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Forsideillustrasjon: Gravrøys fra førromersk jernalder på tomten til den katolske kirken under utgraving. Til venstre vises en profil kuttet gjennom rasleiren. Foto: C. McLees. Fra artikkelen "Nidarneset før Nidaros. Trondheims landskaps- og bosetningshistorie i perioden 500 f.Kr.-1000 e.Kr." av Cadamarteri *et al*. s.51-73.

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Saurbekken – a discussion of food subsistence strategies

Monica Enehaug

A settlement mound, "boplasshaug", is characterised by the remains of dung, buildings and household debris (Brox 1965:7-8; Munch 1966; Bertelsen 1984; 1985a; Bertelsen and Lamb 1995b; Wickler 2016). For a site to develop into a settlement mound, continued settlement must have occurred over time (Munch 1966; Bertelsen 2019b).

Settlement mounds can be found in Norway, Iceland, Greenland (Bertelsen 1974:2; Vésteinsson 2010; Wickler 2016), the Orkney Islands (Harrison 2013) as well as further south (e.g. Martens 2016:40). In Norway, they are most often found in the northern part of the country (Bertelsen 1974:2; Vésteinsson 2010; Wickler 2016), more specifically in the counties of Nordland, Troms and Finnmark. However, they are also found further south, although not as prolific as in the north (Martens 2016:43). Most are from the Viking Age or Norwegian Early Middle Ages (Bertelsen 2019b), although the oldest identified site dates to approximately 900 BC (Bertelsen 2011b:82−83). Settlement mounds in Northern Norway were settled at least until the 16th century (Munch 1966), and their time of desertion varies from the 14th century and the arrival of the Black Death to present day as some are still in use (Martens 2016:40).

In Northern Norway, Norse inhabitants, as opposed to the Sámi, most often settled on the outer coast, on islands close to the open sea, on the strandflat along the coast (Bertelsen and Lamb 1995b; Bertelsen 2001; 2019a; Wickler 2016). This close connection to the sea was necessary as the main sites of settlement mounds are connected to fishing (Bertelsen 2001; 2019a; Wickler 2016). However, access to fertile soil was also crucial (Bertelsen 1974:42). With a limited portion of arable land available between steep mountains and the sea, as well as local knowledge and knowhow of fishing generated through time, the chosen location would provide the settlement with a stable food source regardless of environmental challenges (Bertelsen 1983; 2019a).

The aim of this study is to obtain an understanding of food subsistence and economy at Saurbekken in Harstad municipality in Troms throughout time as highlighted through zooarchaeological methods. This includes an intra-site analysis of the site throughout time, and inter-site analysis comparing the material from Saurbekken to other sites, allowing for comparisons of similarities and differences in food subsistence and economic strategies. The sites used for inter-site analysis are Bleik, on Island Andøya, Vestvatn in Misvær municipality (Jørgensen 1984) and, in particular, Soløy in Lavangen municipality (Bertelsen and Urbańczyk 1985; new results presented briefly in the current study, see figure 1).

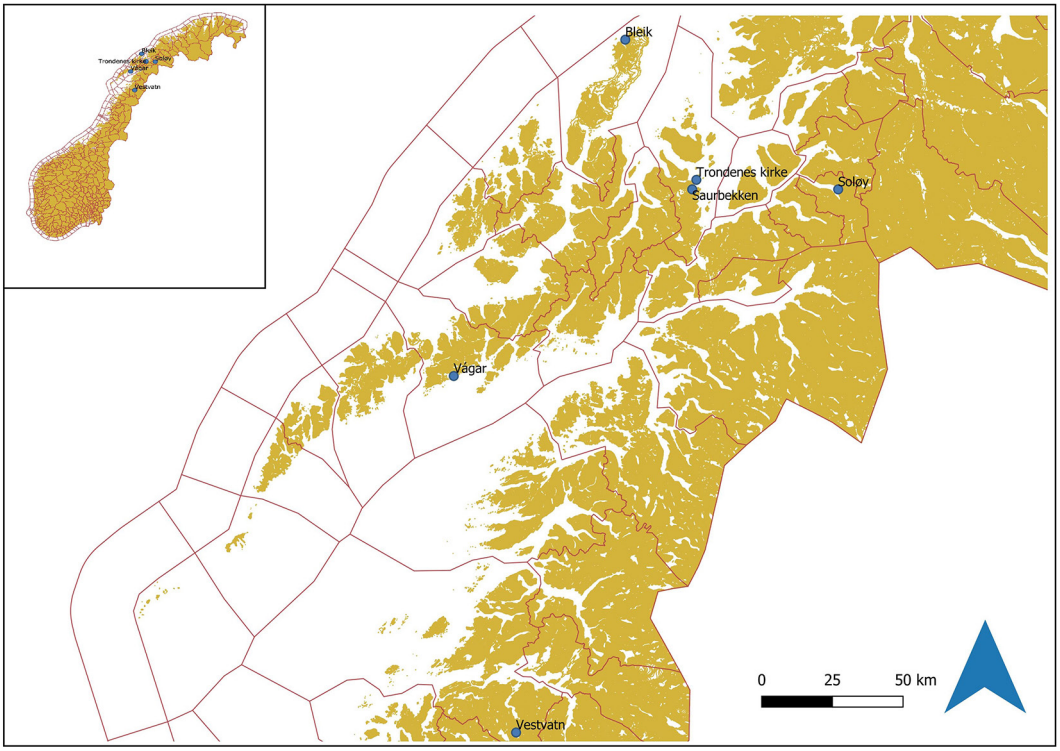

Figure 1: Saurbekken and the comparative sites of Soløy, Vestvatn and Bleik. The location of Trondenes Church and Vágar relative to Saurbekken is also marked. The map source is kartverket.no, with the added locations by the author in QGIS.

