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The Animal Bones from Litlibær, Nes, Iceland

Albína Hulda Pálsdóttir and Indriði Skarphéðinsson

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Photo on front page:

Sheep/goat metatarsal with extensive rodent gnawing (Þjms no. 2012-22-1555). Scale 2 cm. Photo: Albína Hulda Pálsdóttir.

Útdráttur

Í fornleifarannsókninni á Litlabæ á Nesi var grafin upp þurrabúð sem byggð var í kringum 1900 en breyttist síðar í sumarhús sem hætt var að nota um 1930. Heildarfjöldi dýrabeina úr rannsókninni á Litlabæ var 1135, þar af 907 sem greinanleg voru til tegunda. Dýrabeinasafnið frá Litlabæ er sérlega áhugavert og fjöldi dýrategunda nokkuð hár miðað við smæð safnsins. Samsetning þess bendir til þess að íbúar á Litlabæ hafi nýtt villt dýr sem þau höfðu aðgang að, sjófugla, seli, hval og fisk enda bærinn staðsetur stutt frá fjörunni á Seltjarnarnesi. Af húsdýrum voru bein kinda/geita algengust; ekkert bein sem hægt var að greina með vissu sem geit fannst þó í rannsókninni. Nokkur nautgripabein fundust við rannsóknina en flest þeirra komu úr neðri hluta útlima af mjög ungum kálfum. Í dýrabeinasafninu frá Litlabæ voru tvö rottubein og nokkur fjöldi beina sem greinilega hafði verið nagaður af nagdýrum. Einn jaxl úr manni fannst í uppgreftinum en í honum var stór skemmd, líklega hefur tönnin verið dregin úr og hent í ruslið. Af fuglabeinunum sem fundust má sjá að íbúarnir veiddu sjófugla, t.d. máva, skarf og líklega voru einnig haldin hænsni á Litlabæ. Fiskibeinin komu flest úr þorski en einnig nokkur úr ýsu og flatfiskum, stærð þeirra og samsetning bendir til fiskveiða til sjálfsþurftar frekar en fiskvinnslu til sölu.

Summary

At Litlibær in Nes Iceland a small fisherman's cottage, built around 1900 turned summerhouse and abandoned in the 1930s, was excavated. The total number of bones recorded in the Litlibær archaeofauna was 1135 (TNF) and the number of identified specimens (NISP) was 907. The range of species found at Litlibær was quite wide for a collection of such a modest size indicating that the inhabitants of Litlibær made good use of the wild animal resources available to them around the coast. The domestic mammal group is dominated by bones from sheep/goat. A small number of cattle bones was found at the site but interestingly most of them come from the lower limbs of very young calves. The collection included two rat bones which are rare finds in Iceland. The collection included a single human molar with cavity. The bird bones from Litlibær reflect the coastal location of the site and show that the inhabitants routinely hunted sea birds for food. They also likely kept chickens. The fish bone from Litlibær mostly consists of gadid bones with haddock *(Melanogramus aeglfinus*) and cod (*Gadus morhua*) being most common. A few flatfish bones were also found at the site, size and elements found indicate subsistence fishing.

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Introduction

This report details the results of zooarchaeological analysis of the animal bone collection from the site of Litlibær, Nes in Seltjarnarnes Iceland. The excavation at Litlibær at Nes, Seltjarnarnes (64°09.561N/22°00.734W) took place in May and June 2012 as part of an undergraduate course for archaeology students at the University of Iceland.

The site consists of a building with a concrete cellar and a sunken concrete tank which likely belong to more than one construction phase. The structures at the site were built at the beginning of the 20th century as a fisherman's cottage but it was converted to a summerhouse in the 1930s (Lucas, Ólafsson, Pálsdóttir, & Skarphéðinsson, 2019). Documentary records show that there was a hay barn and byre added to the house some time before 1930; artefacts found at the site indicate that milking was taking place and memoirs of a former inhabitant tell that horses were also kept at Litlibær (Lucas et al., 2019). The buildings at Litlibær were torn down sometime between 1942 and 1954 (Lucas et al., 2019). The Litlibær excavation is unusual with its focus on the very recent past and the amount of documentary evidence, photographs and information about the buildings and its inhabitants.

The excavation used the single context excavation method and animal bones were recovered and bagged by context (Lucas & Ólafsson, n.d.; Lucas et al., 2019). The animal bone collection from Litlibær is hand collected. A single context a wet deposit at the bottom of the cess tank, number [13836], was sieved but there were no bones or finds from that context.

Since it was not possible to clearly assign the excavated contexts at Litlibær to the different phases of the occupation and due to the relatively small size of the archaeofauna, the material will be analysed in a single phase.

Analysis methods

The analysis of the animal bone collection from Litlibær was performed by zooarchaeologist Albína Hulda Pálsdóttir and Indriði Skarphéðinsson, BA student in Archaeology at the University of Iceland between May and December 2018. The analysis was done at the Agricultural University of Iceland, Keldnaholt using the Icelandic ZooArch reference collection (Albína Hulda Pálsdóttir & Elísa Skúladóttir, 2018).

Basic data was recorded through the NABO Zooarchaeology working group NABONE system 9th edition which combines an Access database with specialized Excel spreadsheets. The NABONE package allows application of multiple measures of abundance, taphonomic indicators, and skeletal element distribution (North Atlantic Biocultural Organization Zooarchaeology Working Group, 2010).

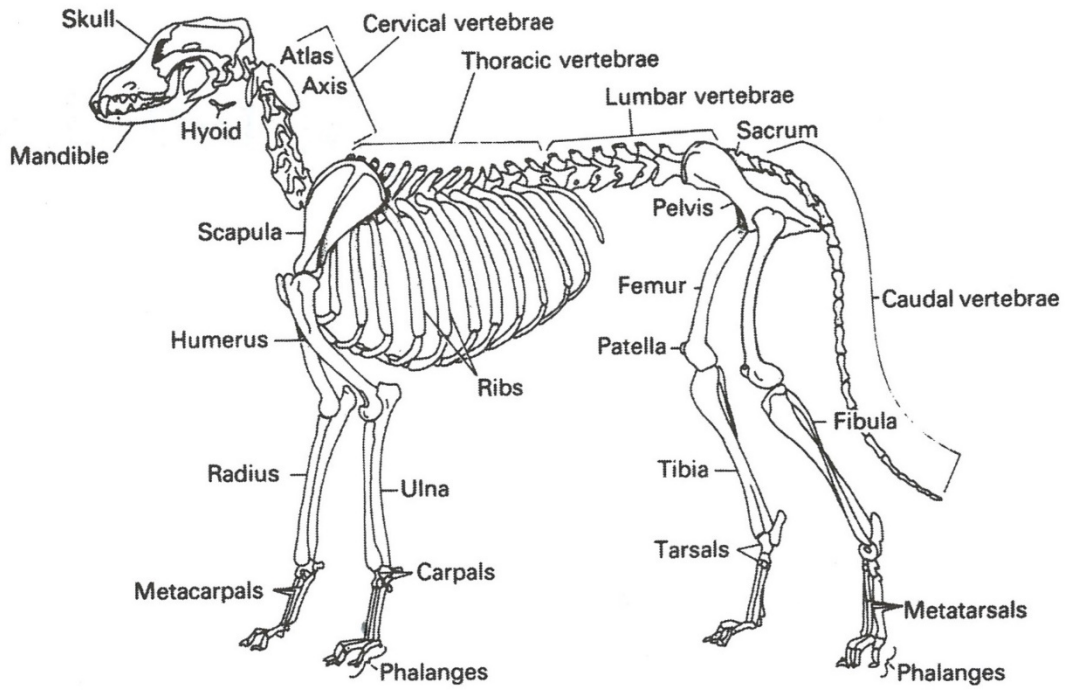

Figure 1: Dog skeleton with major bone elements labeled (Davis, 1987, p. 54; Reitz & Wing, 2008, p. 364).

All teeth and bones were identified to species and element (Figure 1) when possible and basic taphonomic indicators recorded. Texture of bones was recorded following the York system (Harland, Barrett, Carrott, Dobney, & Jaques, 2003) to get an overview of the general state of preservation of the collection. Elements were generally not sided. When aging sheep, goat and cattle bones Grant's (1982) dental wear system was used and O'Connor (O'Connor,

2003, p. 160) for age categories. All teeth and mandibles with recorded tooth wear were also numbered and packed individually in bags.

All measured elements got a database number and were packed individually. Any elements with pathologies were also numbered and packed individually. For descriptions of pathology the system of O'Connor (2003, pp. 188–192) was used.

For distinctions between sheep (*Ovis aries*) and goat (*Capra hircus*) bones the standards of Zeder & Lapham (2010) were followed. Phalanges were not separated into sheep and goat since the criteria does not seem to work well for North-Atlantic material (AHP, personal observation). For identification of seal bones Hodgetts (1999) and Storå (2001) were used in addition to the reference collection. Seal bones are hard to identify to species due to high inter-species variation (Hodgetts, 1999, p. 296) and there is a limited number of seals in the Icelandic ZooArch reference collection at present (Albína Hulda Pálsdóttir & Elísa Skúladóttir, 2018). Speciation of seal bones requires a good reference collection with multiple individuals of each seal species likely to be found in the area of different sex and age classes. Therefore, seal bones are not identified to species in this report, just to size class. Phocid species/PSP are bones that are clearly seal but can't be put into a size category. Large Phocid species/LP are bones which likely come from seals the size of the bearded seal (*Erignathus barbatus*), grey seal (*Halichoerus grypus*) or hooded seal (*Cystophora christata*). Small Phocid species/SP are bones from a seal the size of harbour seal (*Phoca vitulina*), harp seal (*Phoca groenlandica*) or ringed seal (*Phoca hispida*).

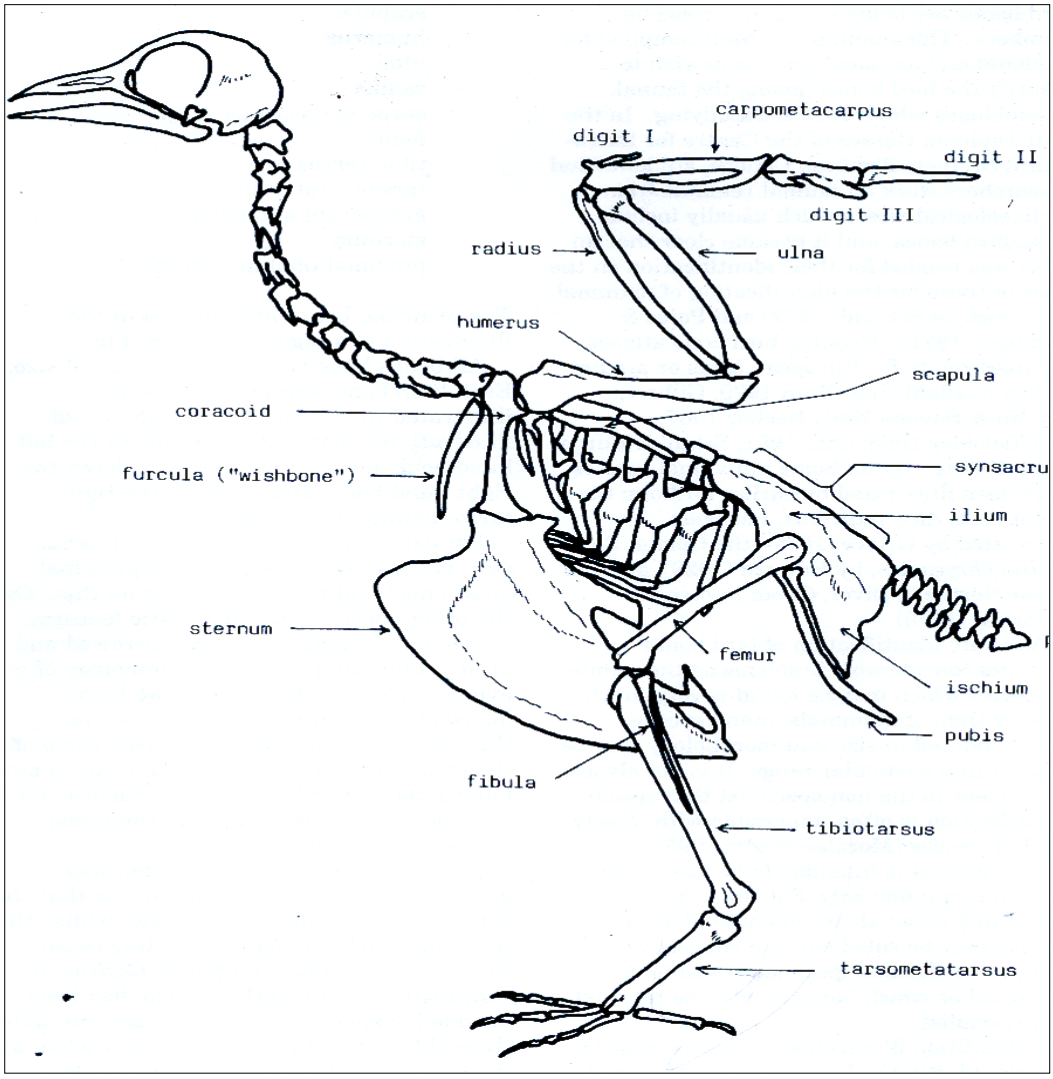

Figure 2: Bird skeleton with element names (Cohen & Serjeantsson, 1996).

