in Iceland, and the early modern period saw numerous eruptions of varying degrees of destructiveness. The worst was the catastrophic *Lakagígar* eruption in 1783–1784 and the "Famine of the Mist" that followed as fluorine gas spread over much of Iceland and killed the majority of the animal stock (Demarée and Ogilvie 2001, Vasey 1991). The resulting famine claimed as much as a third of the human population of Iceland by 1785.

Despite all these woes, the Icelanders (unlike their relatives in Norse Greenland) survived, and by the late 19th century, Iceland had begun the process of modernization that would lead to the emergence of an independent and increasingly urbanized society in the 20th and 21st centuries. The early modern period in Iceland represents a fertile case for the investigation of both the grave impacts and eventually successful responses, as well as the persistent resistance to innovation and eventual resilience that may offer both cautionary and hopeful lessons for modern small-scale societies experiencing rapid change. This paper seeks to present and better mobilize the evidence of zooarchaeology for the collaborative investigation of one of the most important parts of the Icelandic past.

Skálholt: The Bishop's Manor Farm

The Skálholt project (2002–2007) is the largest open-area archaeological excavation ever carried out in Iceland to date. The focus for this project was the early modern period, specifically 1600–1800 CE, and a decision was made from the outset to sample

a large contemporary horizontal area rather than aim for a set of narrow, deep units (Lucas and Snæsdóttir 2006). Skálholt (with Hólar in north Iceland) was one of two principal cultural and religious centers in Iceland from its foundation as an Episcopal see in the late 11th century until its destruction by earthquake in 1784. After the earthquake in 1784, the Bishop's residence was moved to Reykjavík[2], the manorial complex—which consisted of the Bishop's quarters, a school, and considerable infrastructure devoted to the household—was partially abandoned, and a prosperous farm took its place. Skálholt at all times was a major livestock farm based in one of the most fertile areas of the southern part of Iceland that had one of the largest cattle herds in the country (Grímsdóttir 2006). Church documents, early maps, geophysical survey, and early modern travelers' accounts all indicate the unusual size and intricacy of the complex of buildings that were exposed by excavation, with the expanded manor, school, and cathedral complex taking on the scale of a small village by the 18th century. Skálholt probably had the highest year-round population density of any settlement in Iceland until it was replaced by the expansion of Reykjavík at the end of the eighteenth century (Lucas 2002).

The archaeofauna from the Bishop of southern Iceland´s cathedral farm at Skálholt comes from one of the richest and most powerful farms in early modern Iceland and may well reflect a series of unique conditions (Lucas and Snæsdóttir 2006). Skálholt could draw not only upon its own rich and environmentally buffered pastures, but could also draw on rents (generally paid in kind) and resources from virtually all quarters of Iceland (Grímsdottír 2006, Lárusson 1967). Skálholt and Hólar (the cathedral-farm for the bishop of Northern Iceland), in part sustained their wealth and power through income from church tithes, which continued after the Reformation was enforced in Iceland in the early 16th century. The Church also directly owned large numbers of farms throughout Iceland (Fig. 2). Many of these were rented out as tenant farms, while others were run as direct outstations of the Bishopric home manor. Alongside rents and tithes, there were also animal rents. Properties often had a certain number of cattle attached to them that were owned by the property owner, but had to be raised and cared for by the occupants. Though the property owners were in theory supposed to replace these animals when they died, in practice this obligation was the tenants. Though this system was intended to help tenants by supplying them with livestock, the number of animals attached to properties grew and

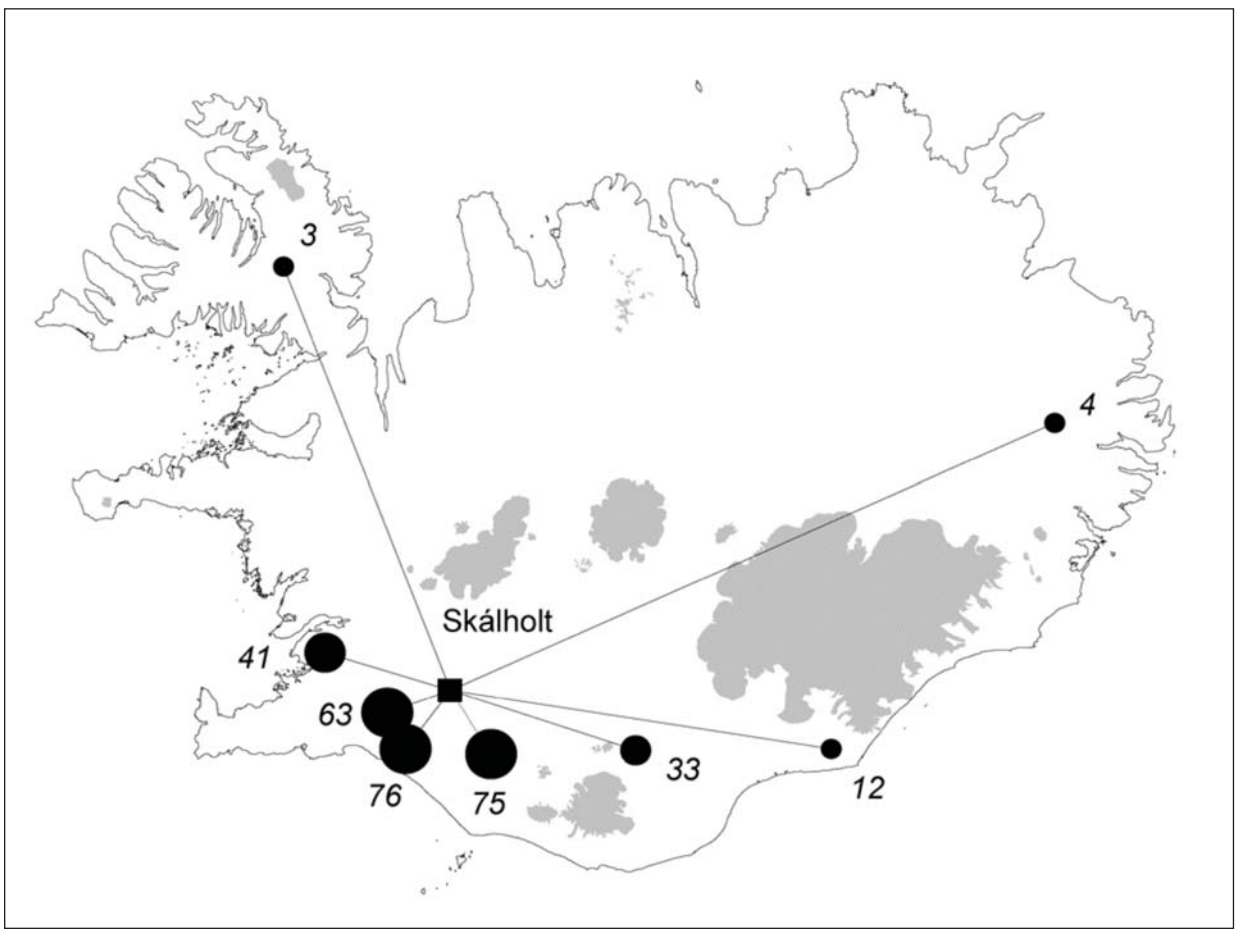

Figure 2. Number of farms owned by Skálholt ca.1700 (Grímsdóttir 2006)

their maintenance and replacement became an onerous obligation for tenants, preventing them from building up their own herds (Lárusson 1967). In a region as reliant on animal husbandry as Iceland was from Landnám through the early 20th century, this ownership of a large proportion of Iceland's most productive grazing land, as well as the cattle grazing on them, was one of the primary buttresses upholding the church's wealth and power. If accumulation of prime pasture and a cattle-rich domestic economy were markers of status and power in Viking Age and Medieval Iceland, by early modern times the magnate bishops were among the ultimate winners, along with the Danish Crown and a handful of wealthy Icelandic and Danish families.

The Skálholt Archaeofauna

0The early modern faunal material from Skálholt analyzed so far and discussed in this article derive from a series of midden test pits excavated outside of the main residential and administrative complex. Midden material was found in each of the five trenches excavated. Artifacts and stratigraphic analysis indicate that these faunal materials were deposited in the 17th and 18th centuries. For the purposes of this article, all this data will be presented together.

Appendix 1 presents a count of the identified specimens for all the sites discussed in this article. The most obvious difference between Skálholt and the other sites is the dominance of cattle and the paucity of fish (Fig. 3).

Ongoing analysis of a 17th-century midden found within the complex is revealing a large number of fish, mainly gadids; thus, the small numbers of fish found in the outside middens is not indicative of the site as a whole. This indoor midden is also producing large numbers of cattle similar to the outside middens. Yet the numbers of cattle, while interesting, are not as significant as their visual appearance and the way in which they were slaughtered. Nearly all the cattle from this context were young adults, animals just reaching the peak of their growth curve (Hambrecht 2006, 2007a, 2007b).