In addition, fish from Saurbekken will be analysed in a consumer-producer perspective, examined for possible connections to the stockfish industry.

Saurbekken: archaeology and history

Saurbekken is located in Harstad municipality and is sometimes referred to as Heggen in literature (Bertelsen and Holm-Olsen 1971; Bertelsen 1995b), but here Saurbekken will be used. The settlement mound consists of one single farm and is located about 35 km by boat from the open sea (Munch 1966; Bertelsen 1995a). What separates Saurbekken from other settlement mounds is its location, 884 meters from the shore and 49 meters above sea level (Bertelsen 2002).

The inhabitants rented Saurbekken from Trondenes church, though the church was not the sole proprietor of the farm (Bertelsen 1974:4; 2002). By typological assessment, it is believed that Saurbekken was settled sometime around AD 1000 (Bertelsen 1973:32-33). The cadastre of Trondenes reveals that after AD 1350 the land was utilised by other nearby farms (Lysaker 1958:87), suggesting a habitation period of 350 years, terminating with the arrival of the Black Death in Norway (Bertelsen 1973:34; 1974:4).

The archaeological excavation in 1970 was conducted using a 5x5 meter grid, focusing on the area thought to be the centre of the settlement (areas G3 and G4). However, due to time constraint, further concentration was needed, and the southern halves of the two grids were excavated in 1972. The area measured 10m x 2,5

meter, reaching a maximal depth of 1.1 meter, an area of about 2 % of the original mound (Bertelsen 1971:2; 1995a; 1995b; 2001).

Throughout the different strata, signs of household activities, such as a hearth and house remains were identified (Bertelsen and Holm-Olsen 1972). Organic materials were few or missing altogether, as only a few fragmented pieces of wood and no leather or textiles were recovered. However, the bones recovered are noted as being well preserved (Bertelsen 1995a). To ensure the recovery of osteological material, sieving was used in specific areas (unknown mesh size). The sieved material has unknown date and is listed in a separate column in table 3. At the end of the excavation, four buildings had been identified and in one section the team excavated through the cultural layers, until they again hit natural soil (Bertelsen and Holm-Olsen 1971; 1972; Bertelsen 2002).

Compared to other settlement mounds in the area, Saurbekken is one of the smallest. Both the archaeological excavation and the name, Saurbekken, indicates that this farm was settled later than the other sites in the vicinity, and therefore that the best areas for cultivation were already in use. That Saurbekken was deserted during the time of the Black Death is also typical of smaller farms during the time of the plague, as farms with better soil were often preferred by the survivors (Bertelsen 1974:5).

Several finds from Saurbekken had been handed into the local museum in Tromsø before the excavation took place, some of which can be dated to the Viking Age. Of finds mentioned by Munch (1966), the most obvious pertaining to food subsistence are five fishhooks and six arrowheads. Archaeologist Reidar Bertelsen discussed the animal remains found during the excavation at Saurbekken in his magister thesis (1974:74-83), and the initial investigations suggest food subsistence associated with both fishing and livestock, with evidence of hunting. Grain seems to have been part of the diet as well, but it is not known to what extent or how it was procured (Bertelsen 1974:4).

Material

The material for the present investigation comprises an osteological report, curated at the Osteological collection at the University Museum (hereafter UM), University of Bergen (JS 539). This report contains information regarding the zooarchaeological material found through excavations at Saurbekken in 1970 and 1972 (Bertelsen and Holm-Olsen 1971; 1972).

Previous examination of the animal remains from Saurbekken includes macroscopic identification of fragments to family and/or species found in the osteological report JS 539, and a taxonomic relative abundance analysis by Bertelsen in 1973. Through the work with this article, the data from both the 1970 and 1972 excavations is included, and the osteological report is further analysed, searching for patterns by dividing the bones according to stratigraphic units.

The fish bones recorded in the osteological reports are examined using new methods as described in Barrett 1997, analysing the head-body ratio. A producer site is expected to have a higher prevalence of head bones compared to the body of the fish, while a higher number of bones connected to the body is expected at a consumption site. This analysis should add to the initial investigation conducted by Bertelsen in 1973.

The comparative site of Soløy has also undergone osteological identification, and the data from the 1980 excavation can be found in the osteological report JS 659. The bone fragments are identified to family rather than species (Hufthammer 1982; Bertelsen 1985a).

The fragments from the 1981 excavation were identified to family and/or species at the Osteological collection, UM in 2018 and the results were recorded in an Access database at the UM in Bergen. The osteological data were analysed by the present author in 2018.