Bird bones (Figure 2) were identified using the Icelandic ZooArch reference collection and identification manuals (Bochenski & Tomek, 2009; Cohen & Serjeantsson, 1996). Around 75 species of birds regularly nest in Iceland and around 370 species of birds are recorded as having been seen in Iceland (Náttúrufræðistofnun Íslands, n.d.). To confidently identify birds bones to species when species are closely related and of similar size skeletons from at least 2-3 individual of each species are needed for a high quality identification (Bocheński & Tomek, 1995). To avoid over identification where there Icelandic ZooArch reference collection does not have enough reference specimen's gulls (*Laridae*) have not been identified to species but for all gull bones size category has been noted. Same applies to auk species (*Alcidae*). Cormorants/shags have (*Phalacrocorax* spp) not been identified to species either due to lack of reference material.

Fish bones were identified using the Icelandic ZooArch reference collection and available databases and manuals ("Archaeological Fish Resource," n.d.; "Idaho Virtual Museum—Osteo Bony Fishes," n.d.; Perdikaris, Krivigorskaya, McGovern, & Pirjo, 2004; Wheeler, 2009).

The zooarchaeological (rather than taxonomic) categories of "small terrestrial mammal (STM)" (cat-fox sized), "medium terrestrial mammal (MTM)" (pig-sheep-goat-large dog sized) and "large terrestrial mammals (LTM)" (cow/horse sized) mainly include vertebral, rib, and long bone shaft fragments that could not be securely identified further. They are probably mostly from domestic mammals already identified on other elements. Unidentified mammal fragments (UNIM) are mammal bones which can't be identified further. Unidentified fragment (UNI) are bone fragments, usually very small or badly preserved which can't be placed in any of the above categories.

Land mammal element measurements were done according to the metrical standard of von den Dreisch (1976) with digital callipers to the mm. Domestic fowl (*Gallus gallus*) bones were measured following von den Dreisch (1976) but other bird bones were not measured. Seal bone measurements followed Ericson og Storå (1999). Fish bones were measured following the York system (Harland et al., 2003).

Packing of the Litlibær animal bones

The packing of the animal remains from Litlibær was done according to the rules of the National Museum of Iceland (Þjóðminjasafns Íslands) (*Leiðbeiningar um umhirðu forngripa og frágang sýna*, 2013) and all animal remains from the Litlibær excavation are permanently archived at the National Museum of Iceland.

The animal remains had been cleaned on site and were packed with find numbers in the format 2012-22-XXX. During analysis all animal bones are re-bagged according to species identification. Bones which can't be identified to species go together in a bag (LTM; MTM; UNIM and UNI). Each bag is labelled with the ÞJMS number, context number and identification code following the NABONE manual 9th edition (North Atlantic Biocultural Organization Zooarchaeology Working Group, 2010) or full species name. A Tyvek label with the same information written in pigment ink is also placed in each bone bag. All elements which are measured as well as mandibles with teeth are bagged separately and they get a database number and those numbers are written on both the bag and Tyvek label. Any artefacts found among the animal bones are bagged separately and handed to the excavation director for analysis.

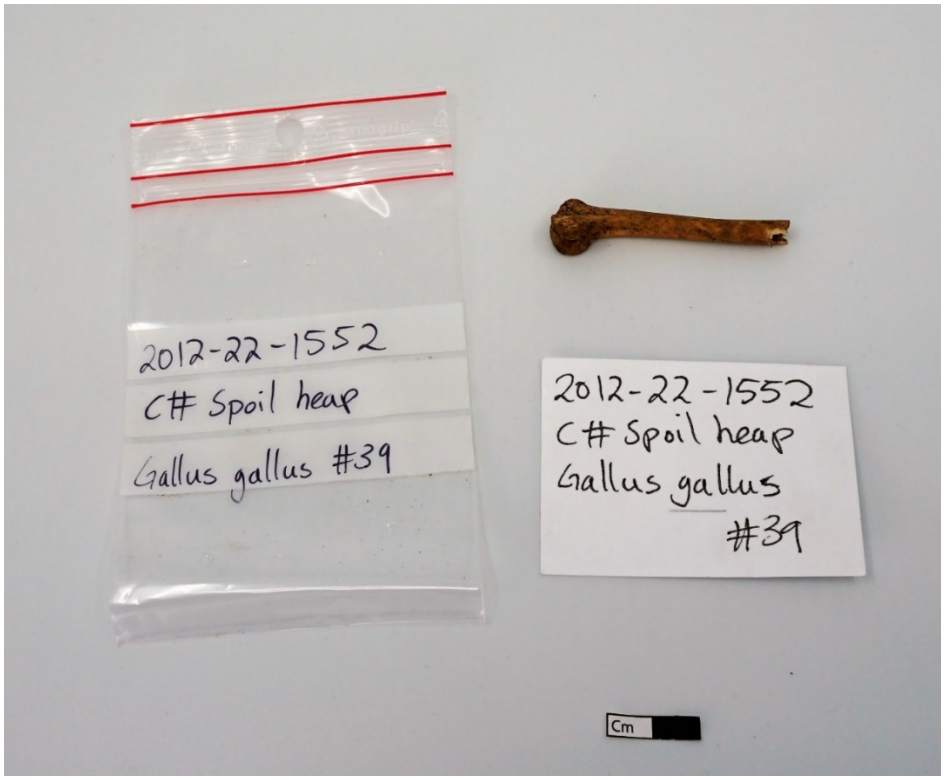

Figure 3: A typical bag and Tyvek label from the Litlibær animal bone collection. Scale 2 cm. Photo: Albína Hulda Pálsdóttir.

Overview of species present

The summary table uses the Number of Identified Specimens or NISP, which refers to the number of bones or bone fragments identified to each species. The total number of bones recorded in the Litlibær archaeofauna was 1135 (TNF). The NISP was 907. It is common to use a cut off of NISP 100 for major domestic species before the sample size is too small to be of much use (Hambleton, 1998, p. 68). As evident in Table 1 the NISP for sheep/goat from Litlibær is 185 and NISP for wild fowl and fish are also above 100. The Litlibær collection is therefore slightly above common required samples size and some more detailed interpretations of the archaeofauna are justified.

Table 1: Summary overview of Taxon by Economic Group

Taxon by Economic Group	NISP	% of whole	% of group
DOMESTICATES			
Cattle (*Bos taurus*)	15	1,65	7,35
Horse (*Equus caballus*)	2	0,22	0,98
Cat (*Felis domesticus*)	1	0,11	0,49
Pig (*Sus scrofa*)	1	0,11	0,49
Sheep (*Ovis aries*)	36	3,97	17,65
Sheep/goat (Ovis/Capra sp).	149	16,43	73,04
total Ovis/Capra	185	20,40	90,69
total Domesticates	204	22,49	
SEALS			
Small seal	2	0,22	100,00
total Phocid	2	0,22	
CETACEA			
Small whale	2	0,22	100,00
total Cetacea	2	0,22	
OTHER MAMMALS			
Rat species	2	0,22	
Human	1	0,11	
total Other Mammals	3	0,33	
BIRDS			
Wildfowl - sea birds	129	14,22	91,49
Wildfowl - land birds	1	0,11	0,71
Domestic fowl	11	1,21	7,80

Bird sp.	70	7,72	
Total Birds	211	23,26	
FISH			
Gadid sp.	378	41,68	95,45
Other Fish	18	1,98	4,55
Fish sp.indet.	86	9,48	
Total Fish	482	53,14	
MOLLUSCA			
Mollusca sp.	3	0,33	
Total Mollusca	3	0,33	
TOTAL NISP (Identified fragments) =	907	100,00	
Unidentified fragments	4		
Medium Terrestrial Mammal	145		
Large Terrestrial Mammal	7		
Unident. Mammal Frags	72		
TOTAL TNF (all fragments) =	1.135		

The Litlibær archaeofauna is dominated by fish, followed by birds and sheep/goat bones (Figure 4).

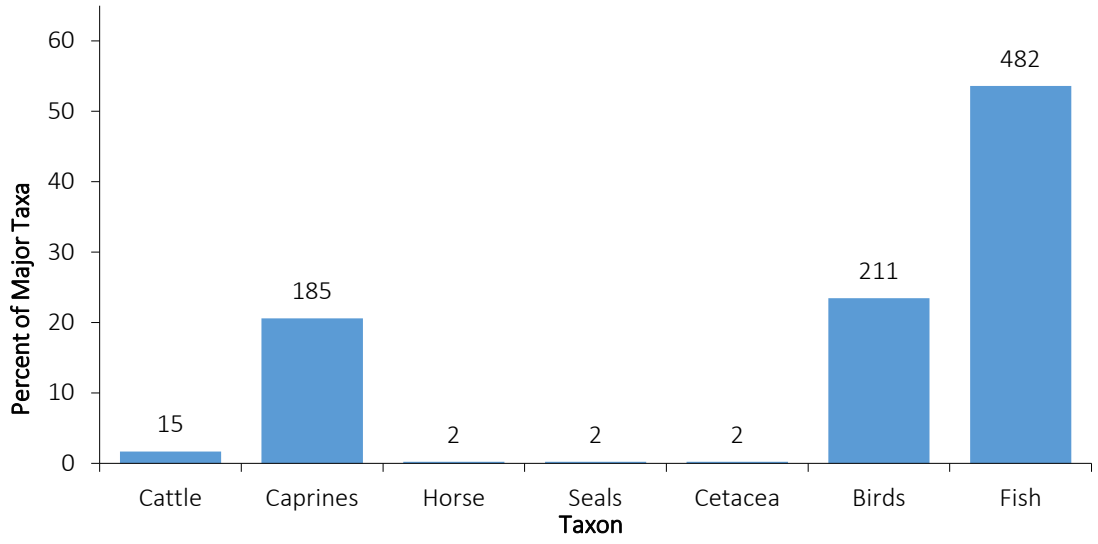

Figure 4: The relative % of major taxa (NISP) from Litlibær.

Distribution of the archaeofauna between contexts

The distribution of animal remains at Litlibær was not even between contexts (Table 2). The majority of bones came from two contexts, [13846], a disturbed natural/ old land surface which covered most of the site and context [14846] a peat ash dump which filled in a hollow (Lucas & Ólafsson, n.d.; Lucas et al., 2019). The majority of the artefacts found at the site also come from context [13846] (Lucas et al., 2019).

Table 2: Number of bones from each context at Litlibær.

Context number	Total number of bones	% of TNF
13744	37	3,3%
13749	88	7,8%
13796	24	2,1%
13808	6	0,5%
13846	326	28,7%
14730	8	0,7%
14846	459	40,4%
14904	3	0,3%
14935	37	3,3%
14941	10	0,9%
15082	21	1,9%
15568	1	0,1%
15663	1	0,1%
16069	2	0,2%
16118	6	0,5%
16122	44	3,9%
16169	5	0,4%
spoil heap	57	5,0%
Total number of bones (TNF)	**1135**	

Bone preservation & taphonomy

In general, the archaeofauna from Litlibær is well preserved. A few bones showed signs of having rolled around in the surf which results in smoothing of edges, e.g. cattle metatarsus 2012-22-1532 and a few other bones from context C# 13846 which is noted as being a disturbed layer in the site unit register so that seems to fit well with the variable taphonomy of the bones in the layer.