This is a culling profile normally associated with the consumption of "prime beef" and stands in strong contrast to the majority of archaeofauna known from all periods in Iceland, where the bones of very young and very old cattle dominate, as demonstrated by the numbers of neonatal (i.e., in the first 3 months of their life) cattle found in archaeological sites from different periods across Iceland (Fig. 4). The larger numbers of neonatal cattle bones are indicative of a zooarchaeological pattern typical of a dairy economy, in which a population of milk cows is maintained at a level determined by the amount of pasture and fodder available and neonates are slaughtered for herd population control and in order to save the cows' milk for human consumption.

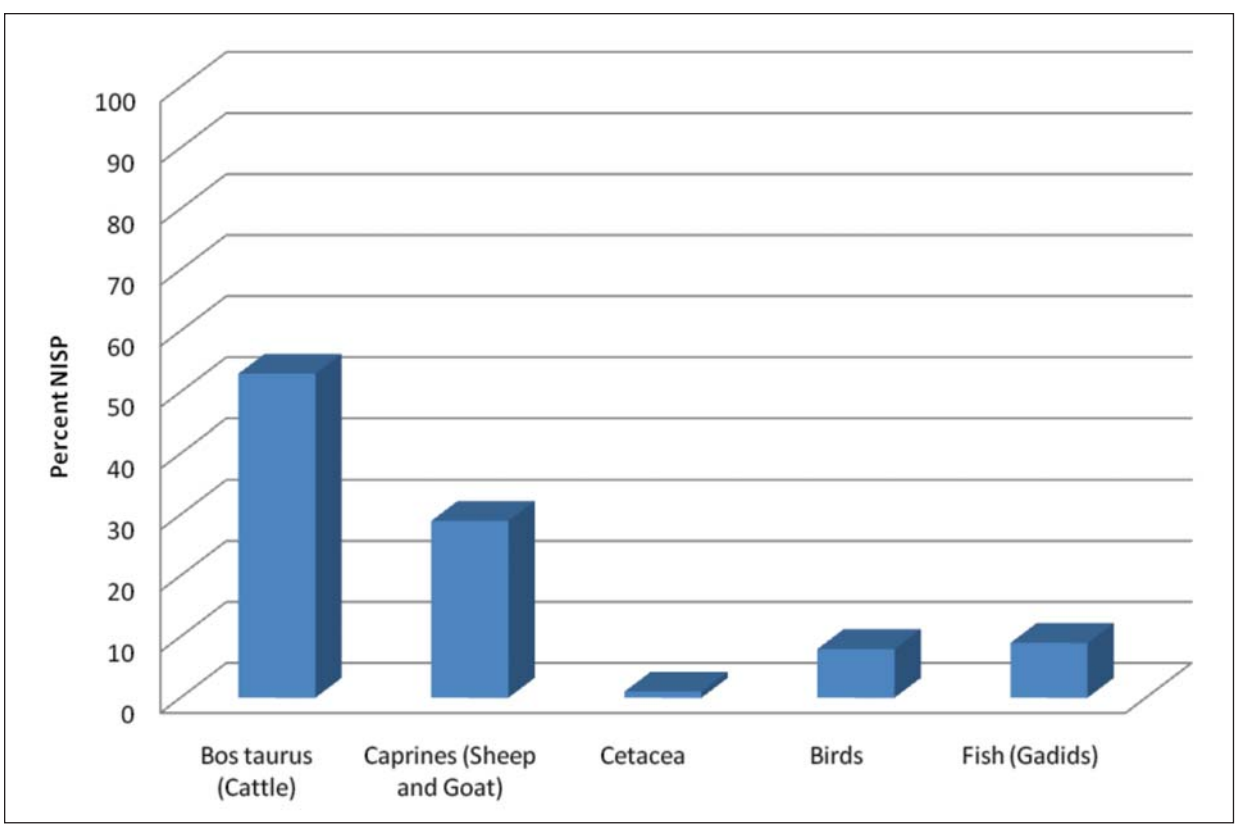

Figure 3. Skálholt NISP percentages.

While a few unproductive animals may be culled in young adulthood, a dairy economy is, in pure energy-investment terms, the most cost-effective way to raise cattle (especially where pasture availability is a limiting variable), with a dairy cow generating many times its slaughter weight in milk products before its death. Unsurprisingly, both small farmers and medieval magnates in the rest of the Scandinavian North Atlantic tend to produce clear "dairy profiles" (McGovern 1985, Mulville et al. 2005). The only significant exception to this pattern is the specialized archaeofauna from the medieval seasonal trading site of Gásir in Eyjafjord (Harrison 2009), where visiting merchants could afford to provision themselves with "prime beef" age animals. Documentary sources and other archaeological contexts do indicate a dairy economy at Skálholt, but these two substantial contexts also indicate that a beef economy was present for at least some part of the 17th and 18th centuries.

Polled Cattle

The cattle from unit 454 all share another distinctive characteristic; they were all polled (lacking horns). Out of 10 crania with the frontals intact, 8 are naturally polled, born without horns, and 2 were artificially polled. The artificially polled animals had their horn buds cauterized at a very young age. The only other intact crania recovered—from the bottom layer of group 2193, a midden test pit directly between unit 454 and group 634, but contemporary with 454—was also naturally polled.

There was a low frequency of naturally polled cattle occurring in the Icelandic cattle population from the Settlement Period to the introduction of new breeds in the nineteenth century, so it is unlikely that all of these polled cattle were the product of this rare mutation. Dr. Uno von Troil, who accompanied Joseph Banks on his trip to Iceland in 1772, remarks on the hornless cattle in the south of Iceland (von Troil 1780:132). Drawings made by an artist also accompanying Joseph Banks confirm their presence at Skalholt at least in the year 1772. Another traveler to Iceland earlier in the century, Niels Horrebow, remarked that there were some polled cattle in the south, but that the majority were in fact horned (Horrebow 1758). It should also be said that of the two groups, only Horrebow traveled throughout Iceland. Banks and von Troil traveled from Bessastaðir to Mt Hekla, the goal of their trip, to collect geological specimens. Along their way they stopped at Skálholt[3] and traveled through a region largely owned by the Bishops. This particular breed of cattle of unit 454 might have been introduced from continental Europe by the Bishop's household or bred by them from Icelandic cattle. Another possibility is that they are all native Icelandic cattle, but that only the naturally polled variety existed around Skálholt. This might have been the case, but the fact that other cattle in this assemblage were artificially polled makes them distinctive in relation to other Icelandic cattle found in archaeological contexts. It could be that the cattle were bred towards a polled variety, and those born with horns were artificially polled to minimize

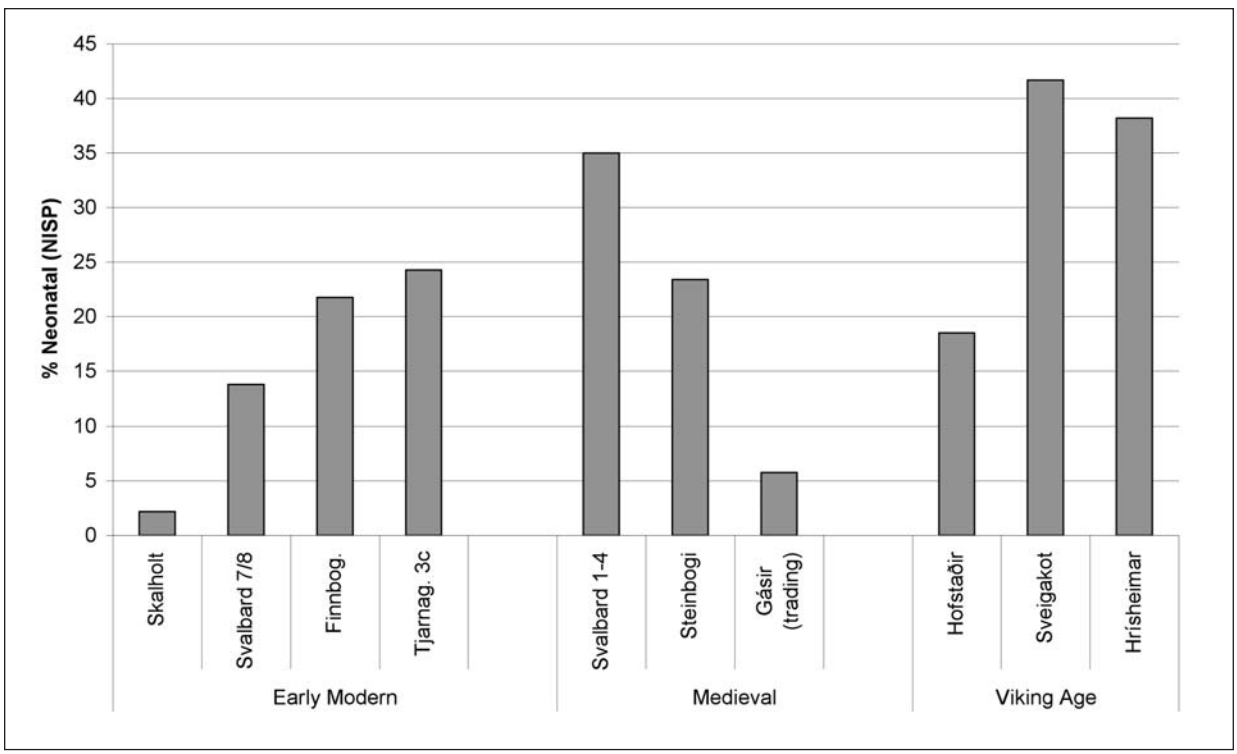

Figure 4. Percentages of neonatal cattle from a selection of Icelandic assemblages.