The bones and fragments mentioned in the osteological report from the 1980 excavation will be included when the material from the 1981 excavation is discussed to class, but not

Class	*Family/Species*	NISP	NISP %
Aves	Lesser Black-backed gull	4	0,06 %
	Great Black-backed gull	4	0,06 %
	Undetermined	2	0,03 %
	Willow grouse	2	0,03 %
	Common gull	1	0,01 %
	Hooded Crow	1	0,01 %
Aves Total		**14**	**0,20 %**
Mammalia	Undetermined	1886	26,87 %
	Sheep/goat	312	4,45 %
	Cattle	222	3,16 %
	Pig	44	0,63 %
	European water vole	3	0,04 %
	Cat	3	0,04 %
	Reindeer	1	0,01 %
	Fox	1	0,01 %
	Horse	1	0,01 %
Mammalia Total		**2473**	**35,23 %**
Mammalia/sea	Seal	10	0,14 %
	Whale	1	0,01 %
	Porpoise	1	0,01 %
Mammalia/sea Total		**12**	**0,17 %**
Mollusca	Mollusks	214	3,05 %
Mollusca Total		**214**	**3,05 %**
Pisces	Undetermined	1721	24,52 %
	Cod	651	9,27 %
	Ling	160	2,28 %
	Haddock	92	1,31 %
	Cusk	85	1,21 %
	Saithe	83	1,18 %
	Atlantic Herring	20	0,28 %
	Redfish/rockfish	3	0,04 %
	Atlantic Halibut	1	0,01 %
Pisces Total		**2816**	**40,12 %**
Seashell	Shell	433	6,17 %
Seashell Total		**433**	**6,17 %**
Seasnail	Shell of sea snail	1043	14,86 %
Seasnail Total		**1043**	**14,86 %**
Shell	Shell	14	0,20 %
Shell Total		**14**	**0,20 %**
Total		**7019**	**100,00 %**

Table 1: Class, species/family, NISP and NISP% from Saurbekken

described alongside the results from the 1981 excavation, as they have already been analysed elsewhere (Bertelsen 1985a). When classes are discussed, bones from both the 1980 and the 1981 excavations are included, but when going into further details about family/ species, I exclusively use the material from the 1981 excavation. This analysis is, to my knowledge, the first where fragments from Soløy have been investigated per stratigraphic unit and the fish bones analysed using the method of head-body ratios (Barrett 1997).

Method

Zooarchaeological studies have a long tradition of estimating relative abundance of taxa of a certain area (Grayson 1984), but also variation of food subsistence within an area over time (e.g., Morlan 1983). Based on previous studies suggesting a combination of methods when quantifying taxonomic abundance (Lyman 2018), several methods were considered for the analysis. The method developed by White (1953) is using the most abundant element in an assemblage to calculate minimum number of individuals (hereafter MNI). MNI was originally developed to calculate nutritional abundance of food animals (White 1953) but has also been used to compensate for an overrepresentation of species that have bones fragmented into multiple identifiable fragments. Although MNI targets the number of identifiable bones in an assemblage, studies have found some limitations; an underrepresentation when an assemblage is heavily fragmented, an under- or overrepresentation due to the number of identifiable bones in the animal (Marshall and Pilgram 1993) and a possible sensitivity to aggregation as different interpretations of deposits can skew the results of MNI count (Domínguez-Rodrigo 2012; Lyman 2018). Because of these limitations, MNI was solely utilised on fish bones and should be considered a rough estimate.

Due to the low number of fragments identified to species, the number of identified specimens (hereafter NISP) was found to be the method best suited for further analysis. Of methods available, NISP is the easiest to use, as each bone or bone fragment is counted as one individual (O'Connor 2000:54). The observational units are presented as NISP values (Lyman 1994a) and is the number of fragments counted. The analytical data are presented as NISP% (E.g. Barrett *et al*. 2004; Hufthammer *et al*. 2011). NISP is a quantitative method, used in the interpretation of e.g. food subsistence (Grayson 1984:115; Lyman 1994a). When analysing NISP data, the final number of identified elements will not vary based on site unit division. In other words, NISP is not dependent on aggregation, and Grayson (1984:91-92) therefore argues that NISP is the preferred method for studying relative abundance when it comes to archaeologically excavated animal bones.

There are, however, some limitations to be addressed: NISP will not provide a true representation of the past and it is important to consider the difference that will be between the sample that is NISP and the death population (O'Connor 2000:55). NISP is influenced by the degree of fragmentation (Cannon 2013) and does not account for animal variation. For instance, several fragments from the same element/bone may be counted as several animals (O'Connor 2000:55-56). Nor does it account for the number of bones present in each animal, and so exaggerates the presence of some species. On the other hand, there will be an underrepresentation of animals prepared off site, rather than on site. Preservation is also affected by butchering techniques that would entail larger bones being cut into smaller pieces while smaller bones may not have undergone the same treatment (Binford 1978). NISP does not account for whether bones are articulated, and hence belonging to one individual, or from several different individuals (Bökönyi 1970). Nevertheless, the results are easy to reproduce and the limitations are well researched (e.g. Binford 1978; O'Connor 2000; Cannon 2013) so that this can be included in the discussion and analysis of results.

Results provided by MNI and NISP cannot be understood as a direct proxy of past society,

as stated through taphonomy. Taphonomy entails the processes that influence the bones themselves from the living animal (Van Neer and Muniz 1992; O'Connor 2000:20), to the fossils uncovered by archaeologists (Grayson 1984: 34; Klein and Cruz-Uribe 1984:69-75), ending with the published articles reporting or interpreting their presence within the site (O'Connor 2000:20). Both cultural and natural factors influence the material culture at a site (Klein and Cruz-Uribe 1984:75; Urbańczyk 1995:70), and these processes influence each other and cannot always be separated (Urbańczyk 1995:70). Investigating animal remains will therefore not give a true interpretation of what happened in the past, but only by understanding the taphonomic processes is it possible to start interpreting the animal remains from past societies (Behrens-meyer and Hill 1980:4; Olson 1980).

Bones or fragments cannot be used as a direct proxy to the past due to taphonomic influences, and what is discussed below is therefore only representative for the bones excavated. This is therefore not necessarily characteristic for the entire economy that may have been available for people living and working at Saurbekken.