The archaeofauna from Litlibær was handpicked but since the site was used for a student training excavation the rate of recovery is likely to have been high. This is evidenced by the fact that rat bones, juvenile bird bones and two bones from arctic tern which are very small were recovered at the site. While sieving is the ideal way to minimize recovery bias of animal remains during excavation the effects of recovery bias on the Litlibær archaeofauna are likely small.

Fragmentation

One way to estimate recovery bias and to understand the taphonomy of an archaeofaunal collection is to look at the size of the material recovered (Table 3 and Figure 5). The number of elements recovered smaller than 1 cm is relatively low, due to lack of sieving but recovery of bones in the 1-2 cm category is high, likely due to high quality hand picking. The relatively low number of elements larger than 11 cm is explained mostly by the fact that the majority of the material found at Litlibær comes from secondary butchery[1] and consumption rather than from primary butchery[2] activities.

Table 3: Fragment sizes of bones and teeth in the Litlibær archaeofauna.

Fragment size in cm	TNF	% of TNF
0-1	139	12,2%
1-2	344	30,3%
2-5	355	31,3%
5-10	212	18,7%
Larger than 11	85	7,5%
TNF	1135	

[1] Secondary butchery is the subdivision of a dismembered animal carcass into smaller cuts of meat (Reitz & Wing, 2008, p. 126).
[2] Primary butchery is defined as initial dismemberment of an animal carcass (Reitz & Wing, 2008, p. 126).

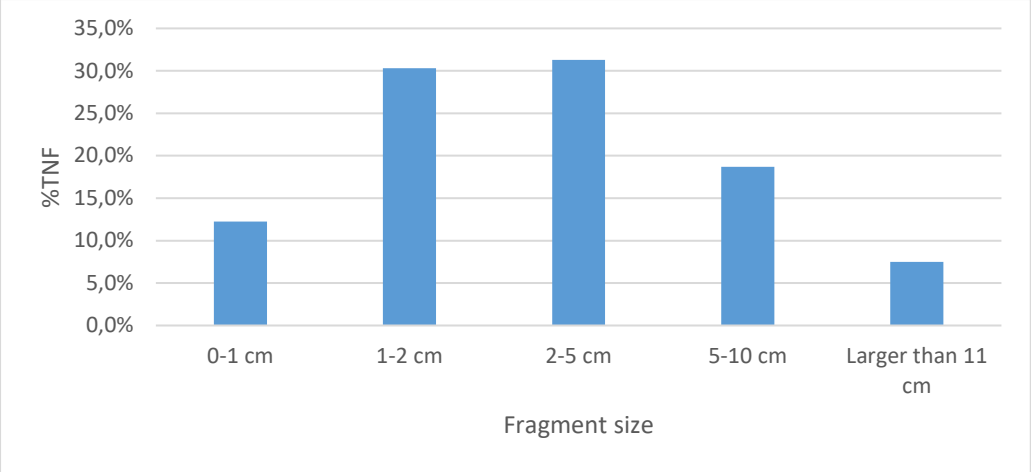

Figure 5: Chart of the percentage of TNF of bones in each size category from Litlibær.

Texture

The majority of the animal bones from Litlibær have well preserved surfaces and over 70% of the bones have either excellent or good surface preservation (Table 4) based on the criteria from the York system (Harland et al., 2003). Texture is not recorded for burnt bones. Some of the bones from Litlibær are sun bleached bones indicating delayed burial of the material.

Table 4: Overview of texture recorded in the Litlibær collection following Harland et al (Harland et al., 2003).

Texture	Count	% of total
1. Excellent	113	15,3%
2. Good	407	55,0%
3. Fair	154	20,8%
4. Poor	66	8,9%
Total	**740**	

Gnawing

Only 3% of the bones at Litlibær showed evidence of gnawing (Table 5) which is indicates that the bones were largely covered fast rather than lying on the surface and accessible to rodents and carnivores on the surface. This also fits well with the good over all preservation of the bones from Litlibær. Interestingly most of the bones which had been gnawed were gnawed by rodents, possibly rats since two rat bones were found at the site. Very few bones seem to have been gnawed by dogs or other carnivores.

Table 5: Gnawed bones at Litlibær

Gnawing	Count	% of TNF	% of gnawed
No gnawing	1101	97,0%	
Dog	1	0,1%	2,9%
Dog?	2	0,2%	5,9%
Rodent	27	2,4%	79,4%
Rodent?	4	0,4%	11,8%
Gnawed bones total	*34*	*3,0%*	
Total number of bones (TNF)	1135		

Figure 6: Sheep/goat radius (ÞJMS no 2012-22-1555) with extensive rodent gnawing. Scale 2 cm. Photo: Albína Hulda Pálsdóttir.

Burning

The majority of the animal bones from Litlibær were unburnt (Table 6). Remains of meals seem to have been thrown away rather than burnt.

Table 6: Burning in the Litlibær archaeofauna

Burn stage	TNF	% of TNF
No burning	747	65,8%
Scorched	11	1,0%
Burnt black	49	4,3%
Burnt white-grey	328	28,9%
TNF	1135	

Most of the burnt remains from the site come from a single context [14846] which had a large number of burnt fish vertebrae (Table 7).

Table 7: Burning by context in the Litlibær collection

Context number	Scorched	Burnt black	Burnt white-grey
13749			2
13796			16
13846	1		
13846			12
14846		46	
14846	10		
14846			255
16122			43
Total	**11**	**46**	**310**

Domestic animals

A total of 204 bones from domestic animals were recovered at the site but the category is completely dominated by bones from sheep/goat.

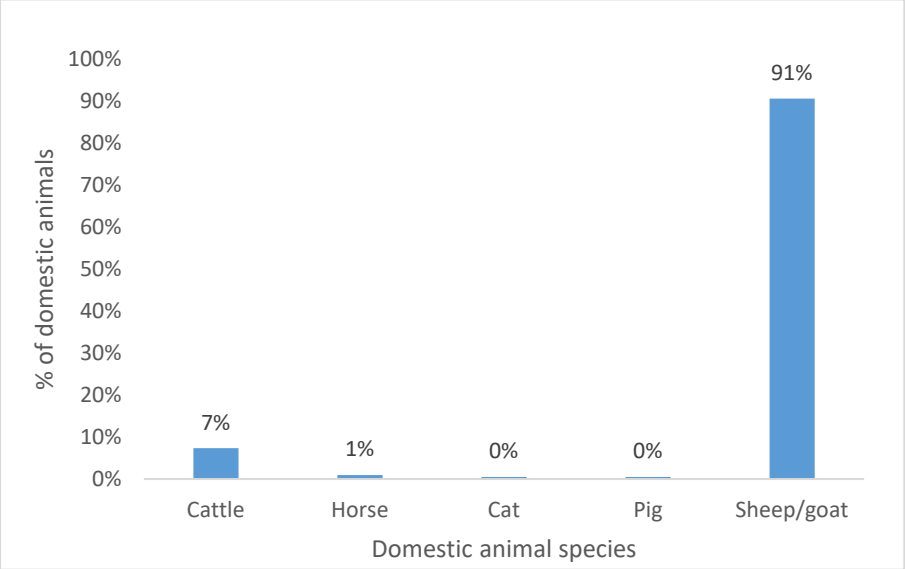

Figure 7: Chart of ratios of domestic mammals in the Litlibær archaeofauna. The percentage of each domesticate mammal species of the total number of domestic mammal bones recovered.

Only two horse bones were identified in the collection which is not unexpected. The collection is relatively small and from a lower status site. Horse bones rarely account for more than a few percent of Icelandic animal bone collections.

Caprines - Sheep/goats

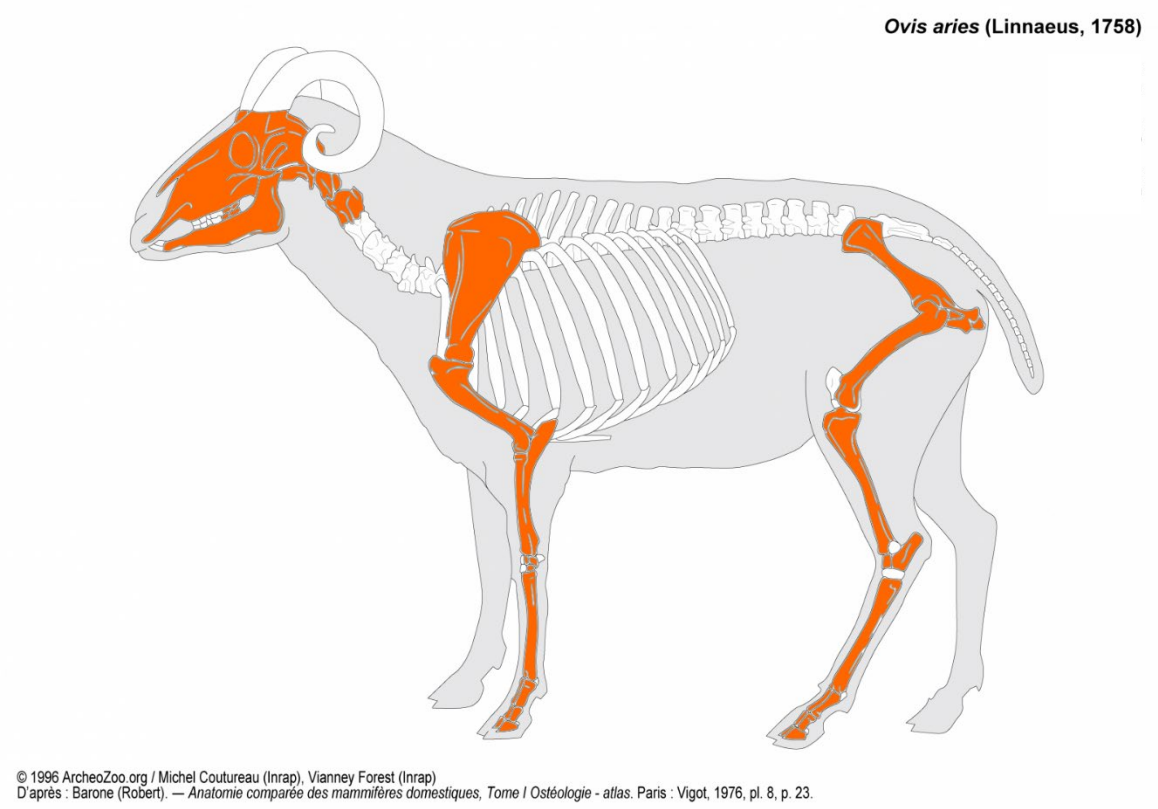

Figure 8: Sheep/goat elements found at Litlibær marked in on a sheep skeleton in orange.

Caprine bones are the most common mammal bones found at the site. Note that the term "caprine" refers to sheep and goat collectively as most elements of these closely related species cannot be reliably distinguished. At Litlibær 36 elements were identified as coming from sheep (*Ovis aries*). 149 elements were identified as caprine but most likely they are also all from sheep. No goat bones were identified in the collection which fits well with what is to be expected in a 20th century collection but goats become rare in Icelandic zooarchaeological material after the 12th century (Baldurssdóttir, Pálsdóttir, & Hallsson, 2017).

The sheep/goat elements found at Litlibær come from all parts of the body (Figure 8) when the fact that ribs and vertebra all go in the medium terrestrial mammal category is taken into account (Table 8).

Table 8: Caprine elements found at Litlibær.