damage caused by the horns, especially during their confinement during the long winter months. Yet if this is the case, it is at this point exceptional in that all of the Icelandic zooarchaeological data, excepting Skálholt, reinforces the idea that Icelandic cattle were generally horned until modern times. Another possibility is that the horned cattle in the assemblage were polled in order to look like the other naturally polled animals, a practice perhaps more attuned towards aesthetics than husbandry practice. Another intriguing possibility is that this might be an attempt at a proto-Lamarkian breeding strategy (in contemporary Enlightenment Sweden, improving agricultural enthusiasts were confidently planting masses of tea bushes, and Danish improvers were attempting to alter size and conformation of local dairy cattle) (Kjaergaard 1994; Koerner 1996, 1999). The larger issue is that these polled cattle may be indicative of an elite community that is clearly in touch with the scientific, agricultural, and even pastoral fashion sentiments of early modern Europe. That the Bishops of Skálholt were so connected to the larger European world is not at all surprising, but it is striking that this connection might be expressed in and through their cattle. These cattle were already being treated in a very different way, as beef producers, than the majority of other Icelandic cattle. That they were also physically different makes the contrast with the rest of Iceland even greater (Hambrecht 2006, 2007b).

Svalbarð: An Elite Farm in the Sub-Arctic

Excavations at a deeply stratified midden at the site of Svalbarð farm in Þistilfjórð in northeast Iceland in 1987–88 recovered a substantial archaeofauna from the early 11th century to the early modern period; only the later phase (AU 7/8) datable by tephra and artifacts to the 18th–19th century is discussed here (see Amorosi 1992 for a preliminary analysis).[4] Svalbarð is described in the Jarðabok[5] as a *beneficium* of the diocese of Hólar. As a regional church farm, Svalbarð held a relatively large amount of good grazing land along the coast and up the valley of the Svalbarðsá river, as well as use-rights and rent from a range of regional resources. Beach rights over much of the western part of Þistilfjórð assured the owners of Svalbarð farm the right to hunt seals and collect driftwood, wreckage, and other valuable flotsam. A portion of any whale stranded on the beach was also saved for the farm at Svalbarð. Such beach resources were of great value in Iceland, as driftwood was one of the only sources of timber suitable for boat or house construction, and a "whale stranding" in colloquial modern Icelandic still means an unexpected jackpot. Svalbarð owned the best landing place for boats in the region, and the owners could collect a share of fish in payment for its use. The Jarðabok also mentions that this farm paid no tithes and though it did owe a cow rent, this was paid to the local priest, who was also the occupant of the farm (Amorosi 1992).

Svalbarð was thus in a good position within its region, well provided with access to both marine and terrestrial resources and with enough status to provide the flexibility to shift its economic strategies among multiple income sources and without major fixed external obligations to constrain its managers. Yet the northeast corner of Iceland was vulnerable to climate fluctuations and sea ice. As noted by Ogilvie (1992), northern Iceland is generally more affected by colder weather than the south of Iceland; the written records from this region report increased sea-ice and colder weather for much of the early modern period, and a map created by the Bishop of Hólar, Guðbrandur Þorláksson, published in the collection of the Dutch cartographer Abraham Ortelius in 1590, showed driftwood, sea ice, seals and a great many polar bears packed into the Þistilfjórð Bay (Ogilvie 1981). A dramatic increase in the number of seal bones (from ca 6% of the Svalbard archaeofauna in later medieval contexts to over 60% in the early modern) and the increasing presence of the bones of the ice-riding harp seal (*Phoca groenlandica*) probably reflects both the incoming drift ice and human response to this major change in the marine ecosystems. Hunting of the common or harbor seal (*Phoca vitulina*) took place in Iceland from the settlement period onwards, but harp seal bones only appear in the late medieval and early modern period (Ogilvie et al., in press). Harp seals live on drift and pack ice, while the harbor seal lives in coastal waters and is averse to summer drift ice (Ogilvie et al., in press; Woollett et al. 2000). The appearance in the early modern archaeofauna of harp seal bones, as well as a few bones from bearded seals, walrus, and polar bear are the product of intensified hunting on increasing drift and pack ice off of the coast of northeast Iceland in the early modern period. Such sea-ice hunting of the abundant migratory ice-riding seals had long been a key element of Norse subsistence in Greenland (McGovern 1985; Ogilvie et al., in press), but had not seen widespread use in Iceland; new skills were being acquired and new risks were being taken by Icelandic sealing parties in northeast Iceland in the 17th–18th centuries (Ogilvie et al., in press).

The impacts of summer drift ice in this area upon other parts of the subsistence economy may have spurred such efforts. The Jarðabók mentions that the sheep houses of Svalbarð were all on the coast, "against the sea." This placement would have exposed the sheep to the impacts of adverse sea-ice conditions in the spring lambing season. This may be reflected

in changing mortality profiles in the Svalbard lambs: bones of neonatal sheep rise from 2–5% of caprines in medieval times to over 16% in the early modern period. The percentage of mussel shells (*Mytilus edulis*) in the Svalbarð archaeofauna likewise increases from 6% of the total collection in medieval layers to over 12% in early modern layers. While some mussels may have been collected for fish bait (fish bones also appear to increase from around 30–40% in medieval layers to just over 65% in early modern), ethnographic accounts from the region repeatedly identified mussels as famine food, and older residents retained an aversion to them for this reason right up to the late 20th century (Amorosi 1992). Svalbard's managers apparently reacted to the disproportionably harsh climatic impacts inflicted on the northeast by drift ice and a general reduction in the growing season by mobilizing its household and region for intensified maritime resource use. Some elements in this strategy may have been traditional (mussel collection, inshore fishing, common seal hunting along the shore), but to turn the floating sea ice from pure threat to productive hunting grounds of harp seals and polar bears required daring and innovation. While the Bishop at Skalholt in the ice-free south had the option of elaborating upon a pasture-focused, cattle-based farming economy and further developing pre-existing patterns of conspicuous consumption of terrestrial products, the managers of the Svalbard church farm were actively seeking new maritime adaptations to creatively adapt to the potentials as well as the challenges of the new sea-ice patterns.

Finnbogastaðir: A Small Farm in the Northwest

The Finnbogastaðir archaeofauna from the Strandur district of the West Fjords was collected in the summer of 1990 as part of the cooperative Icelandic Paleoeconomy Project involving the National Museum of Iceland and the City University of New York (Edvardsson et al. 2004). Artifacts recovered (ceramics and a single kaolin pipe stem) indicate that the deposits sampled extend from the early 18th to early 19th centuries, with the most productive context probably dating to the first quarter of the 18th century.

Finnbogastaðir is in the eastern edge of the West Fjords, a region of Iceland often seen as agriculturally marginal. There is little pasture land between the highlands and the deep fjords and the northwest peninsula is vulnerable to sea ice from Denmark Strait in both winter and summer. Aside from agriculture, the major resources of the Northwest in the 18th and 19th centuries included fishing, sealing, egg collection, bird hunting, driftwood, and the windfalls provided by the stranding of both whales and ships (Kristjánsson 1980). In the 1706 Jarðabók land registry, the Finnbogastaðir farm appeared as a fairly typical farm in its district, valued at 16 hundreds, which was a mid-range farm for the West fjords. Compared to the rest of Iceland, the farm would be classified among the poorer farms. It was a royal farm, owned ultimately by the King of Denmark, though there was a fairly complex and not atypical management structure between the tenants and the authorities in Copenhagen.

Two tenant households occupied the farm at Finnbogastaðir at the time of the Jarðabok survey (such joint occupancy was not unusual prior to the great epidemics later in the century). One tenant was the local Lutheran priest Sr. Bjarni Guðmundsson with his household, while the other was the small farmer Brandur Björnsson and his family. Sr. Bjarni was highly literate (in more than one language) and was an educated man with contacts outside the district, while Brandur seems to have been a local farmer with little education. Sr. Bjarni maintained four servants (both male and female) as well as his wife and four children (it was not uncommon for poor tenants to have still more impoverished landless servants living in their households). Both household heads ranked far above the landless and homeless indigents, but by any reasonable standard, both Sr.Bjarni and Brandur were poor men, and neither were more than one or two bad seasons from disaster. However, there were clearly different degrees of poverty among tenants in 18th-century rural Iceland. Sr. Bjarni had a mix of milk cows, wethers, milk ewes, and two horses as well as younger cattle and sheep apparently being maintained over the winter with an eye to stock renewal. He also owned some additional stock maintained at the nearby church farm Árnes. Brandur supported his wife and six children with a single cow and five milk ewes.