At Saurbekken a total of 7019 bones were recovered from both excavations. Although no specification as to the size a sample size should hold in order to obtain valid results for a population (Grayson 1984:116-117), 7019 only refers to the number of fragments and not complete animals, amounting for a very low NISP (e.g. Barrett 1997; Hufthammer 1999). Analysis using low NISP may still provide information about the sites, making it possible to compare Saurbekken to other settlement mounds. In addition, this investigation, together with others concerning economy of the past, may prove useful as a basis for future research such as isotope analysis (e.g. Barrett *et al*. 2008; 2011) and aDNA (e.g. Star *et al*. 2017).

Results

At Saurbekken, the animal remains excavated in 1970 and 1972 (Bertelsen 1973), have a collected NISP of 7019. The class with the highest number of fragments is fish at 40,12 % (Table 1). Mammals is the second largest group (35,23 %) and 0.17 % of the fragments could be identified as sea mammals. Most fragments could not be further identified than to fish and mammal (Table 1). There is a small number of bones that can be identified to the class of birds, and the two most prevalent birds are Great Black-backed gull (*Larus marinus*) and the Lesser Black-backed gull (*Larus fuscus*, table 1).

Of the mammalian category, sheep/goat (*Ovis aries/Capra hircus*) dominates the category with 312 identified fragments, constituting 4,45 % of the total assemblage. This is followed by cattle (*Bos taurus*, 222 fragments) and pig (*Sus scrofa*, 44 fragments) constituting 3,16 % and 0,63 % respectively. Other animals with more than one fragment present are cat (*Felis catus*) and European water vole (*Arvicola amphibius*), each represented with three fragments, and 0,04 % of the assemblage (Table 1).

As indicated in table 1, the highest number of fish bones belongs to cod (*Gadus morhua*, 651 fragments) constituting 9,27 % of the total number of fragments. Other species represented in the assemblage is ling (*Molva molva*, 160 fragments), haddock (*Melanogrammus aeglefinus*, 92 fragments), cusk (*Brosme brosme*, 85 fragments) and saithe (*Pollachius virens*, 83 fragments).

Taking a closer look at cod (*Gadus morhua*), the most frequently occurring bone is vertebrae with 460 fragments, followed by cleithrum with a NISP of 24. Epihyale, ethmoidale and urohyale are represented with one fragment each, with no additional fragments connected to the wider category of Gadidae (Table 2). Going by the two most prevalent fragments in the assemblage, vertebrae (460 fragments) and cleithrum (24 fragments), it represents a MNI of 12 fish.

In order to further investigate the presence of cod (*Gadus morhua*) at Saurbekken, specific skeletal elements belonging to this genus were counted per placement in the body (Table 2) (see Barrett 1997). The majority of skeletal fragments belonged to the post-cranial body (464 fragments)

Gadus morhua	Junction of the head and trunk	Post-cranial	Skull element	Sum fragments
Cod	**77**	**464**	**110**	**651**
Vertebrae		460		460
Claviculare	24			24
Supraclaviculare 2	19			19
Supraclaviculare 1	18			18
Postclaviculare	16			16
Dentale			16	16
Praemaxillare			14	14
Ceratohyale			10	10
Articulare			10	10
Maxillare			9	9
Parasphenoid			8	8
Ectopterygoid			7	7
Quadratum			6	6
Praeoperculum			5	5
Palaopterygoid			5	5
Operculum			4	4
Suboperculum			4	4
Quadratum 2		4		4
Hyomandibulare			4	4
Vomer			3	3
Interoperculum			2	2
Epihyale			1	1
Ethmoidale			1	1
Urohyale			1	1
Sum fragments	**77**	**464**	**110**	**651**

Table 2: Cod (*Gadus morhua*) by element from Saurbekken

with the remaining fragments belonging to the junction of the head (77 fragments) or skull (110 fragments).

When assessing temporal distribution of the animal remains, ranging from its initial settlement at approximately year AD 1000 to abandonment around AD 1350 (Table 3), 1523 fragments are connected to the first time period of use ranging from ca. AD 1000 to ca. AD 1100. Of these, there are two fragments from birds, 614 from fish, 334 from mammals and seven from marine mammals. The second time period, ca. AD 1100 to ca. AD 1300 is represented with 12 fragments from birds, 2132 of fish, 1776 of mammal and two fragments from marine mammals. The third, and final, group of animal bones dated to approximately AD 1350 comprises 20 fragments from fish, 332 from mammals and three from sea mammals.

From Saurbekken there is a second category of animals comprising of molluscs, were seashell, shell and shell of sea nail were identified. The molluscs are represented with 47 fragments in the first time period, 132 from the second and 35

Years	Ca. 1000-ca. 1100	Ca. 1100-ca.1300	Ca. 1350	Sieving	Total
Birds	**2**	**12**			**14**
Common gull		1			1
Great Black-backed gull		4			4
Hooded Crow		1			1
Lesser Black-backed gull		4			4
Undetermined	1	1			2
Willow grouse	1	1			2
Fish	**614**	**2132**	**20**	**50**	**2816**
Atlantic Halibut		1			1
Atlantic Herring	16	4			20
Cod	197	432	8	14	651
Cusk	21	63		1	85
Haddock	17	73	1	1	92
Ling	33	122	3	2	160
Redfish/rockfish		3			3
Saithe	24	59			83
Undetermined	306	1375	8	32	1721
Mammals	**334**	**1776**	**332**	**31**	**2473**
Cat		2	1		3
Cattle	33	135	50	4	222
European water vole		1	2		3
Fox	1				1
Horse			1		1
Pig	10	24	7	3	44
Reindeer		1			1
Sheep/goat	52	208	47	5	312
Undetermined	238	1405	224	19	1886
Marine mammals	**7**	**2**	**3**		**12**
Porpoise	1				1
Seal	6	2	2		10
Whale			1		1
Mollusks	**47**	**132**	**35**		**214**
Mollusks	47	132	35		214
Seashell	**115**	**315**	**3**		**433**
Shell	115	315	3		433
Shell			**14**		**14**
Shell			14		14
Shell of sea snail	**404**	**639**			**1043**
Shell of sea snail	404	639			1043
Total	**1523**	**5008**	**407**	**81**	**7019**