Body part	Element	Count
Head	Molar 2	1
Head	Molar 3	1
Head	Molar	9
Head	Premaxilla	1
Head	Nasal	1
Head	Maxilla	1
Head	Mandible	19
Head	Hyiod	3
Head	Petrous	1
Head	Occipital	2
Vertebral column	Atlas	1
Vertebral column	Axis	4
Front leg	Scapula	4
Front leg	Humerus	8
Front leg	Radius	6
Front leg	Ulna	2
Front leg	Carpals	3
Front leg	Metacarpal	16
Hind leg	Acetabulum	1
Hind leg	Innominate	3
Hind leg	Femur	13
Hind leg	Tibia	12
Hind leg	Astragalus	4
Hind leg	Calcaneus	4
Hind leg	Metatarsal	25
Hind leg	Metapodial	4
Hind leg	Phalanx 1	25
Hind leg	Phalanx 2	9
Hind leg	Phalanx 3	2
	Total	**185**

The vast majority of caprine bones from Litlibær come from adult animals but a number of elements were categorised as juvenile (unfused bones) or neonatal (Table 9). Neonatal bones come from very young animals and in this case probably lambs younger than 1 month indicating that sheep farming was taking place at Litlibær to some level even if there is no documentary evidence of this.

Table 9: Age categories of caprine bones from Litlibær. Most of the bones with no age will likely come from adult animals.

Age category	NISP	% of caprine elements
	161	87,0%
Juvenile	19	10,3%
Neonatal	1	0,5%
Neonatal/juvenile	4	2,2%
Total	**185**	

The majority of sheep and sheep/goat mandibles from Litlibær fall into the age categories (O'Connor, 2003, p. 160) of immature or juvenile with only two mandibles categorized as adult (Table 10).

Two caprine bones showed signs of pathology. A sheep mandible (Þjms no. 2012-22-1558, Ref# 21) had a small bone growth on buccal side due to some sort of active pathology at death. A sheep/goat second phalanx (Þjms no. 2012-22-1559, Ref# 22) also had some excess bone growth possibly due to an injury.

Figure 9: Sheep mandible with excess bone growth on the buccal side (Þjms no. 2012-22-1558, Ref# 21). Scale 5 cm. Photo: Albína Hulda Pálsdóttir.

Table 10: Table of sheep and sheep/goat mandible with tooth wear Grant (1982) and measurements following von den Driesch (1976). Age category following O'Connor (O'Connor, 2003, p. 160).

Find number	Unit	Species	Bone	End	Frag	Texture	Butchery	Gnaw	Age category	Side	Ref#	dp2	dp3	dp4	P4	M1	M2	M3	Measurements
2012-22-1565	13846	Sheep	Mandible	Frag	10	2			At least immature		3	no wear	in wear	f		c	missing	missing	
2012-22-1566	13846	Sheep	Mandible	Frag	11	2			At least juvenile		5	missing	missing	g	c	missing			
2012-22-1532	13846	Sheep / goat	Mandible	Whole	11	1			At least juvenile		8	broken	broken	g	e				
2012-22-1531	13846	Sheep	Mandible	Whole	11	2			Adult 3	left	10					h	g	g	7. 72,21 8. 51,03 9. 10. L. 23,35 B. 8,87
2012-22-1535	14935	Sheep	Mandible	Frag	10	2			Immature	left	14	in wear	in wear	f		b	Crypt		
2012-22-1535	14935	Sheep	Mandible	Frag	10	3			Immature	left	15	no wear	in wear	g		b	Visible		
2012-22-1535	14935	Sheep	Mandible	Frag	11	2		Dog?	Immature	right	16	broken	broken	g		c	Crypt		
2012-22-1558	Spoil heap	Sheep	Mandible	Frag	11	2			Juvenile	left	21	missing	missing	f	c	crypt			
2012-22-1559	13846	Sheep	Mandible	Frag	11	2	Knife		Adult 1		23				g	g	f	b	7. not possible 8. 46,49 10. L not erupted B 6,37
2012-22-1570	15082	Sheep	Mandible	Frag	10	4			Immature	left	28	in wear	in wear	g		b	crypt		
2012-22-1570	15082	Sheep	Mandible	Frag	11	4		Rodent	Immature	left	29	missing	in wear	g		c	crypt		
2012-22-1570	15082	Sheep	Mandible	Frag	10	4			At least juvenile	right	30	in wear	in wear	f		missing			
2012-22-1561	13744	Sheep	Mandible	Posterior	11	2			Sub-adult 1	right	31					missing	c	crypt	
2012-22-1561	13744	Sheep	Mandible	Whole	11	1			Immature	left	32	in wear	in wear	g		c	crypt		
2012-22-1561	13744	Sheep	Mandible	Anterior	11	2	Chopped		Immature	left	33	in wear	in wear	f		b	crypt		

Cattle (*Bos taurus*)

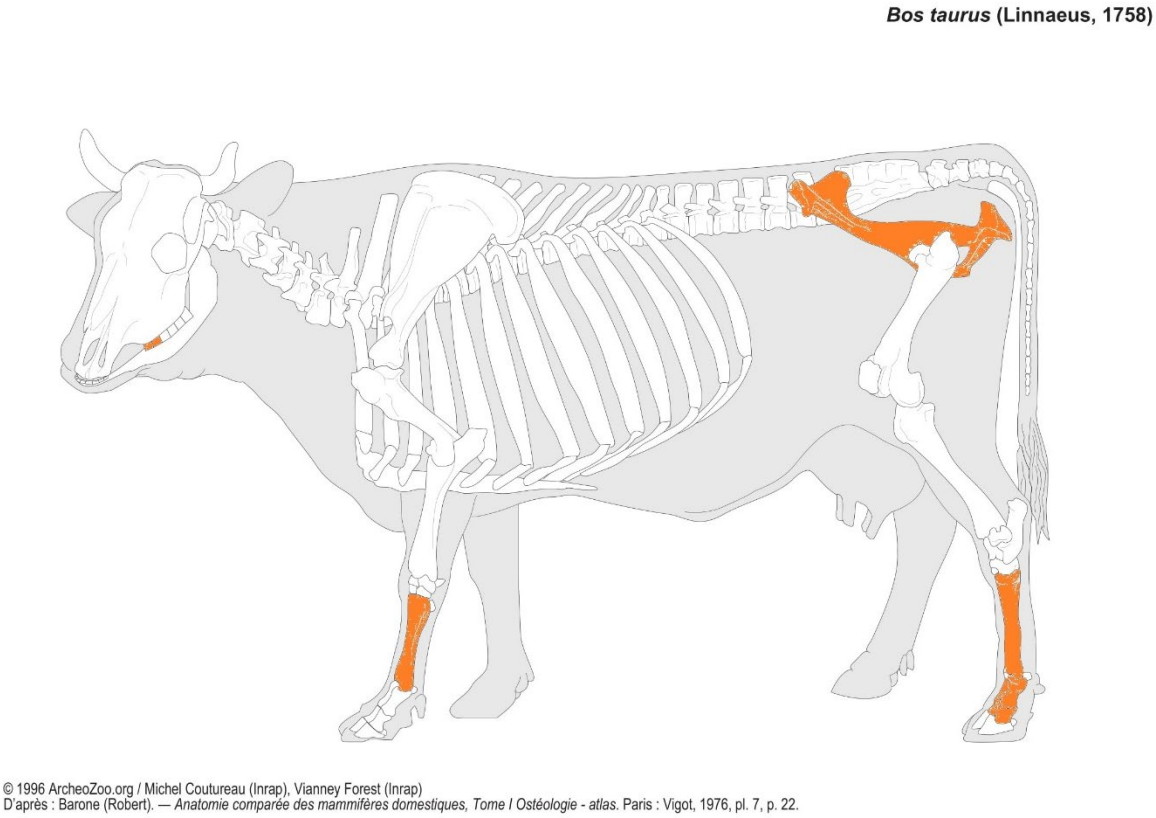

Figure 10: The cattle elements found at Litlibær marked in orange.

Almost all the cattle bones recovered at Litlibær are from very young calves and represent the lower half of the legs. Three neonatal cattle bones, metacarpal, metatarsal and pelvis, were in bag 2012-22-1531 U#13846, the bones were not articulated but they are all at a very similar developmental age, so it is likely that they come from a single young calf. Find number 2012-22-1558 had three neonatal calf bones, a metatarsal and a first and third phalanx, probably all from a single individual. Find number 2012-22-1561 unit # 13744 had four neonatal calf bones, there were two metatarsals from the left and right side of the body but there was also a slight size difference between them so it is not certain they are from the same animal, the two metacarpals from this find number were also left and right sides but not as much of a size difference so they could be from the same animal.

Table 11: Cattle bones found at Litlibær

Find number	Unit	Bone	End	Count	Frag	Texture	Fusion	Butchery	Gnaw	Age	Side	Path	Comments	Ref#	Bp
2012-22-1546	13749	Premolar 4	Lower	1	5	2					left	Uneven wear	Wear stage f/g. Probably same individual as P4.		
2012-22-1546	13749	Premolar 2	Lower	1	5	2							No wear. Probably same individual as bos p4		
2012-22-1532	13846	Metatarsal	Proximal	1	10	2		sp?					Smoothed from rolling around in the surf		
2012-22-1531	13846	Metacarpal	Whole	1	11	1	Unfused			Neonatal			Probably same individual as mtt and inn from same bag, midline still clearly visible but fused		
2012-22-1531	13846	Metatarsal	Proximal	1	11	2	Unfused		dog	Neonatal			Probably same individual as mtc and inn from same bag,		
2012-22-1531	13846	Innominate	Fragment	1	10	3	Unfused			Neonatal			Probably same individual as mtt and mtc from same bag,		
2012-22-1540	13749	Metatarsal	Proximal	1	11	4	Fused							13	40,90
2012-22-1558	Spoil heap	Metatarsal	Whole	1	11	1	Unfused			Neonatal					
2012-22-1558	Spoil heap	Phalanx 1	Whole	1	5	1	Fused distally / unfused proximally			Neonatal					
2012-22-1558	Spoil heap	Phalanx 3	Whole	1	5	1	Unfused			Neonatal					
2012-22-1570	15082	Metatarsal	Shaft	1	11	4	Unfused			Neonatal			Midline fusion line still visible		
2012-22-1561	13744	Metatarsal	Whole	1	11	1	Unfused			Neonatal	left		With half of distal epiphysis		
2012-22-1561	13744	Metatarsal	Whole	1	11	2	Unfused			Neonatal	right		Fresh break		
2012-22-1561	13744	Metacarpal	Whole	1	11	1	Unfused			Neonatal	right				
2012-22-1561	13744	Metacarpal	Whole	1	11	3	Unfused			Neonatal	left				

Horse (*Equus caballus*)

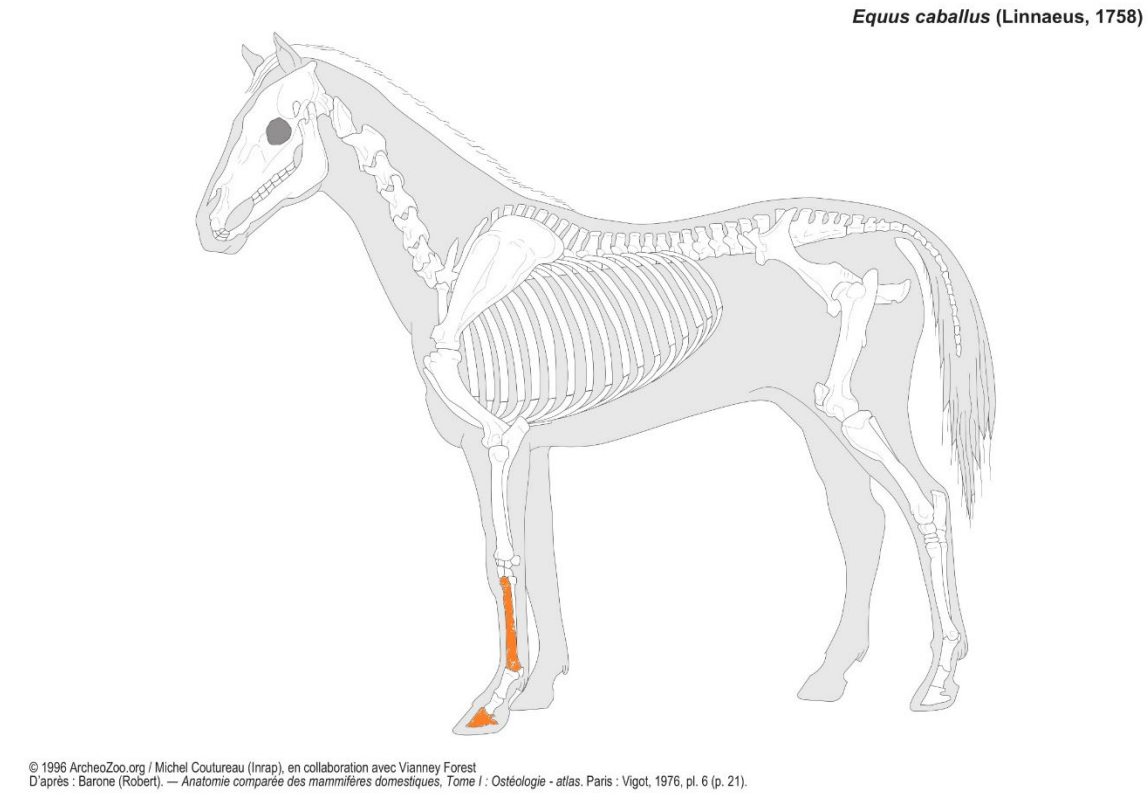

Figure 11: Location in the body of the two horse bones recovered at Litlibær.