Sturla Friðriksson (1972) estimated that under conditions of traditional Icelandic agriculture (before the mid-19th century) it took the product of nine ewes to sustain one adult, with six ewes equaling one cow. If we use these figures as a rough guide, it is possible to show that in Finnbogastaðir´s district, the total number of animals could not possibly sustain the number of people actually living on the farms in 1706. Both households at Finnbogastaðir appear to have had a shortfall: Sr. Bjarni had approximately 5.3 human rations to maintain his ten household members while Brandur had only 1.1 human rations to feed his family of eight. The households of early 18th-century Finnbogastaðir, like the great majority of their contemporaries in the northwest fjords, must have relied on other resources to maintain bare subsistence. We are informed that seal hunting was sometimes successful and that both households had access to boats for fishing, but

the Jarðabók register typically makes no attempt to quantify non-agricultural production (Edvardsson et al. 2004). The early modern archaeofauna (which probably represents the combined refuse of both households) corresponds in most respects with the information on stock keeping provided in the land registry (Fig. 5). All animals mentioned in the registry are present in the assemblage and the ratio of cattle to caprine bones in the archaeofauna (1:9.96) matches the overall ratio of cattle to sheep in the registry (1:9.43). The seals mentioned in the entry appear as bones in the midden, and whale bones correlate with recorded (and highly disputed) strandage rights. The archaeofauna also indicates the importance of marine resources at Finnbogastaðir: just over 97% of the collection is made up of fish, seal, sea bird, and marine mollusk remains (Fig. 5; Edvardsson et al. 2004). It would appear that as early as 1703, poor but educated men in the West Fjords were already investing what scarce resources they had in a combined subsistence and market fishery, and small holders were dependent on fishing for day-to-day survival.

Tjarnargata 3c, Aðalstræti 10, Aðalstræti 14–16: Early Reykjavík

During rescue excavations in downtown Reykjavík in 1999, nearly 100 kg of well-preserved animal bone was recovered in investigations at Tjarnargata 3C by the Institute of Archaeology, Iceland (FSÍ) directed by Mjöll Snæsdóttir. This collection represents one of the largest archaeofauna recovered from Iceland to date. The Tjarnargata 3C collections derive from a widespread sheet midden deposit that clearly post-dates a 1500 CE tephra, and contains a range of artifacts (including much imported English and Dutch pottery and many pipe stems) dating to the late 18th to early 19th centuries. It probably represents refuse discarded by multiple households and local shops, fish processing centers, and small craftsmen participating in the rapid urbanization of what is now central Reykjavik. The collection shows some distinctive urban characteristics, with clear indications of local butchery being significantly supplemented by meat-rich joints presumably imported from nearby farms provisioning the growing city. The remains of some preserved hams almost certainly indicate trans-Atlantic shipment, and serve to illustrate the expanded dietary range of the urbanizing population. Other bone remains illustrate another side of early modern city life: rodent gnawed bones, remains of stray dogs, scavenging gulls and fulmars, and other elements of an unwanted commensal "urban fauna." The collections also reflect the eventual source of Reykjavík's prosperity, as it is dominated by fish bones (Fig. 6). These are nearly all cod (*Gadus morhua*), and the ratio of the skeletal elements present and the reconstructed live length strongly suggest that intensive preserved fish

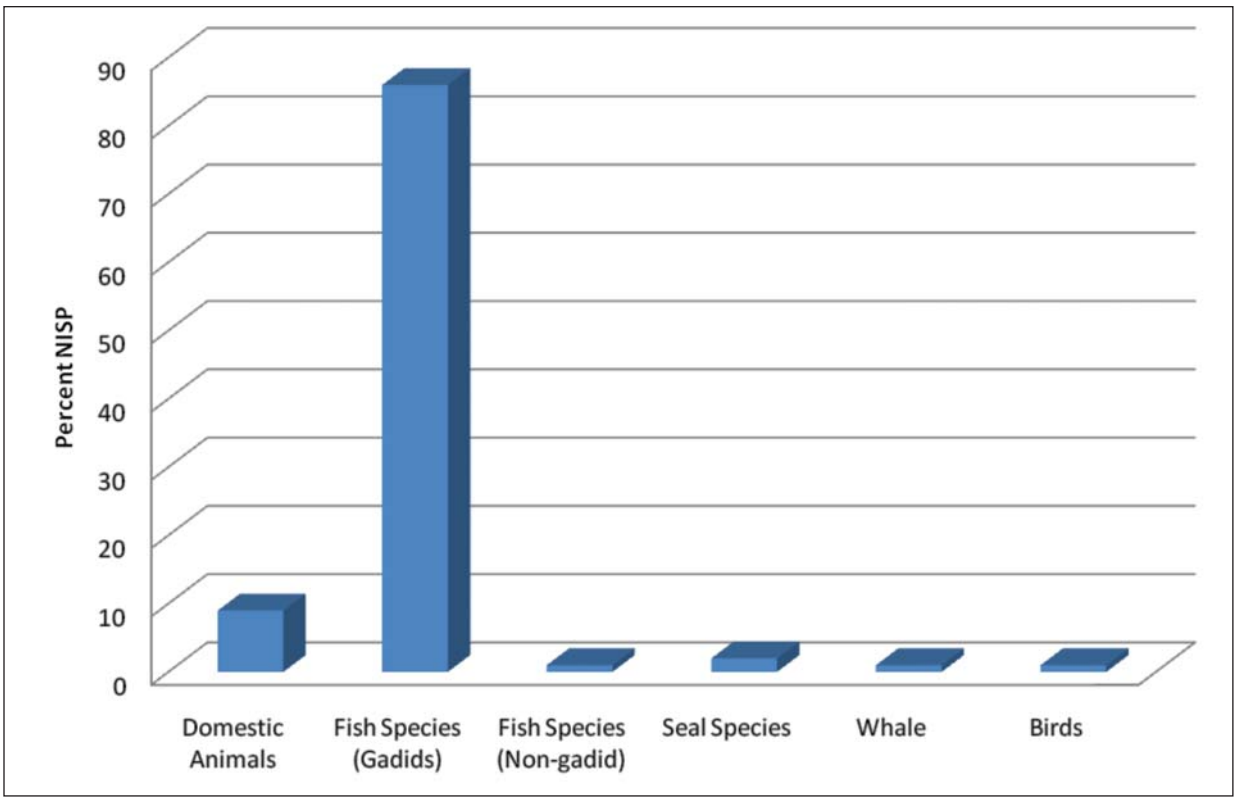

Figure 5. Finnbogastaðir NISP percentages.

preparation (probably for stockfish) was a major activity in the locality (Perdikaris et al. 2002). The bone-element distribution pattern shows a clear commercial fish-production signature with a significant surplus of head bones (cut off and discarded at the landing site) and lower numbers of vertebrae (exported with the dried or salted body; Perdikaris and McGovern 2007, Perdikaris et al. 2007). While cod were largely exported (apart from some individuals too small to dry effectively), a substantial amount of haddock was retained as whole individuals to provision the fisher folk and their supporting work force (a pattern continuing into the 20th century).

The inside foundation of the house at Aðalstræti 10 was excavated in August–September of 2005, yielding bone material which weighed about 30 kg. The excavators found rows of stones associated with the original wooden floor of the present building as well as several thick cultural layers underneath which were dated to the 18th century mainly based on pottery and clay-pipe fragments. The archaeofauna is associated with these pre-1760s cultural layers which predominantly consisted of peat ash from fire-places. The 2005 Aðalstræti archaeofauna is thus roughly datable to the late 17th and early 18th centuries CE and appears to be closely associated with the early modern farm buildings. The Aðalstræti 05 collection is thus closely contemporary with the larger Tjarnargata 3c bone collection excavated in 1999 from beneath the parking lot of the modern Icelandic Parliament building, which appears to have been an outdoor dump/processing area used by multiple households and the growing fish-processing trade (Perdikaris et al. 2002). A much smaller assemblage from Aðalstræti 14–16 has been included. These were household dumps of domestic waste. They are all roughly contemporary and within close proximity of each other. All show the same early urban characteristics discussed in the Tjarnargata 3c assemblage and show the signs of the first attempts at centralizing the dried-fish trade in Iceland in the 18th century.