Table 3: Saurbekken throughout occupation

Class	*Family/species*	NISP	NISP %
Birds	*Birds undetermined*	9	0,93 %
	Western capercaille	6	0,62 %
	Hooded crow	3	0,31 %
	Purple sandpiper	1	0,10 %
	Goose	1	0,10 %
	Grouse	1	0,10 %
Birds Total		**21**	**2,17 %**
Fish	*Fish undetermined*	193	19,96 %
	Atlantic cod	19	1,96 %
	Haddock	16	1,65 %
	Pollack/saithe	3	0,31 %
	Atlantic halibut	3	0,31 %
	Saithe	2	0,21 %
	Cod family	2	0,21 %
	Ling	2	0,21 %
	Flatfishes	1	0,10 %
Fish Total		**241**	**24,92 %**
Mammal	*Mammal undetermined*	519	53,67 %
	Sheep/goat	110	11,38 %
	Cattle	37	3,83 %
	Pig	14	1,45 %
	Even-toed ungulate	13	1,34 %
	Reindeer	3	0,31 %
	Dog	1	0,10 %
	Carnivores	1	0,10 %
	Even-toed ungulate/pig	1	0,10 %
Mammal Total		**699**	**72,29 %**
Mammal/Bird	*Mammal/bird undetermined*	3	0,31 %
Mammal/Bird Total		**3**	**0,31 %**
Marine mammal	Family of seal	2	0,21 %
	Ringed seal	1	0,10 %
Marine mammal Total		**3**	**0,31 %**
Sum		**967**	**100,00 %**

Table 4: Class, species/family, NISP and NISP% from the 1981 excavation at Soløy

during the last period of settlement. For seashells the numbers vary from 115, 315 and three. There are 14 fragments recovered of shell, all from the last period of settlement. The shells of sea snail vary from 404 and 639 within the first two time periods of the settlement, while no fragments were present during the last period Saurbekken was in use.

The last category in table 3 is called Sieving. These fragments are not dated through stratigraphy as they were found through sieving or in mixed contexts.

From Soløy a total of 967 bones were excavated and identified from the 1981 excavation. The most prominent class is Mammalia, representing 72,29 % of the bone fragments. The remaining assemblage consists of fish- (24,92 %) and bird bones (2,17 %, table 4).

A large number of bones present at Soløy were unidentifiable to level of species and only identified to class. This includes 699 mammal bones, 241 fish bones and 21 bird bones.

The greatest number of fragments from the class of fish belongs to cod (*Gadus morhua*), representing approximately two percent of the sample (19 fragments). Haddock (*Melanogrammus aeglefinus*) is represented with 16 fragments and 1,65 % of the entire assemblage. Other fish represented have three or less fragments present (Table 4).

When looking at cod (*Gadus morhua*) excavated from Soløy (Table 5) only two elements have more than one fragment present. Epihyale, with two fragments, and vertebrae with five fragments. If the fragments determined as Gadidae are examined, only two fragments can be added to what is identified as Cod (*Gadus morhua*) (Table 5), providing a MNI of one fish.

The last point of interest is to look at food subsistence through time at Soløy (Table 6). From ca. AD 950 to ca. AD1300 there are 26 bone fragments of mammals and two fragments of fish. In the time period ca. AD 1300 to ca. AD 1430 a total of 121 fragments are found, two of which are birds, 36 fish and 83 mammals. Deposits from the period AD 1430 onwards hold a total of 818 fragments. 19 fragments are from birds, 203 from fish, 590 of mammal, of which three are sea mammals, and three fragments belonging to the category of mammal/bird.

Gadus morhua	Fragment	NISP
Cod	Ceratohyale	1
	Cleithrum	1
	Cranium	1
	Dentale	1
	Ectopterygoid	1
	Epibranchiale	1
	Epihyale	2
	Hypobranchial	1
	Interoperculum	1
	Postcleithrum	1
	Praemaxillare	1
	Quadratum	1
	Scapula	1
	Vertebra	5
Cod Total		**19**
Cod family	Radii branchiostegi	1
	Supracleithrum	1
Cod family Total		**2**
Total		**21**

Table 5: Cod (*Gadus morhua*) and Gadidae recovered at Soløy.