Two horse bones were recovered at Litlibær, both from the lower leg (Figure 11). Based on the greatest length of the third metacarpal the withers height of the horse can be calculated to around 1,28 m based on the multiplication factors from small ponies (Table 12). This fits well with the average calculated height of horses from Viking Age burials which usually ranges between 1,25-1,44 m with an average height of 1,30-1,39 m (Leifsson, 2018, pp. 233–234). The metacarpal from Litlibær gives a withers height which is slightly smaller than the Icelandic horse today but this is not unexpected as systematic breeding has increased the average height of the Icelandic horse in the past few decades ("Íslenski hesturinn stækkar," 2014).

Table 12: Calculations for withers height for horse 3rd metacarpal 2012-22-1561 #34 using factors from Eisenmann (2009).

Horse breed	Multiplication factor	Calculated withers height
Draft horses	6,48	1,33
Arab horses	5,81	1,19
Przewalski's horses	5,77	1,18
Small Pony's	6,24	1,28
	Average	1,25

Neither horse bone had any visible butchery marks, and both were reasonably well preserved. It is unclear if the horse bone reflects horse meat consumption at the site. Another possibility is that the bones are raw material for bone working but net weights made from the long bones of horse and cattle were used for fishing in Iceland at least from the 19th century and probably much longer (Gestsson, 1955; Pálsdóttir, 2018).

Table 13: Horse bones from Litlibær. Measurements in mm following von den Dreisch (1976).

ÞJMS number	Context	Context type	Bone	End	Frag	Texture	Fusion	Side	Ref#	Bd	SD	GL	Bp	Dp	DD
2012-22-1559	13846	Disturbed layer	3rd phalanx	Whole	10	3	Fused								
2012-22-1561	13744	Cess tank fill	3rd metacarpal	Whole	11	2	Fused	Left	34	44,29	32,38	205,12	46,23	29,47	19,16

Pig (*Sus scrofa*)

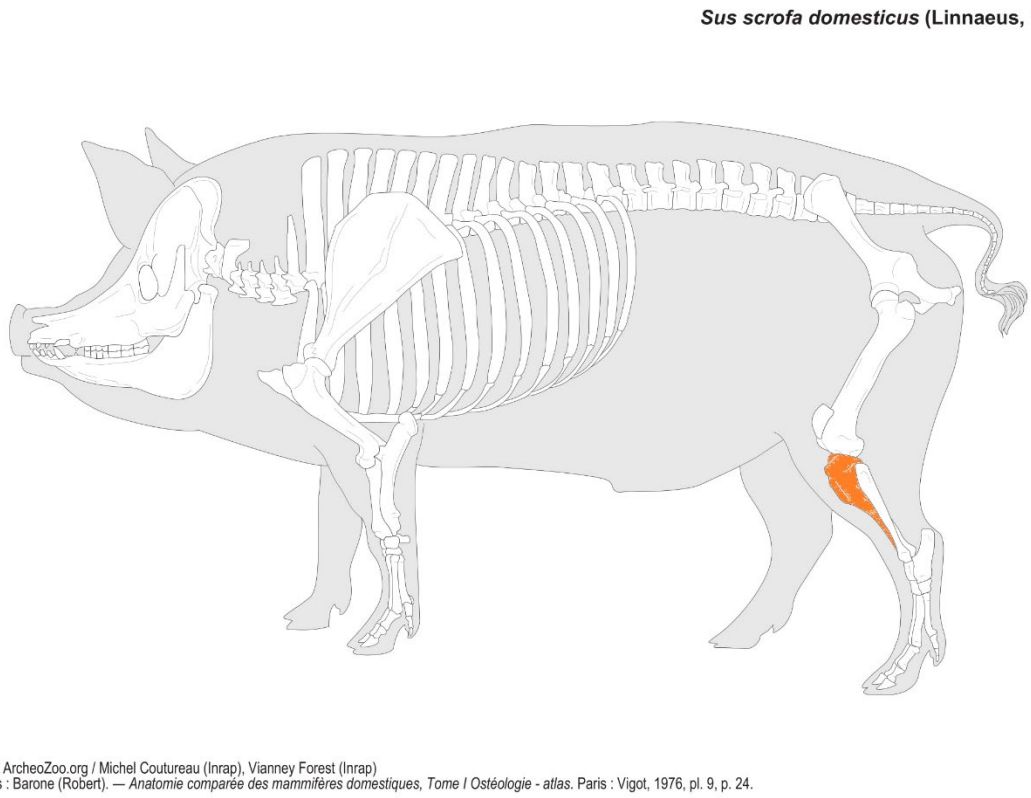

Figure 12: Skeleton of a pig with the tibia marked in orange.

A single pig bone was found at Litlibær, it came from unit 13796 which was an ash dump. The bone was an unfused distal tibia which had been sawn (Figure 13). While pigs where part of the domesticates imported by settlers to Iceland in the late 9th century they seem to have become extinct around 1200 (McGovern et al., 2007). Pig farming did not start again in Iceland until 1900 and was on a very small scale until around the 1930s (Olgeirsson, 2005, p. 55). However, there are archaeological (Harrison & Snæsdóttir, 2012; Pálsdóttir, 2008; Perdikaris, Amundsen, & McGovern, 2002) evidence for import of pork in the form of salted hams and also reports of occasional import of live piglets for rearing by foreign traders (Olgeirsson, 2005, p. 41). It is likely that this sawn juvenile pig tibia represents a purchased piece of ham rather than pigs being kept on the site.

Figure 13: Sawn juvenile pig tibia from Litlibær ÞJMS no. 2012-22-1571. Scale 2 cm. Photo: Albína Hulda Pálsdóttir.

Table 14: Sawn pig (Sus scrofa) tiba from Litlibær. Measurements in mm following von den Dreisch (1976).

Þjms number	Context	Date	Context type	Species	Bone	End	Frag	Texture	Fusion	Butchery	Age	Side	Ref#	Bd	SD
2012-22-1571	13796	2012	ash dump	Sus scrofa	Tibia	Distal	10	2	Unfused	Sawn	Juvenile	Right	38	32,31	21,28

Cat (*Felis catus domesticus*)

2012-22-1531 U#13486 partial juvenile cat skull, frontal

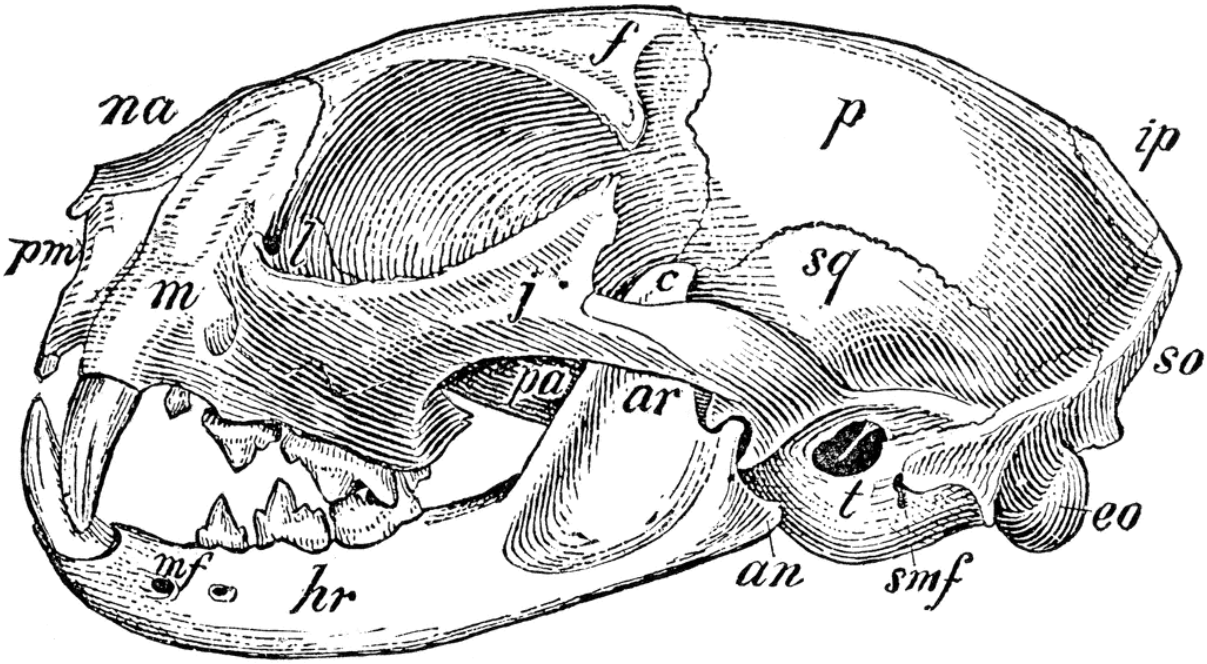

Figure 14: Illustration of cat skull. The bone found at Litlibær was the frontal, marked here with f. (Whitney, 1911)

A single fragment of the frontal bone from the skull of a juvenile cat was found in a disturbed layer at Litlibær (Table 15). The individual can't be aged precisely but while the midline of the skull was unfused it was more developed than in the skull of a weaned kitten, M136, in the reference collection indicating that the cat might have been between 3-12 months old.

Table 15: Cat (Felis catus) skull fragment found at Litlibær

Þjms no.	Context	Species	Bone	End	Size category	Texture	Fusion	Side	Comments
2012-22-1531	13846	Felis catus	Frontal	Fragment	5	2	Unfused	Left	1/4 of a skull, unfused midline.

Human tooth with cavity

A single human molar (Þjms no. 2012-22-1537) was found in the animal bone collection in context #[13749], a gravel layer west of the house. Most likely the tooth was removed due to the large cavity (Figure 15) that was likely causing a bad toothache.

Figure 15: Human molar with cavity (Þjms no. 2012-22-1537) from context #[13749]. Scale 2 cm. Photo: Albína Hulda Pálsdóttir

Wild mammals

Seals

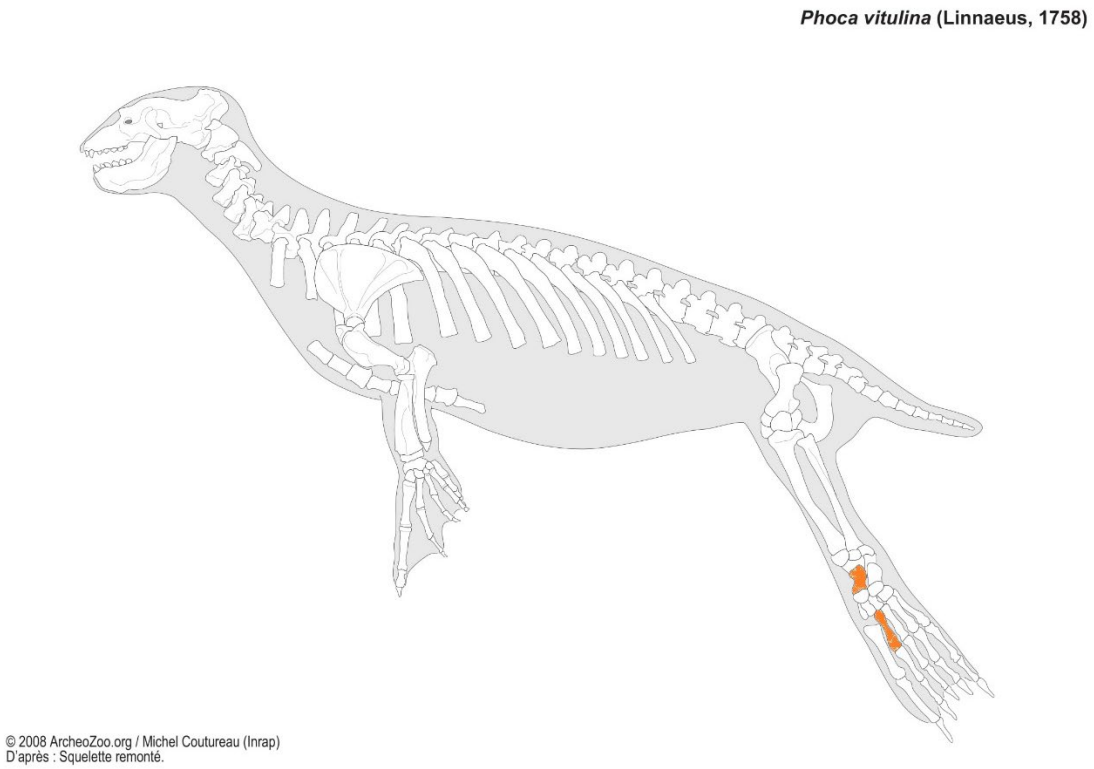

Figure 16: Harbor seal skeleton with the two elements, astragalus and metapodial found at Litlibær marked in orange.