Víðey, Nesstofa, and Bessastaðir: Royal Administrative Centers around Reykjavík

All three of these sites were excavated as rescue operations. Bessastaðir was the seat of the Danish Governor, and from independence on it has been the President of Iceland's residence. The preservation was not excellent, but a small quantifiable assemblage was recovered from an area exposed for the construction of a new parking lot when excavated by Guðmundur Olafson in 1987. Viðey is an island off of Reykjavík and it was the seat of the Danish Lieutenant Governor in the early modern period. Archaeological faunal material from the early modern period was recovered in excavations by Margaret Hallgrimsdóttir in 1990. These excavations were associated with the construction of a conference center on the island. Nesstofa is located on the

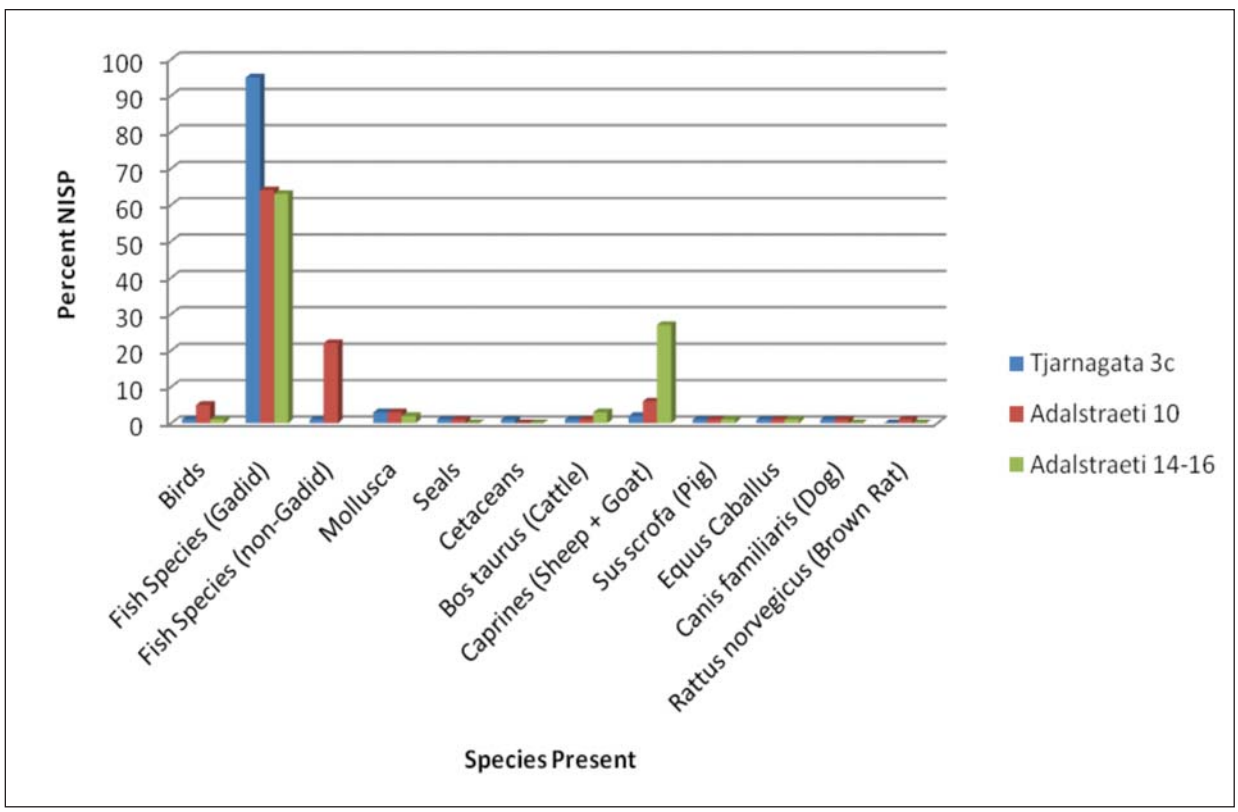

Figure 6. Comparison of NISP percentages for Early Modern Reykjavík assemblages.

Seltjarnarnes peninsula which is now a part of the city of Reykjavik. A stone house, one of the first in Iceland, was built here in 1761–1763 for Iceland´s first Physician General, Bjarni Pallson. These three sites of Danish colonial authority were all located in close proximity to each other around the area that was to become Reykjavík.

All three sites, though elite by most definitions, show a pattern similar to farms from the rest of Iceland, excepting Skálholt. The total assemblages are dominated by fish, and largely by gadids (Fig. 7). The fish from the Nesstofa site have not yet been analyzed, though an informal visual survey of the assemblage reveals large numbers of gadids. Within the domestic mammals, there are significant numbers of cattle, but caprines still outnumber them (Fig. 7). Other domesticates only appear in very small numbers. The age profiles of the slaughtered cattle at both sites are based on small numbers with fairly bad preservation, but they seem to suggest a dairy economy in all three cases. The presence of small numbers of seals and cetaceans at the sites is not especially surprising given their oceanside locations (Amorosi and McGovern 1993; Amorosi et al. 1992, 1994). Yet at Bessastaðir, the presence of a very small number of both polar bear and walrus bones might suggest something about the elite nature of the site. The governor might have had access to fairly exotic goods such as walrus ivory and polar bear skins. Neither of these animals was common in Iceland at this time. They most likely arrived via sea ice during climatic episodes as described above. The display of these objects might have been part of the governor's panoply of authority. They also might have been processed here on the way to Denmark. Polar bear bones have been found at a few other locations, namely in the assemblages of some medieval monasteries in Iceland (Pálsdóttir and Gorsline 2007).

Stóraborg: A Middle Ranking Farm on the South Coast

Stóraborg was a fairly prosperous farm on the southern coast of Iceland that was abandoned due to coastal erosion in 1834. The excavations from 1978 to 1991, led by Mjöll Snæsdóttir, revealed archaeological contexts from the early modern back into the medieval period. This site was not sieved, and faunal material was hand selected. The number of identified specimens (NISPs) are therefore somewhat suspect, and fish bones would have been especially biased against in this situation. Even very small fish vertebrae that would be lost without sieving can be identified down to species. The fish numbers reflected here are likely to be a much smaller representation of total fish remains than is truly the case (Fig. 8; Russel et al. 1986).

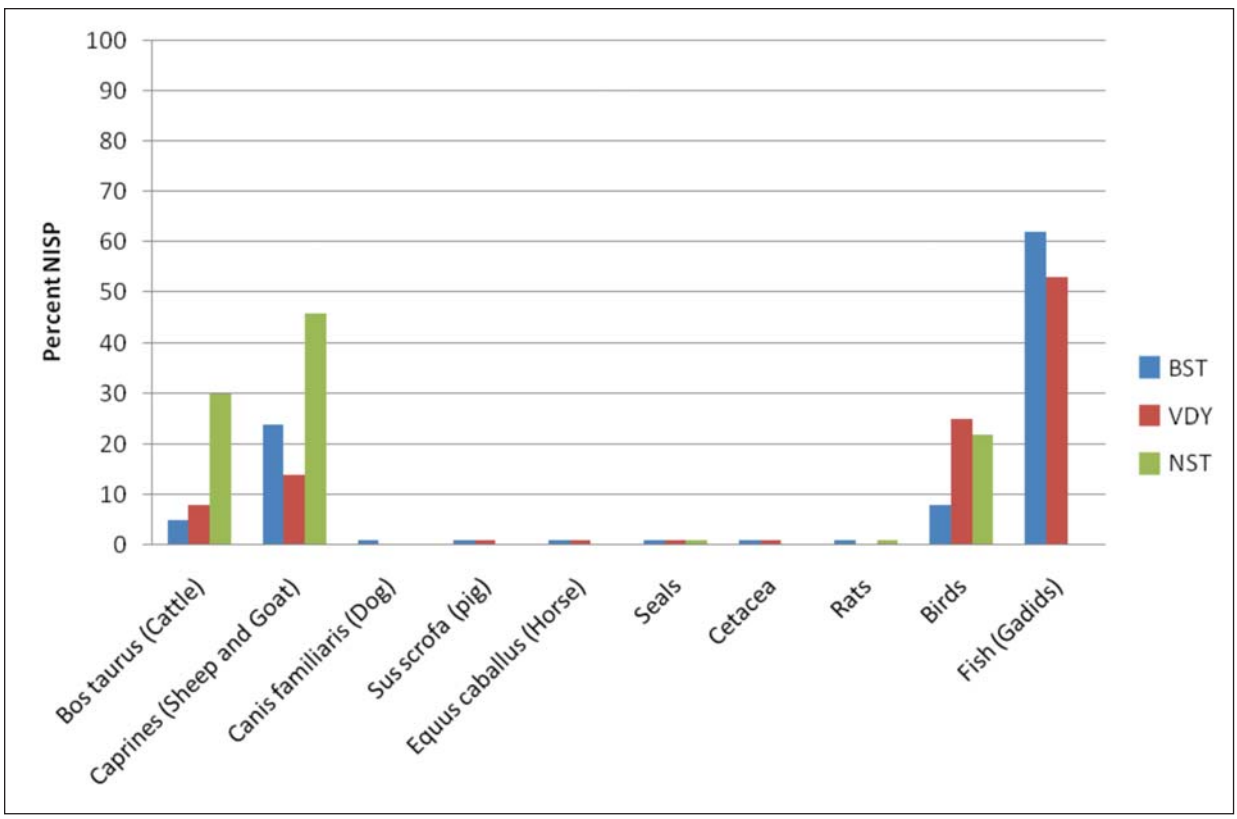

Figure 7. Bessastaðir, Viðey, and Nesstofa NISP percentages. Note that the Nesstofa fish are still under analysis and are not represented in this graph.