Discussion

Following the process of taphonomy as described by O'Connor (2000:20), some explanations to the low NISP at Saurbekken can be identified. Despite Saurbekken being one of the most extensively excavated settlement mounds in Norway (Bertelsen and Lamb 1995a), only part of the site was investigated. Of the bones and fragments recovered, fishbones are some of the smallest and therefore harder to spot during excavations. Additionally, Saurbekken is located further from the sea than usual in context of Norse settlement mounds (Bertelsen 1985b; 2001; 2002), and if fish were gutted by the shoreline, few fragments of fish would be possible to recover during the excavations (Jørgensen 1984: 175-176; Wickler 2013). A circumstance that speaks in favour of this is evident from the urban site of Vágar, Lofoten (Figure 1). This site is relatively close to Saurbekken, and a large

Table 6: Soløy and animal remains throughout occupation. The table includes data from the 1980 and the 1981 excavations

Years	Ca. 950-ca. 1300	Ca. 1430 onwards	Ca 1300-ca.1430	From the 1980 excavation	Total
Birds		**19**	**2**	**38**	**59**
Bird undetermined				38	38
Birds undetermined		7	2		9
Goose		1			1
Grouse		1			1
Hooded crow		3			3
Purple sandpiper		1			1
Western capercaille		6			6
Fish	**2**	**203**	**36**	**868**	**1109**
Atlantic cod		16	3		19
Atlantic halibut		3			3
Cod family		1	1		2
Fish undetermined	2	165	26	868	1061
Flatfishes		1			1
Haddock		11	5		16
Ling		1	1		2
Pollack/saithe		3			3
Saithe		2			2
Mammal	**26**	**590**	**83**	**1072**	**1771**
Carnivores		1			1
Cattle	1	30	6		37
Dog			1		1
Even-toed ungulate		10	3		13
Even-toed ungulate/pig		1			1
Mammal undetermined	24	434	61	1072	1591
Pig		13	1		14
Reindeer		1	2		3
Sheep/goat	1	100	9		110
Mammal/Bird		**3**			**3**
Mammal/bird undetermined		3			3
Sea mammal		**3**			**3**
Family of seal		2			2
Ringed seal		1			1
Total	**28**	**818**	**121**	**1978**	**2945**

amount of fish bones have been uncovered in the old harbour at Vágar. This is believed to stem from the boats anchored here and refuse from seashore being washed out at sea. This could indicate that fish was largely prepared by the seaside and not brought home whole (Wickler 2013), and the same would likely be true for Saurbekken, suggesting an underrepresentation of fishbones in the assemblage. Moreover, the fact that what characterizes settlement mounds is that the same area was used to build and rebuild houses for centuries could also contribute to the scattering of fragments.

As the area surrounding Saurbekken, was densely populated, a low amount of wildlife is expected (Bertelsen 1974:5). Additionally, the zooarchaeological material was discovered within buildings, as structures such as a hearth was identified (Bertelsen and Holm-Olsen 1972) and this context may indicate that fragments recovered were mostly leftovers from meals. This facilitate the possibility that most of what was once left here would be brushed outside or fed to animals of the household, thus further scattering and contributing to the low number of fragments recovered. The excavated areas being inside dwellings may further suggest that this was not the primary production site, as the butchering place may well have been on the farm but somewhere outside the living quarters.

Furthermore, secondary products, such as milk, cheese and butter, most likely played a role at Saurbekken, but these usually leave few, if any, traces in the archaeological record (Guilday 1970). A further complicating factor is the climate in this region. Fluctuation in temperature and precipitation can directly alter the depositional environment, influencing conditions for preservation (Martens 2016: 24- 25, 92-93). Moreover, as is evident from the stratigraphy, the soil in the area has been reworked for centuries, changing the conditions, context and number of bones present at any given time (Bertelsen 1973:29-32; 1985b; 2001). Perhaps Bertelsen (1979:6) explains it best when he emphasises that it is impossible to infer diet on a general basis when only smaller areas have been investigated, and it is more or less by chance what material one might find. However, despite these taphonomic limitations, Saurbekken is one of the most extensive excavations on settlement mounds in Norway (Bertelsen and Lamb 1995a), and the analysis conducted can provide results connected to food subsistence strategies at Saurbekken in the past as the bone assemblage reflects what was in fact present and utilised by its inhabitants.

Food subsistence strategies at Saurbekken

Considering the distribution of bones and fragments from the assemblage uncovered at Saurbekken, some trends can be identified. First, the class with the highest NISP is fish, largely dominated by cod (*Gadus morhua*, table 1). Taking into consideration what has already been discussed on taphonomy, fish is known to be underrepresented in the archaeological material. One interpretation based on this data would indicate fish playing a larger role at Saurbekken than implied through the osteological assemblage. Based on these factors in combination with NISP, it is suggested that fish did play an important role at Saurbekken in the Middle Ages. Although people along the coast have always relied on fish for survival, the trend seen at Saurbekken can further be related to religious fasting practices within the Catholic church, such as Lent (Gelsinger 1981:181; Bertelsen 1991; Bruun 2011). Previous studies have concluded that changes in diet did indeed take place during this religious transformation as Christianity and laws connected to religion were established in the country. Fish is one such merchandise that was recognised to grow in importance after this transition (Skaar 2014:71-74; Van der Sluis *et al*. 2016) as fish was allowed by the church to eat during lent (Gelsinger 1981: 181; Bertelsen 1991; Bruun 2011).

The second largest group of bones is from mammals, only separating the classes with about 400 fragments (Table 1). Within the mammal category, the sheep/goat (*Ovis aries/Capra hircus*, 312 fragments) species is prevalent. If Saurbekken was a marginalised farm as suggested

(Bertelsen 1974:5), it is possible that access to grazing land can provide some explanation as to why sheep/goat (*Ovis aries/Capra hircus*) was preferred. They are more resilient than other domesticated animals as they can handle rough terrain and will therefore manage better. Similar situations can be found on e.g. Iceland (Harrison 2014).