Two seal bones were found at Litlibær (Table 16). The bones come from the flippers and both were from a juvenile individual. Both bones were found in the spoil from the concrete cellar and they could come from a single individual. Seal bones are notoriously hard to identify to species, but the bones fit well with a juvenile seal in the Icelandic ZooArch reference collection, M063, a young harbour seal (*Phoca vitulina*) pup but there are no other juvenile seals in the reference collection. The seal astragalus had multiple knife marks (Figure 17) so it is very likely that seal meat was consumed at Litlibær.

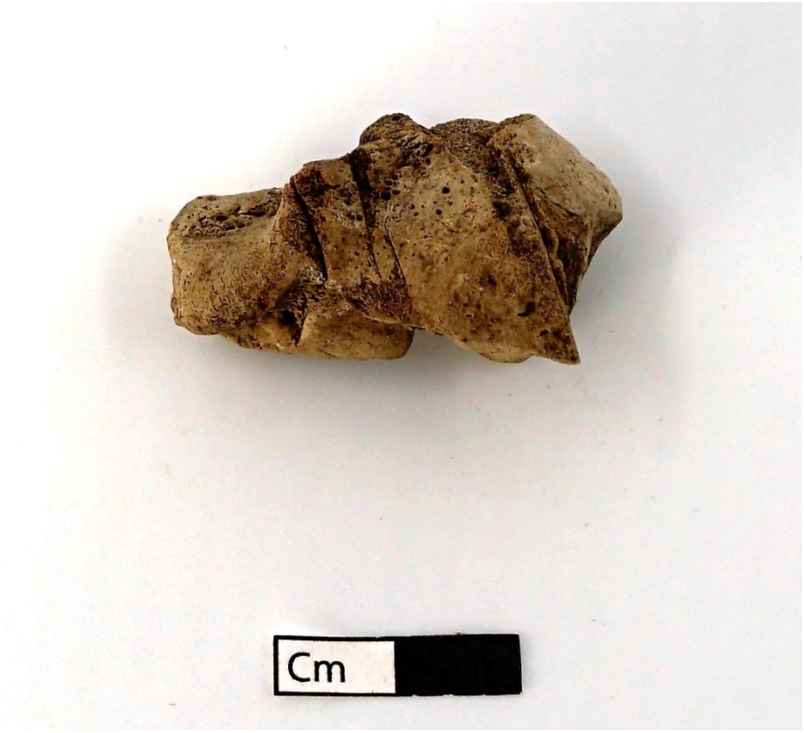

Figure 17: Small juvenile seal astragalus with knife marks from the Litlibær spoil heap. Scale 2 cm. Photo: Albína Hulda Pálsdóttir.

Table 16: Seal bones from Litlibær. Measurements follow Ericson & Storå (1999) and are in mm.

Þjms number	Context	Context type	Bone	End	Frag	Texture	Fusion	Butchery	Age	Comments	Ref#	1	2	3	4
2012-22-1558	Spoil heap	Spoil from the concrete cellar	Metapodial	Proximal	5	3	Unknown		Juvenile						
2012-22-1558	Spoil heap	Spoil from the concrete cellar	Astragalus	Whole	5	2		Knife	Juvenile	Multiple knife marks	19	broken	35,3	22,7	27,5

Cetacea

Two cetacean bones were recovered at Litlibær (Table 17) both in context [13846] which is described as disturbed natural, old land surface. Cetacean bones are hard to identify without a good reference collection but very few institutions have large collections of cetacean bones due to their size. The two bones from Litlibær both come from a small cetacean and fit well with harbour porpoise (*Phocoena phocoena*) specimen M125 from the Icelandic ZooArch reference collection.

Table 17: Small cetacean bones found at Litlibær.

Þjms number	Context	Bone	End	Count	Frag	Texture	Fusion
2012-22-1573	13846	Thoracic vertebra	Whole	1	10	2	Unfused
2012-22-1559	13846	Scapula	Proximal	1	10	2	

Figure 18: The small cetacean scapula from Litlibær. Scale 2 cm. Photo: Albína Hulda Pálsdóttir.

Rat (*Rattus sp.*)

A number of bones in the collection showed signs of rodent gnawing and two rat bones were found, a tibia and pelvis both similar in size to that of a brown rat (Table 18). Identifying rat bones to species is problematic and given the time period of the collection the bones could either come from the brown rat (*Rattus norvegicus*) or the black rat (*Rattus rattus*) but the former is much more common in Iceland (Skírnisson, 2004a, 2004b). The oldest written records of brown rats in Iceland are from 1746 (Skírnisson, 2004b) but the presence of black rat (*Rattus rattus*) is not confirmed in Iceland until the 1920s (Skírnisson, 2004b).

Table 18: Rat bones found at Litlibær.

Find number	Unit	Bone	End	Frag	Texture	Fusion	Side
2012-22-1540	13749	Tibia	Whole	5	1	Fused distally/ unfused proximally	Left
2012-22-1536	13846	Pelvis	Fragment	5	1		Left

Given the location of Litlibær near the coastline and a relatively short distance from Eiðisgrandi, the main Reykjavík garbage dump in the early 20th century (Kristín Lóa Ólafsdóttir & Svava S. Steinarsdóttir, 2006) the presence of rat in the collection is not surprising but it also shows the high level of recovery at the site despite the lack of sieving. Several bones from the site had also been extensively gnawed by rodents.

Rat bones are not very common in Icelandic archaeofaunas; they are mostly found in contexts dating to the 18th century or later and generally in sites by the seaside and/or where urbanization is starting to take place. A single rat bone was found in the Alþingisreitur excavation in downtown Reykjavík, it came from a 18-19th century context (Pálsdóttir, 2010). There were no rat bones in the earliest part of the Alþingisreitur site which dates to late 9th century to 1226 and that part of the archaeofauna has been fully analysed (Pálsdóttir, 2013). In a summary of the zooarchaeology of early modern Iceland, Hambrecht lists three sites Bessastaðir (6), Nesstofa (1) and Aðalstræti 10 (15) as having brown rat (*Rattus norvegicus*) bones (Hambrecht, 2009, p. 20). Two sites have *Rattus* sp. bones Bessastaðir (20) and Aðalstræti 14-16 (2) (Hambrecht, 2009, p. 20). At the site of Eyri in Ísafjörður a single rat mandible was found in layers that likely date to the 19th century (Harrison, Hicks, Colligan, & Schreiner, Amanda, n.d., p. 5).

Figure 19: Rat pelvis found at Litlibær (ÞJMS no2012-22-1536). Scale 2 cm. Photo: Albína Hulda Pálsdóttir.

Figure 20: Rat tibias, the bone to the left is a tibia from a brown rat (Rattus norvegicus) from the Icelandic ZooArch reference collection (no. M043) and the unfused rat tibia found at Litlibær is to the left (Þjms no. 2012-22-1540). Scale 2 cm. Photo: Albína Hulda Pálsdóttir

Bird

A fairly wide variety of bird species were found at Litlibær (Table 19). Most were seabirds or coastal birds (Figure 21) which is not surprising given the location of the site on the Seltjarnarnes Peninsula only a short distance from the shoreline. There are 27 eider bones (*Somateria mollissima*) in the archaeofauna which might seem surprising given that eider has generally been utilized for down rather than as food (Guðmundsdóttir Beck, 2013). However, eider ducks are very common in the Seltjarnarnes area and dead birds often wash ashore and can be found on the beach. These bones are more likely explained by chance inclusion than utilization of eider for food.

The gull bones found at Litlibær are not separated into species since they are hard to identify and require more variety of species and individuals in the reference collection than we have at present. The majority of the gull bones came from very large gulls, probably the great black-backed gull (*Larus marinus*) but there were also a number of gull bones from smaller gulls.

Table 19: Bird bones from Litlibær by species.

Category	Species English	Species Latin	Count	% of group
Domestic				
	Domestic fowl	*Gallus gallus*	11	5,2%
Land birds.				
	Goose species	*Anser* species	1	0,5%
Sea birds				
	Auks	Alcidae	9	4,3%
	Mallard	*Anas platyrhynchos*	2	0,9%
	Duck species	*Anatidae* species	3	1,4%
	Puffin	*Fratercula arctica*	1	0,5%
	Gull species	*Laridae* species	47	22,3%
	Cormorant/ shag species	*Phalacrocorax* species	37	17,5%
	Common eider	*Somateria mollissima*	27	12,8%
	Arctic tern	*Sterna paradisea*	2	0,9%
	Guillemot/ murre species	*Uria* species	1	0,5%
	Bird species		70	33,2%
	Total number of bird bones		**211**	

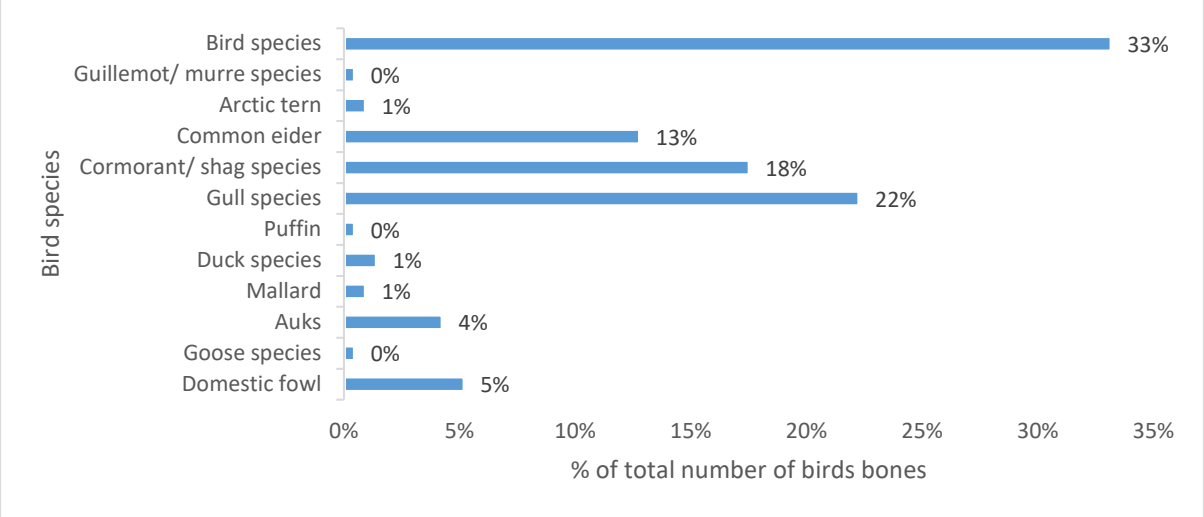

Figure 21: Graph of the bird species found at Litlibær.