Miðbær on Flatey: A Farm at the Center of the Fish Trade

The Miðbær site is on the island of Flatey in Breiðafjörður, northwest Iceland. Flatey has a small but sheltered harbor that attracted both local and foreign fishermen from the late medieval period through the early modern period. French, Dutch, English, Basque, and German vessels all used this harbor between the 16th and 18th centuries (Amundsen 2004). The Miðbær site is located in the center of this small island and has an associated midden that goes down to at least the 13th century. A column sample of this midden was taken in 1989, and though the excavation was small, it produced a very respectable NISP for the early modern period (Fig. 9). As might be expected on an island site, the amount

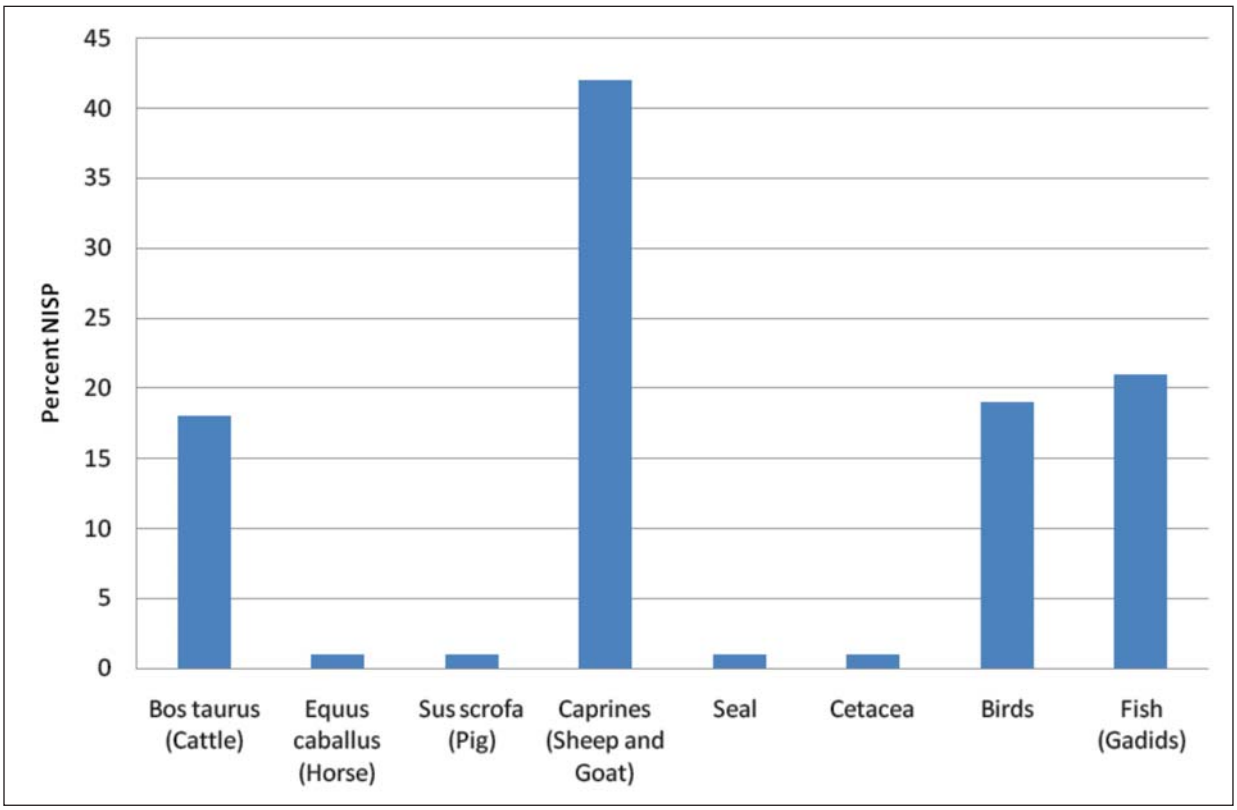

Figure 8. Storáborg NISP percentages.

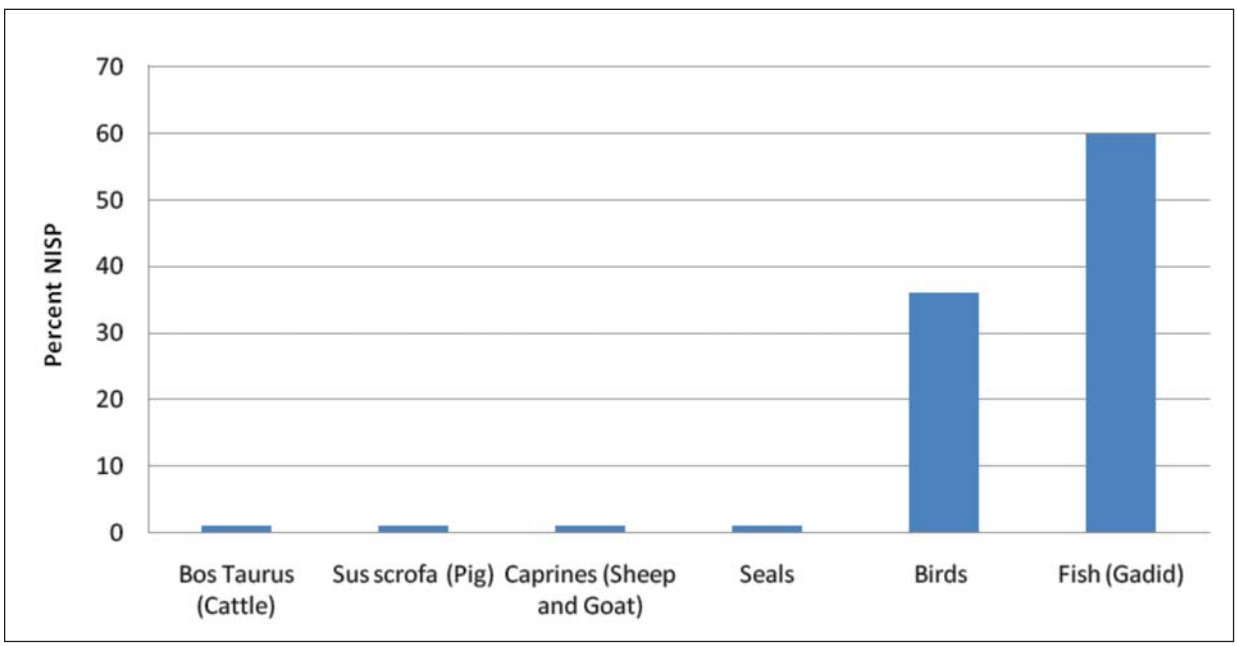

Figure 9. Miðbær NISP percentages.

of terrestrial domestic animal remains are small in proportion to those of birds and fish. The birds are made up primarily of puffin (*Fratercula arctica* L.) a bird that has been, and still is, harvested for food and feathers. The fish are dominated by gadids, mostly codfish. The size reconstruction of codfish represented in this sample suggest that they were too small for stockfish production and were the result of subsistence fishing (Amundsen 2004).

This assemblage is a small sample of what promises to be a large and rich midden. Though it seems to represent waste associated with subsistence production and not participation in the early modern trade in dried cod, it does reflect the site's island location in the preponderance of fish and bird resources. It is also too small a sample to be representative of the site. Hopefully this potentially very rich midden located on an island that participated in the early modern (as well as medieval) trade in tried cod will be more fully excavated in the future.

Discussion

Appendix 1 presents all the NISP data from these sites in one table. An initial comparison of the early modern Icelandic zooarchaeological data suggests a great degree of variation and adaptability on the part of Icelanders (Fig. 10). Patterns that can be observed are the large amount of fish, specifically gadids, showing the increasing penetration of the trade in dried cod from the settlement period through the medieval period and into the early modern (McGovern et al. 2006, Perdikaris and McGovern 2007). This increase in gadid bones can also be interpreted as a reaction to adverse climatic conditions that made terrestrial subsistence a much riskier effort. The increase in seal hunting at the northeastern site of Svalbarð also might be a similar response (Ogilvie, in press). We can see in the more anomalous results—the cows of Skálholt—status-maintenance strategies as well as the possibility of agricultural innovation.