At Saurbekken there is a large variety of animals represented in the archaeological material, such as cattle (*Bos taurus*, 222 fragments) and pig (*Sus scrofa*, 44 fragments). There are traces of wild game and birds, although perhaps not all animals represented are evidence of past subsistence strategies. Lyman (1994b:7) mentions the need for distinguishing between animals utilised by purposes other than consumption. At Saurbekken cat bones may be one such example. Cats are known to be held as companions due to their ability to keep other, less welcome creatures such as mice and rats away from property and although cat bones do occasionally show signs of cut marks, this may be from want of fur rather than for food (Hufthammer 1987).

Ranking third of the classes is that of shell (1704 fragments, see table 1). Although shell can have different purposes, such as bait when fishing, game pieces or as ornamentation (Claasen 1998:196), there are some factors that advocate that the shells recovered from Saurbekken were indeed part of the diet. The distance from the sea would entail some effort to carry the shells from the shoreline to the site. Furthermore, there has been no mention of modification to the shells, as far as the author is aware, hence lessening the probability of them being made into, for example, necklaces. Though it is not impossible that shells have other use than that of food, the share number of shells present at Saurbekken seems to indicate the likelihood that some shells were indeed part of the diet. This will be in line with regulation during lent, as shells may serve as a supplement to other marine resources. If shells were part of the diet, they would not offer a great caloric contribution, but would have been an important source of proteins, fat, vitamins and minerals (Claasen 1998:183-187) that would have contributed to the overall diet of the occupants at Saurbekken.

Consumption or production?

Taking a closer look at fish in a producer-consumer perspective (Figure 2), NISP indicate that cod (*Gadus morhua*) was the most common fish at Saurbekken. However, the high number of unidentified fragments (Table 1) can include bones or fragments from other species, thus creating a more evenly distribution of fish if all fragments were identified to species. Likewise, fragments that could not be identified to family or species may include new species not already mentioned.

Barrett`s (1997) model analysing the head-body ratio from the data in figure 2, provide a noticeably higher number of post-cranial elements. The post cranial elements constitute 71,27 % of the bones from cod (*Gadus morhua*) at Saurbekken (Figure 2), indicating that fish was consumed on site. However, 460 of these belongs to the vertebrae, leaving only four bones as other post-cranial elements (Table 2). As a single fish can have as many as 54 vertebrae (Nordeide and Pettersen 1998), when applying the concept of MNI, there should be a MNI of nine fish.

The most prevalent bone after vertebrae is connected to the junction of the head and body, the cleithrum (24 fragments). This is often removed in dried stockfish. If cleithra is counted

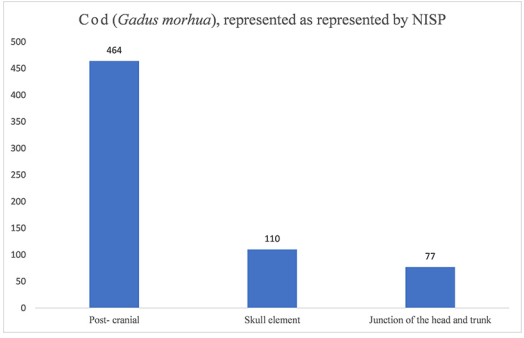

Figure 2: Cod (*Gadus morhua*) by elements from Saurbekken.

within the post-cranial category, this puts the number of possible post-cranial elements higher, as there are only two of these bones in each fish (Wheeler and Jones 1989:103), leaving a rough MNI (as they are not sided) of 12 fish represented by post-cranial elements.

Of head bones, dentale has the highest NISP (16 fragments), but there can be two of each in one fish, leaving an MNI of eight. The second most prevalent bone of the skull is that of praemaxillare (Table 2). Of these, there are also two in each fish (Wheeler and Jones 1989:92-93), again leaving an MNI of eight fish. The largest number of unpaired head bones is the parasphenoid, also represented by eight identifiable fragments. Eight is therefore the MNI based on elements of the skull from the assemblage at Saurbekken.

Saurbekken as a consumption site is in correspondence with the high prevalence of post-cranial bones, also matching results found by Bertelsen (1973: 77). However, this is not to say the inhabitants did not take part in the stockfish industry, a trade highly financially beneficial. In fact, Bertelsen (1973:77) suggests that preparation of fish for drying would have taken place closer to the sea. Nevertheless, not all settlements connected to the outer islands did partake in the trade with stockfish. Overall, based on MNI, there are very few cod (*Gadus morhua*) bones or fragments uncovered at Saurbekken. To be able to infer to what extent Saurbekken did or did not take part in the export of stockfish, more data is needed. What can be stated is that Saurbekken was indeed a place where fish constituted an important contribution to the diet of the tenants.

Looking at the long-term perspective of Saurbekken, emphasising that the NISP is too low to make any definite conclusions, the available material shows an interesting trend. Saurbekken seems to rely on a mixed economy throughout occupancy. From the time of settlement to AD 1300, NISP shows a higher prevalence of fish than any other class of vertebrates. The second largest class through this period is mammal. Around AD 1350 this changed into a seemingly higher prevalence of mammals than fish, indicating a shift from a focus on a fish dependent diet to a mammal consumption diet. Cattle (*Bos taurus*) also replaces sheep/goat (*Ovis aries/Capra hircus*) as the most prevalent mammal in this last phase. By then, however, there are only three fragments separating Cattle (*Bos taurus*) from that of sheep/goat (*Ovis aries/Capra hircus*). With such a small number of fragments separating the two, it is possible that taphonomic processes are responsible.

Although interesting, very few fragments belong to this upper deposit of the excavation, and the shift seen in the NISP can only be regarded as preliminary suggestions, rather than reliable results. More data will be necessary to look for further information about food subsistence at Saurbekken.