A number of the bird bones from Litlibær have pellet holes (e.g. Figure 22), probably from shotgun pellets which would fit well with the shotgun cartridges recovered at the site and the information from a former inhabitant at Litlibær which stated that shooting cormorants and black-black backed gulls was a common pastime (Lucas & Ólafsson, n.d., p. 17; Lucas et al., 2019). To my knowledge this is the first time that pellet holes are reported in an Icelandic archaeofauna.

Figure 22: Cormorant/shag (Phalacrocorax sp.) sternum with pellet hole (ÞJMS no. 2012-22-1558) from the spoil in found in the concrete cellar. Scale 5 cm. Photo: Albína Hulda Pálsdóttir.

A complete duck skull (Þjms no. 2012-22-1569), probably from a mallard (*Anas platyrhynchos*) was also found at Litlibær but it could not be securely identified to species as there were only five duck specimens in the reference collection during the analysis of the Litlibær material so a firm identification is not advisable.

The largest number of bird bones came from context [13846] including some juvenile *Alcidae* bones (Þjms no. 2012-22-1559), possibly razorbill (*Alka torda*) but since there are no juvenile Alcidae bones in the reference collection, the identification could not be pursued further. Interestingly, the juvenile proximal humerus bones have been cut in half to remove wings (Figure 23) which is common butchery technique in bird hunting in Iceland today.

Figure 23: Three proximal humerus bones from juvenile auks (Alcidae) which seem to have been cut in the same way as is common today in Iceland when wings are removed from small birds during initial processing. Scale 2 cm. Photo: Albína Hulda Pálsdóttir.

Domestic fowl at Litlibær

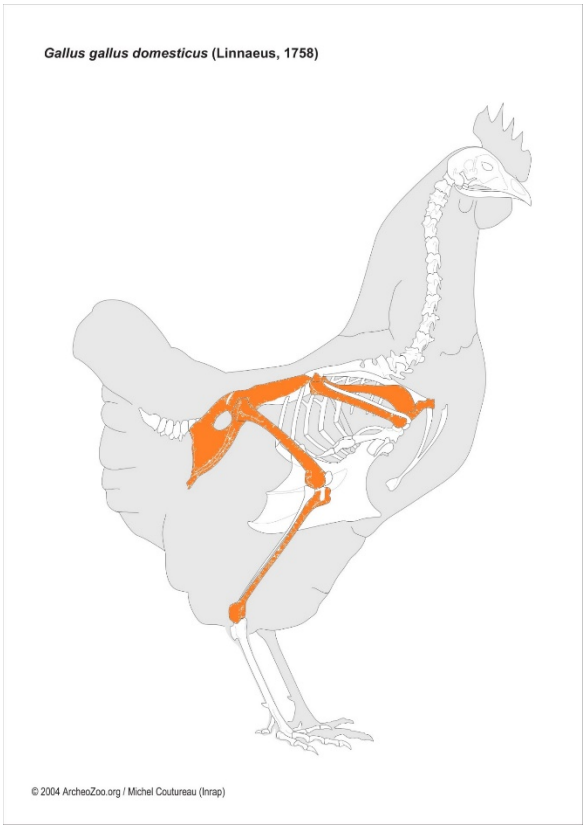

Figure 24: Domestic fowl (Gallus gallus) bones found at Litlibær marked in orange.

Eleven bones from domestic fowl were found at Litlibær (Table 20). This included a juvenile chicken humerus (Þjms no. 2012-22-1566), similar in size to four month old male Icelandic chicken A087 in the Icelandic ZooArch reference collection (Pálsdóttir & Skúladóttir, 2018). The most common element was the humerus, with four bones found and the minimum number of individuals represented for domestic fowl is three. Chicken keeping became increasingly popular in the Reykjavík area from the late 19th century and was commonly seen as a way for women to earn money while working at home (Bernharðsson, 2014, p. 183; Valdimarsdóttir, 1986, pp. 193–195). This is also reflected in the archaeology as bones of domestic fowl become increasingly common in archaeological sites in Iceland after 1900 (Pálsdóttir, Hallsson, & Best, In preparation). It is likely that chickens were kept at Litlibær for eggs as chickens were not commonly eaten in Iceland until after 1960 (Olgeirsson, 2003, p. 161).

Table 20: Domestic fowl bones found at Litlibær. Measurements in mm following von den Dreisch (1976).

Find number	Unit	Other Context 2	Bone	End	Frag	Texture	Fusion	Gnaw	Age	Side	Comments	Ref#	Bd	Bp	Dp	DD	SC	Dip
2012-22-1546	13749	construction layer	Tibiotarsus	Distal	5	3	Fused			r		35				13,29	6,45	
2012-22-1566	13846	disturbed layer	Humerus	Whole	10	2	Unfused	rodent	juvenile		Very similar in size to A087, 4 month male Icelandic chicken							
2012-22-1570	15082	west foundation layer	Ulna	Shaft	10	1				r								
2012-22-1531	13846	disturbed layer	Humerus	Proximal	10	1				r								
2012-22-1531	13846	disturbed layer	Femur	Proximal	10	1				l		36		14,70	10,37		6,82	
2012-22-1531	13846	disturbed layer	Tibiotarsus	Proximal	5	1				l		37						19,74
2012-22-1535	14935	east foundation layer	Coracoid	Whole	5	2	Unfused		juvenile	r	Larger than A087							
2012-22-1558	Spoil heap	Spoil from the concrete cellar	Acetabulum	Fragment	10	1	Unfused		juvenile									
2012-22-1546	13749	construction layer	Humerus	Proximal	5	2	Fused			r								
2012-22-1552	spoil heap	Spoil heap	Tibiotarsus	Distal	10	1				l		39	11,96			12,03	6,04	
2012-22-1536	13846	disturbed layer	Humerus	Distal	5	1				l		40	14,36					

Eggshell

Eggshell was abundant at the site but only a small sample was collected and it has not been identified (Lucas & Ólafsson, n.d., pp. 18, 52). Based on the bird bones recovered at the site the eggshells could have come from chickens which were likely kept at Litlibær or sea birds whose eggs could be collected seasonally in the area.

Fish

A total of 482 fish bones were recovered at Litlibær (Table 21), making up a large part of the material recovered. A number of fishing implements were also found at the site (Lucas et al., 2019). As in most archaeofaunas from Iceland the Litlibær collection is dominated by gadid bones, especially cod and haddock, but a few flatfish and wolfish bones were also recovered.

Table 21: Fish bones from Litlibær.

Fish				
Scientific Names	***English Common Names***	NISP Count	% all ID Fish	% of Family
Gadus morhua	Atlantic cod	60	15,15	39,22
Melanogramus aeglfinus	Haddock	93	23,48	60,78
Gadidae, sp. Indet.	Gadid family	225	56,82	
Pleuronectidae sp.	Flatfishes	13	3,28	
Anarchichas lupus	Wolfish	5	1,26	
Fish, sp. & family Indet.	Fish species	86		
Total Fish		**482**		

Family Breakdown		
	NISP	% Identified to Taxon
Gadidae Family	378	95,45
All Fish ID to taxon	396	100,00

Gadid ID to species	153

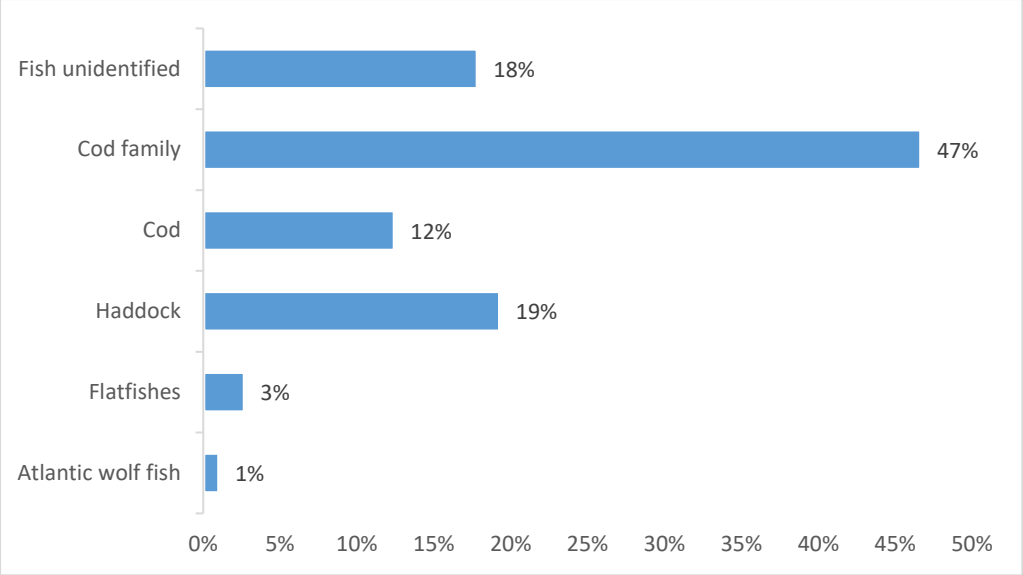

Figure 25: NISP of fish bones from Litlibær identified to species or family.

When all the cod family (Gadidae) elements are put together the pattern revealed is that of subsistence fishing for local consumption rather than large scale fish processing. The relatively even number of elements from the head and body of the fish (Table 22) indicates that primary processing and consumption of fish was taking place at Litlibær.

Table 22: Fish elements by species from Litlibær.

Element / Species	Cod	Gadid	Haddock	Flatfishes	Wolf fish	Fish sp.	Total
Basioccipital			1				1
Ceratohyal	1	1					2
Cleithrum		2	9				11
Dentary	1						1
Hyomandibular	1		1				2
Opercle	2						2
Parasphenoid	1	1					2
Retroarticular			1				1
Supracleithrum	1		1				2
Premaxilla	1						1
Postemporal			4				4
Preopercle	1						1
Pterrotic			1				1
Scapula		1					1
Rib						4	4
Precaudal vertebra	39	90	26	12	3		170
Caudal vertebra	12		37	1	2		52
Vertebra		130				43	173
Penultimate vertebra			11				11
Ultimate vertebra			1				1
Unidentified						39	39
Total	**60**	**225**	**93**	**13**	**5**	**86**	**482**

Shell

Only three shells were recorded in the Litlibær archaeofauna, all from context 14846, which was a peat ash dump. Shells were the most abundant organic material observed during the excavation, mostly small fragments. On site identification by excavators indicated that the shell fragments were mostly mussels and other sea shells (Lucas & Ólafsson, n.d., p. 18). 49 shells and conchs were collected as part of the artefact collection (Lucas & Ólafsson, n.d., pp. 18, 51–52). Context #[14904] is categorised as a shell dump, around 25% of the layer was comprised of shell fragments between 0,5 -1cm (Lucas & Ólafsson, n.d., p. 23). Multiple other contexts included small amounts of shell fragments indicating that there was some use of shell at the site, perhaps as bait (Lucas & Ólafsson, n.d., pp. 18, 20–25; Lucas et al., 2019).

Butchery

10% of the animal remains from Litlibær show some butchery marks. Chopping is most common followed by sawing (Table 23). Knife marks are also fairly common and are probably mostly from removing meat from bones during meals (Figure 26). Many of the sheep/goat bones from Litlibær have been sawn, often on both ends indicating the consumption of meat from modern industrialized butchery with machine saws (e.g. Figure 27). The medium terrestrial mammal category which mostly includes vertebra and ribs, probably from sheep, is intensively butchered which probably means these animals were slaughtered and butchered off site and brought in as processed pieces of meat. A number of the glass finds from Litlibær are containers for pre-prepared food and drink (Lucas et al., 2019) which again indicates the purchasing of processed foodstuffs along with some food provisioning at the site.

A number of bird bones from the site had clearly identifiable pellet damage (e.g. Figure 22) which fits well with the shotgun cartridges found on the site (Lucas et al., 2019). The bi-perforation of metapodials for marrow extraction is a technique observed in Icelandic archaeofaunas from around 1100 (Bigelow, 1985; McGovern, 2009, p. 182) and seemingly maintained well into the 20th century as there were four sheep/goat metapodials with bi-perforated for marrow found at Litlibær.

Table 23: Overview of the frequency of butchery marks on the animal bones from Litlibær. Some bones were recorded as having likely butchery marks in the database but for the purposes of simplification they have been sorted as definite here.