The Bishops of Skálholt maintained a quality of life far more luxurious and expensive than that of the overwhelming majority of Icelanders at this time. The elites of Iceland during the 17th and 18th centuries were, like their continental counterparts, engaged in conspicuous consumption in order to reinforce their political and cultural power (Hreinsson 2005). These demands included the need to feast visitors and in general keep a table in keeping with the power and reputation of a bishop who was also a local magnate and an ecclesiastical member of a royal colonial administration. Like other large land holders of the period, the Skálholt bishops of the early modern period were troubled by shortages of labor caused by famine, disease, and the attractions of non-agricultural employment. Like all Icelanders in this period, they felt the effects of the multitude of climatic, demographic, and volcanic challenges, but unlike most land owners they had the

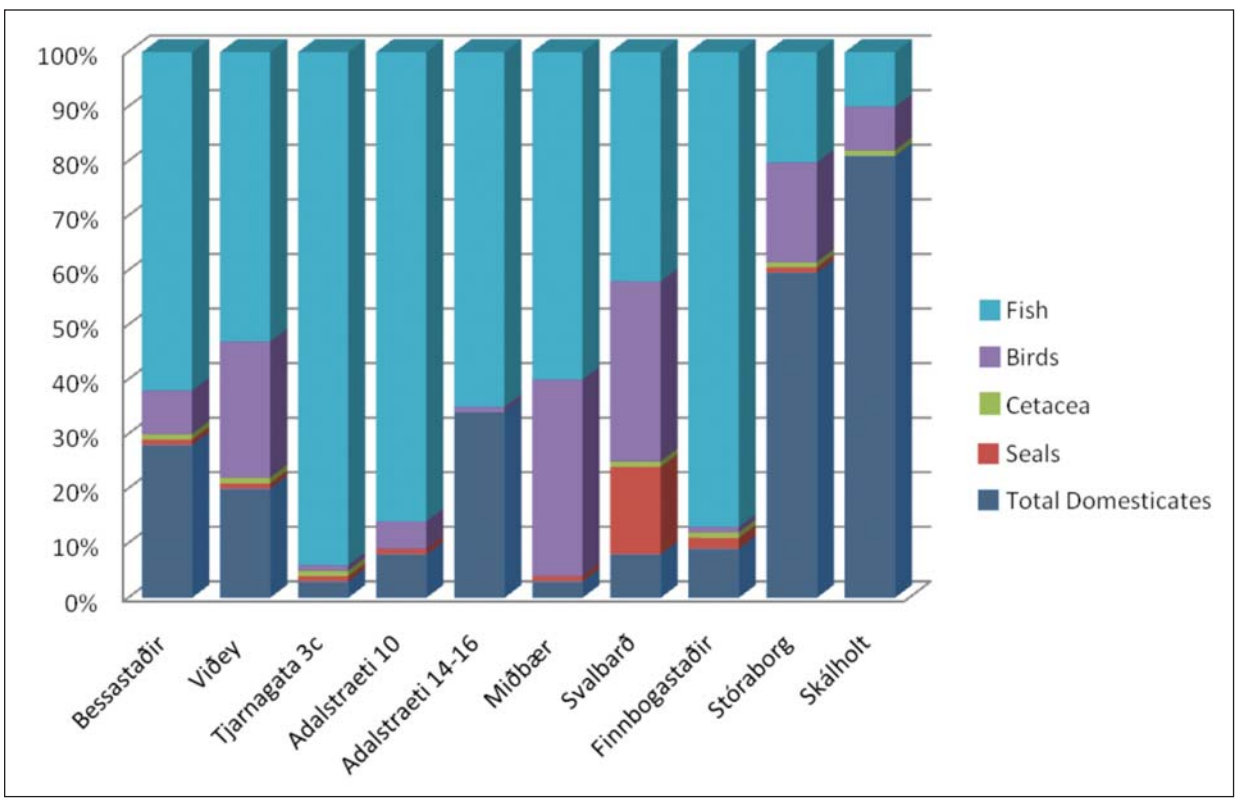

Figure 10. NISP of all sites compared. Note: Nesstofa is not included as the fish from this assemblage are still being analyzed. The Stóraborg assemblage was mostly not sieved, which creates a large bias against fish bone recovery.

advantages of relatively protected pastures in the warm south whose sustained productivity provided a steady income and allowed a cattle-heavy farming strategy that left room for beef consumption. Unlike local elite centers such as Svalbarð, they also had an effective island-wide dispersal of their holdings, further buffering them against fluctuating climate and local disasters. While the general downturn in farming conditions during the 17th and 18th centuries and the resulting loss of rental income affected them, it affected them far less than managers in more environmentally vulnerable areas, or those with less ability to shed risk and impact (Lárusson 1967). Political, economic, and religious power allowed for the creation of buffers against climatic and economic change, and the Skálholt bishops made it through hard times with their life style and their power intact, though diminishing, until the earthquake of 1784 abruptly wrecked the ancient manor complex and proved the catalyst towards an irrevocable shift of power to the developing fishing town of Reykjavík.

These initial comparisons generate a number of observations and questions. One of the first is that each assemblage reflects the regional resources available to the inhabitants of each site as well as the desire to obtain them. This last point is important in light of the structuralist "prisoners of culture" argument made by Hastrup (1990). Kirsten Hastrup, in her work *Nature and Policy in Iceland 1400–1800*, presents a case that Iceland in the early modern period was not only subjected to the negative consequences of climate change and Danish mercantilism, but that they were themselves mentally incapable of reacting to these phenomenon in any effective way. Hastrup argues that this was the case because Icelandic mentalities were so rooted in the ideals and structures of the Commonwealth Period (900–1262/1264 CE) that they did not have the conceptual tools to deal with the problems of the early modern period. Her premise is that Icelanders were literally incapable of improving their land or of adopting new farming or fishing technologies because their culture was stalled in the structures of an earlier period (Hastrup 1990). This disconnect between Icelandic culture and the realities of the environment and economy is posited as having created a situation in which innovative response was impossible as the Icelandic mentality was incapable of truly perceiving the problems confronting them. The argument suggests the Icelandic mentality was an element as detrimental to Icelandic survival as climate change and volcanism. This structural interpretation of the troubles of early modern Iceland has been criticized for, among other things, being based on a too literal analysis of early law codes and sagas of Iceland, emphasizing mentalities at the expense of agency to an extreme, and even of being an example of orientalism through the exoticization of the Icelanders in this anthropological analysis (Durrenberger 1988a, 1988b, 1992; Pálsson 1995). Contrary to a view of early modern Iceland as having been a static society with an internal ideological brake against innovation and change, the zooarchaeological analysis of these assemblages reveal the ability of early modern Icelanders to respond to their environment by changing subsistence strategies to meet new conditions. It reveals the diversity of reactions to hard times reflecting the importance of local conditions for all the sites discussed with the exception of Skálholt, which had access to resources from across Iceland.

One of the central questions that has been asked about early modern Iceland is why there were no successful attempts at institutional reform towards creating a more effective buffer between Iceland and the tough conditions it faced. Certainly there were major geographical, environmental, and legal/social/cultural impediments to agricultural reform and an intensified participation in the dried cod trade, both of which it has been argued would have helped alleviate the hard times of the early modern period (Eggertsson 2005; Gunnarsson 1980, 1983; Hastrup 1990; Lárusson 1967; Vasey 1996). Yet the zooarchaeological data from the existing early modern excavations in Iceland suggest a different perspective on this question. The clear presence of international influences in the form of the cod trade, the ham hocks at Tjarnagata 3c, and the possibility that the polled cattle of Skálholt were a product of Icelandic participation in the Agricultural Revolution show the adaptability of the Icelanders in the face of tough conditions. The exploitation of maritime resources at all the rest of the sites (with the assumption of similar numbers at Stóraborg and Nesstofa) reveals the ability of the Icelanders to cope through the use of resources close at hand. All these examples should, I suggest, be seen as the actions of individual farms and agents in the face of tough times. While most studies of early modern Iceland are historical and thus emphasize the documentary evidence and macro-level analysis, the zooarchaeological data comes from the actions of households, whether relatively large and prosperous such as Skálholt or small and relatively poor such as Finnbogastaðir. In this case, the archaeological micro-scale perspective reveals a much more adaptive and dynamic set of responses than historical analysis has typically suggested.

This analysis is just the beginning of a zooarchaeological approach to the study of the early modern period in Iceland. One of the more obvious results of this discussion is the need for further research on a wider spectrum of settlements in early modern

Iceland. Another route to be taken should be to engage in inter-Atlantic comparisons. In the end, it is hoped that this paper will stimulate further discussion and work in the very fertile field of early modern Icelandic as well as North Atlantic archaeology.

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Endnotes

[1]The preservation of the faunal material from Reykholt was unfortunately very uneven, and it was not possible to fully quantify the archaeofauna from this important site, so it has been excluded from the comparative tables.

[2]The Bishop returned to Skálholt after having bought the property from the crown and lived there until his death in 1796.