Butchery type	Count	% of TNF
No butchery observed	1024	90,2%
Biperforated	4	0,4%
Chopped	38	3,3%
Chopped/perforated?	1	0,1%
Chopped/sawn	7	0,6%
Chopped/sawn/knife	1	0,1%
Cut?	3	0,3%
Knifed (scratches)	15	1,3%
Pellet hole	5	0,4%
Pellet hole/knife	1	0,1%
Perforated	1	0,1%
Sawn	29	2,6%
Sawn/worked	1	0,1%
Split down saggital plane	4	0,4%
Svið?	1	0,1%
Total number of fragments (TNF)	**1135**	

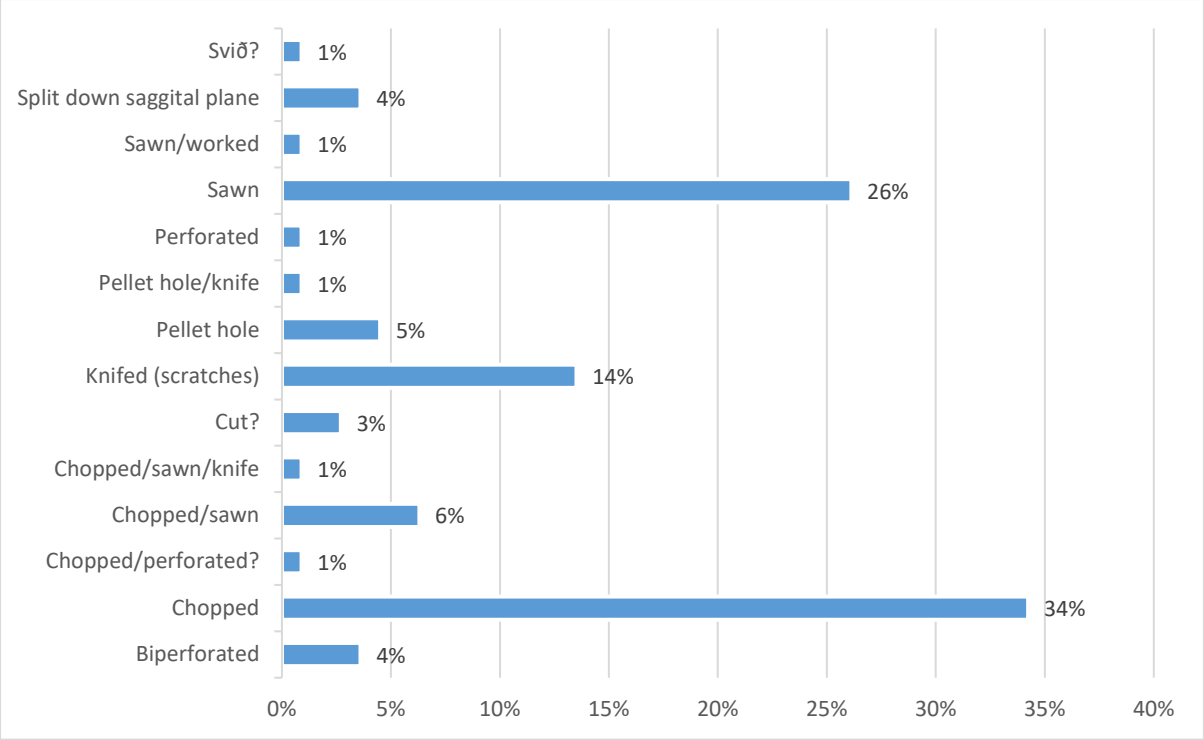

Figure 26: Graph of the frequency of each type of butchery mark.

Figure 27: A selection of sawn bones from the spoil heap at Litlibær (ÞJMS no 2012-22-1558). A large mammal rib sawn on three sides, medium mammal long bone fragment sawn on two ends and a medium mammal vertebra sawn. Scale 2 cm. Photo: Albína Hulda Pálsdóttir.

Table 24: Butchery by species

Butchery type / Species	Alcidae	Phalacrocorax species	Mallard	Gull species	Bird species	Sheep	Sheep/ goat	Cattle	Pig	Small phocid	Medium terrestrial mammal	Large terrsetrial mammal	Unidentified mammal	Total
Biperforated						3	1							4
Chopped						1	12				24		1	38
Chopped/ perforated?							1							1
Chopped/ sawn											5	2		7
Chopped/ sawn/knife													1	1
Cut?	3													3
Knifed (scratches)		3		1	1	5	3			1	1			15
Pellet hole		1	2	2										5
Pellet hole/ knifed				1										1
Perforated							1							1
Sawn							8		1		13	3	4	29
Sawn/ worked												1		1
Split down saggital plane							3	1						4
Svið?							1							1
Total	3	4	2	4	1	9	30	1	1	1	43	6	6	111

Discussion

There are only a few sites with animal bones, dating to the 20th century, which have been thoroughly analysed and published from Iceland. A small animal bone collection was recovered during test trenching in "Þorpið" on the southeast side of Viðey island off the coast of Reykjavík in 2011 (Elín Ósk Hreiðarsdóttir & Lucas, 2014). The village was founded in 1907 by "Milljónafélagið" which swiftly began construction of a pier, worker housing and buildings for fish processing and the site remained active until 1943 (Elín Ósk Hreiðarsdóttir & Lucas, 2014). Refuse layers were the target of the excavation of Þorpið in contrast with Litlibær where both structures and their surrounding areas were excavated (Elín Ósk Hreiðarsdóttir & Lucas, 2014; Lucas et al., 2019).

A total of 1176 animal bones, teeth and shells from roughly the same time period as the material from Litlibær were identified from the site in Viðey (SBK11) (Leifsson, n.d.). The collection was also handpicked not sieved but due to lack of a good bird bone reference collection the bird bones were not identified to species (Leifsson, n.d.). Over half of the animal remains from SBK11 was burnt most likely as a way to get rid of trash rather than due to cooking of meat (Leifsson, n.d.). This fits well with recollections of people who grew up in Þorpið as they recall the majority of trash being burnt and used as fertilizer for cabbage patches (Elín Ósk Hreiðarsdóttir & Lucas, 2014). Butchery marks were only recorded on 11 specimens from SBK11, on medium and large mammal bones and a single shell. No butchery marks were observed on the bird bones from the site. None of the butchered bones from SBK11 were sawn and no knife marks were recorded either (Leifsson, n.d.). This is very different from the material found at Litlibær which had a rather high incidence of butchery marks and little evidence of burning.

No goat bones were recorded at SBK11 but nine sheep bones in addition to 134 bones from sheep/goat. A single cattle bone, three horse bones were identified in the material and a single possible domestic fowl bone. The fish bone from SBK11 included cod, haddock, plaice and gadid family bones with a total of 196 fish bones recorded (Leifsson, n.d.). Due to the high rates of burning and fragmentation levels of the SBK11 collection (Leifsson, n.d.) the identification rates of the material are much lower than at Litlibær. The taphonomy of the two collections is clearly quite different which obscures direct comparisons of the two archaeofaunas when it comes to species composition and butchery. They do seem to reflect

quite different treatment of animal refuse and the dominance of mammal bones in the SBK11 collection contrasts (Leifsson, n.d.) with the higher ratio of fish bones found at Litlibær. At SBK11 there is rather clear evidence of sheep farming with elements from all of the skeleton recovered as well as bones from young individuals (Leifsson, n.d.). This is also the case at Litlibær where bones from all parts of the sheep skeleton were recovered as well as neonatal sheep/goat bones.

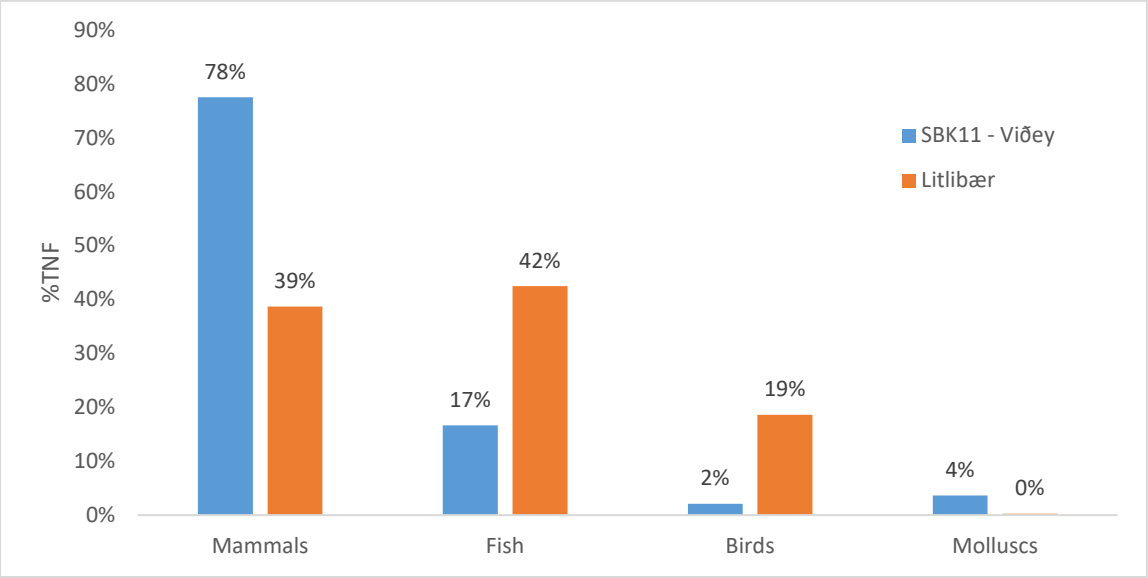

Figure 28: Graph of %TNF per taxon from the sites of SBK11 – Viðey and Litlibær.

The numbers of species identified at Litlibær is much higher than at SBK11. This is partially due to taphonomic factors and the fact that the bird bones from SBK11 were not identified to species (Leifsson, n.d.) but also likely reflects a broader subsistence base at Litlibær than at SBK11. No marine mammal bones were identified in the SBK11 collection (Leifsson, n.d.) but at Litlibær bones from a small cetacean, likely harbour porpoise and juvenile seals were found with butchery marks indicating consumption. There were no rat bones or rodent gnaw marks found at SBK11, possibly the location of SBK11 meant that rats had a much harder time establishing there than at Litlibær which was close to the refuse dump of the Reykjavík area.

Conclusion

The archaeofauna from Litlibær is surprisingly diverse and informative for a collection of this size. It is unique within Icelandic archaeology as it is the only sizable archaeofauna from a high-quality excavation dating to the early 20th century. Hopefully there will be more excavations which yield well preserved archaeofaunas from this time period in the future to aid with our understanding of a time of great changes within the settlement patterns, economy and subsistence in Iceland. It is important that animal bone material from this time period be excavated with the same precision and focus on uniform retrieval to minimize recovery bias (Baker & Worley, 2019, pp. 15–17) as is practised with archaeofaunas from the Viking Age. For comparisons over time scales it is vital for the standard of recovery to be similar in all time periods.

The Litlibær archaeofauna shows a mixed subsistence strategy of fishing, bird hunting farming and purchase of food from outside sources. The domestic fowl found are evidence of the surge in chicken keeping which took off at the beginning of the 20th century

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Appendix 1: Animal bone find numbers from Litlibær

Þjms number	Count
2012-22-1530	73
2012-22-1531	19
2012-22-1532	4
2012-22-1533	75
2012-22-1534	385
2012-22-1535	37
2012-22-1536	16
2012-22-1537	1
2012-22-1538	1
2012-22-1539	1
2012-22-1540	40
2012-22-1541	1
2012-22-1542	1
2012-22-1543	2
2012-22-1544	2
2012-22-1545	1
2012-22-1546	45
2012-22-1547	2
2012-22-1549	2
2012-22-1550	1
2012-22-1551	6
2012-22-1552	7
2012-22-1553	1
2012-22-1554	1
2012-22-1555	3
2012-22-1556	6
2012-22-1557	44
2012-22-1558	50
2012-22-1559	82
2012-22-1561	22
2012-22-1562	2
2012-22-1563	6
2012-22-1564	3
2012-22-1565	14
2012-22-1566	51
2012-22-1567	14
2012-22-1569	1
2012-22-1570	21
2012-22-1571	24
2012-22-1572	10
2012-22-1573	58
Total number of fragments (TNF)	**1135**