[3]Sadly neither have much to say specifically about Skálholt. Banks says very little in his journal except the priggish comment that the Bishop was a “gentleman,” unlike most everyone else he had met.

[4]The faunal analysis of the Svalbarð site is ongoing. Dr James Wollett of Laval University in Quebec has also gone back to Svalbarð in the 2008 season for further excavation and stratigraphic analysis. Work will continue over the next few years, and the Svalbarð data will continue to develop.

[5]1710–1712 census and inventory of Iceland

Appendix 1. NISP for all sites.

Taxa	Common name	Bessastaðir	Viðey	Nesstofa	Tjarnagata 3c	Aðalstræti 10	Aðalstræti 14–16	Miðbær	Svalbarð	Finnbogastaðir	Stóraborg	Skálholt
Domestics												
Bos taurus	Cattle	285	213	30	387	64	35	9	58	23	649	1395
Equus caballus	Horse	15	1	0	10	4	1	0	0	0	12	5
Canis familiaris	Dog	7	0	0	40	2	0	0	0	0	0	0
Sus scrofa	Pig	7	3	0	19	5	8	1	0	0	11	2
Ovis aries	Sheep	146	55	4	8	48	0	0	39	102	273	132
Capra hircus	Goat	0	0	0	0	2	0	0	5	0	29	1
Caprines	Sheep/goat	1324	322	42	727	461	334	12	271	127	1139	616
Seals												
Phoca groenlandicus	Harp seal	0	0	0	0	0	0	0	33	0	0	0
Phoca vitulina	Common seal	1	0	0	1	0	0	0	32	41	2	0
Erignathus barbatus	Bearded seal	0	0	0	0	0	0	0	1	0	0	0
Phocid sp.	Seal species	2	3	1	4	1	1	24	691	34	2	0
Cetacea												
Large cetacea	Great whales	0	0	0	2	0	0	0	0	33	0	3
Cetacea spp.	Whale/dolphin/porpoise spp.	3	11	0	12	0	0	0	29	0	3	1
Other mammals												
Alopex lagopus	Fox	1	0	0	3	0	0	0	1	0	1	2
Ursus maritimus	Polar bear	2	0	0	0	0	0	0	1	0	0	0
Odobenus rosmarus	Walrus	1	0	0	0	0	0	0	1	0	0	0
Rattus norvegicus	Brown rat	6	0	1	0	15	0	0	0	0	0	0
Rattus spp.	Rat species	20	0	0	0	0	2	0	0	0	0	0
Birds												
Phalacrocoracidae												
Phalacrocorax aristotelis	Shag	0	0	0	0	0	0	14	47	0	0	0
Phalacrocorax carbo	Cormorant	0	0	0	0	2	0	9	6	0	0	0
Phalacrocorax sp.	Cormorant sp.	3	0	0	0	0	0	3	1	0	0	0
Gaviidae												
Gavia stellata L.	Red-throated diver	2	0	0	0	0	0	0	8	1	0	0
Gavia sp.	Diver sp.	0	0	0	0	0	0	0	0	0	0	1
Procellariidae												
Fulmaris glacialis	Fulmar	0	0	0	13	0	0	0	0	1	1	0
Sulidae												
Sula bassana	Gannet	0	0	0	0	0	0	0	0	0	12	0

Taxa	Common name	Bessastaðir	Viðey	Nesstofa	Tjarnagata 3c	Aðalstræti 10	Aðalstræti 14–16	Miðbær	Svalbarð	Finnbogastaðir	Stóraborg	Skálholt
Birds, cont.												
Anatidae												
Anas platyrynchos L.	Mallard	18	0	0	0	02	0	0	0	0	0	4
Aythya sp.	Scaup or tufted duck	4	0	0	0	0	0	0	1	0	0	0
Somateria sp.	Eider duck	0	0	0	0	0	0	0	0	1	0	0
Somateria mollisima	Common eider	12	0	0	0	0	0	0	54	0	0	0
Mergus merganser	Common merganser	0	0	0	0	1	0	0	0	0	0	0
Melanitta nigra	Common scoter	0	0	0	0	2	0	0	0	0	0	0
Cygnus cygnus	Whooper swan	0	0	0	0	1	0	0	0	0	0	0
Cygnus olor	Mute swan	0	0	0	0	0	0	0	3	0	0	0
Anser anser domesticus	Domestic goose	0	0	0	0	0	0	0	0	0	205	0
Anser anser	Graylag goose	6	0	0	0	0	0	0	2	0	0	0
Branta leucopsis	Barnacle goose	0	0	0	0	0	0	0	0	0	8	0
Branta sp.	Black goose sp.	2	0	0	0	0	0	0	0	0	2	0
Anatidae sp.	Duck sp.	10	0	0	0	5	0	0	11	0	0	0
Anseridae sp.	Goose sp.	2	0	0	0	3	0	0	4	0	0	0
Cygnus sp.	Swan sp.	0	0	0	0	0	0	0	2	0	0	0
Anseriformes	Goose or duck sp.	0	0	0	0	0	0	0	1	0	0	0
Phasianinae												
Lagopus mutus L.	Ptarmigan	8	0	0	0	3	0	0	0	0	0	0
Charadriidae												
Pluvialis apricaira	Golden plover	0	0	0	1	0	0	0	0	0	0	0
Haematopus ostralegus	Oystercatcher	1	0	0	0	0	0	0	0	0	0	0
Rissa tridactyla	Kittiwake	0	0	0	0	1	0	0	0	0	0	0
Pluvialis sp.	Plover family	0	0	0	0	7	0	0	0	0	0	0
Laridae												
Larus canus	Common gull	0	0	0	3	0	0	0	1	0	0	0
Larus argentatus	Herring gull	3	0	1	3	0	0	0	0	0	9	0
Larus marinus L.	Greater black backed gull	2	0	0	0	0	0	0	8	0	6	0
Larus glauscesens	Glaucus gull	0	0	0	0	0	0	0	0	0	1	0
Larus sp.	Gull sp.	4	0	1	4	1	0	0	1	2	6	0
Alcidae												
Alca torda L.	Razorbill	0	0	0	0	1	0	0	1	0	9	1
Uria sp.	Murre or guillemot	1	0	0	0	1	0	0	416	10	20	10
Fratercula arctica L.	Puffin	2	0	0	6	0	0	212	3	0	186	0
Alcidae sp.	Auk sp.	0	0	0	0	2	0	0	4	0	0	0
Stercorariidae												
Stercorarius parasiticus	Arctic skua	0	0	5	0	0	0	0	0	0	1	0
Stercorarius skua	Great skua	0	0	0	0	0	0	0	0	0	5	0
Scolopacidae												
Arenaria interpres	Ruddy turnstone	3	0	0	0	0	0	0	0	0	0	0

Taxa	Common name	Bessastaðir	Viðey	Nesstofa	Tjarnagata 3c	Aðalstræti 10	Aðalstræti 14–16	Miðbær	Svalbarð	Finnbogastaðir	Stóraborg	Skálholt
Other Birds												
Bubo scandiacus	Snowy owl	0	0	0	0	0	0	0	0	0	1	0
Rallus aquaticus	Water rail	0	0	0	0	0	0	0	0	0	1	0
Gallus gallus	Chicken	0	0	0	0	2	0	0	1	0	22	0
Aves indeterminate		346	667	15	53	139	46	377	998	27	44	212
Fish												
Gadus morhua	Atlantic cod	3860	794	0	14643	298	0	221	0	1813	672	105
Melanogrammus aeglefinus	Haddock	0	0	0	3306	402	0	31	0	60	16	7
Molva molva	Ling	0	1	0	1096	0	0	0	0	42	26	1
Pollachius pollachius	Pollack	0	0	0	0	0	0	4	0	0	0	0
Pollachius virens	Saithe	0	0	0	498	10	0	0	0	80	14	2
Brosme brosme	Torsk	0	0	0	7	0	0	0	0	8	0	0
Merlangius merlangus	Whiting	0	0	0	0	0	0	0	0	0	2	0
Gadidae	Cod family	0	644	0	5105	822	0	753	0	808	0	129
Anarrhicas lupus	Wolf fish	0	1	0	16	0	0	3	0	19	0	0
Hippoglossus hipoglossus	Atlantic halibut	0	0	0	40	0	0	1	0	9	0	0
Pleuronectiformes	Flatfish species	0	3	0	96	1	0	0	0	7	0	0
Rajidae	Ray species	0	0	0	0	0	0	0	0	2	0	0
Somniosus microcephalus	Greenland shark	0	0	0	0	0	0	0	0	2	0	0
Salmonid identified	Salmon family	1	1	0	0	0	0	0	0	0	0	1
Fish species identified		4747	360	5518	38819	4463	747	2947	2027	2418	10700	2617
Mollusca spp.	Shellfish	322	139	323	2334	186	23	583	430	740	208	0
NISP		11179	3218	5941	67256	6957	1197	5204	5192	6410	14298	5247