The comparative site of Soløy

The Norse settlement mounds known as Soløy and Saurbekken are both located in the southern part of Troms and Finnmark county (Figure 1). Soløy was settled from the Viking Age (AD 800- 1030) to the 19th century. The sites are therefore contemporaneous (Bertelsen and Holm-Olsen 1971; 1972; Bertelsen 1985b; 1985c), although Soløy was in use for a longer time period (Bertelsen 1985b; 1985c). The distance between the two is roughly 50 km as the crow flies (Bertelsen and Holm-Olsen 1971; 1972; Bertelsen 1985b; 1985c).

Saurbekken was archeologically excavated in 1970 and 1972 (Bertelsen and Holm-Olsen 1971; 1972) and Soløy in 1980 and 1981 (Bertelsen and Urbańczyk 1985: i). Both excavations were conducted by, amongst others, Reidar Bertelsen, and utilising cutting-edge technology at the time (Bertelsen and Holm-Olsen 1971; 1972; Bertelsen and Urbańczyk 1985). The sites are therefore well-suited for comparison, but also interesting as they are located relatively close to one another. Before comparing Saurbekken and Soløy, as the osteological reports from the 1981 excavation from Soløy has not been analysed elsewhere, a short summary is provided below.

Soløy is located in Lavangen municipality (Bertelsen 1985b), close to the end of a fjord (Bertelsen 1995a), and further from the shoreline than settlement mounds are predominantly found (Bertelsen 1985b; 2001). From the central mound, it is roughly 175 meters to the fjord shoreline (Askeladden, ID 37150), and 80 km to the open sea (Bertelsen 1995a). In the Iron Age and Early Middle Ages settlements along the fjords were predominantly Sámi, and prior to AD 1250 only five known Norse settlements were located within the fjords, Soløy being one of them (Hansen 2011).

At Soløy, mammal has the highest NISP, and the category is largely dominated by sheep/goat (*Ovis aries/Capra hircus*). This could be due to the location as Soløy is located at the innermost part of a fjord, on the slope between the mountain and the sea, and as with Saurbekken, the resilience of these animals may have been important when choosing livestock. However, inhabitants of Soløy seemed to have a varied access to animals as evidence of cattle (*Bos taurus*), pig (*Sus scrofa*) and possible other species in the category of undetermined and even toed ungulates are present. In addition, bird bones are represented in the assemblage, although in low numbers. It is uncertain if birds were part of the diet or if their presence is due to chance.

As discussed above, an underrepresentation of fish in the archaeological assemblage is expected, and this underrepresentation may contribute to the seemingly preference for mammal, and sheep/goat (*Ovis aries/Capra hircus*). The results from this research is, however, consistent with the investigation of the 1980 assemblage (Jørgensen 1984:168, 175-176; Bertelsen 1985c). From the 1981 excavation, mammal bones constitute 72,29 % (699 fragments) and fish bones 24,92 % (241 fragments) of the assemblage. As the sample size is too small to make an elaborate interpretation, the only conclusion that can be implied is that a variety of fish did indeed play a meaningful part of the food subsistence strategy for this site located well into the fjords.

Analysing cod (*Gadus morhua*) by studying head-body ratio (e.g. Barrett 1997; Barrett *et al*. 1999; Hufthammer 1999), was not possible with the data available (Table 6). Each bone is represented with only one fragment, except for vertebrae and epihyale. Utilising a rough MNI, it becomes clear that both the vertebrae and the two epihyle (as they are not sided) could stem from one single fish. Therefore, there is not enough material to pursue this investigation further.

Throughout the almost 800-year long history, Soløy was a place of continuity and stability (Bertelsen 1985c), and the 58 stratigraphic units provides a well-documented context for the collected bones and serves as a foundation when food subsistence strategies through time is investigated. The highest NISP is found within the later phase, ranging from AD 1430 to the abandonment of the settlement in the 19th century. As NISP are too low from the other stratigraphic units (Table 6) to make a conductive comparison, few conclusions can be implied from the fragments uncovered. Bearing this in mind, but still using NISP as presented through the excavations, there appears to be a mixed economy through occupancy (Table 6). With the utmost precaution it may be implied a potential preference for mammals, particular sheep/goat (*Ovis aries/Capra hircus*), throughout the settlement of Soløy.

Subsistence strategies: an inter-site comparison

Through centuries, the people living on what became settlement mounds in northern Norway adapted their food staples based on their availability (Bertelsen 2011a). Already in the Iron Age people seem to have combined agriculture with fishing and hunting of sea mammals (Johansen 1979). Given the evidence at hand, Saurbekken relied on a mixed economy, drawing on resources from both the landscape and the seascape to provide a varied and stable subsistence. The mixed economy seems to have enabled people to make the best of the placement, with the sea on the one side and the steep mountains on the other, turning the challenging and varied environment into opportunities. Thus, creating an economy not too susceptible to outside changes such

as weather conditions or seasonal changes, secured food access all year round. This puts the settlement well within the normal patterns found in Northern Norway, where a mixed economy appears to be the norm.

The differing economy seen at Saurbekken is not exclusively found here. At the settlement mound of Bleik a mixed economy is also documented, where about 25 % stems from domesticated animals such as cattle (*Bos taurus*) and sheep (*Ovis aries*), mostly sheep, and about 75 % from fish (Jørgensen 1984:168). This is similar to Saurbekken, where the highest NISP was that of fish, but with an economy including domesticated animals as well. For both Bleik and Saurbekken, sheep/goat (*Ovis aries/ Capra hircus*) was the most prevalent mammal.

This seemingly preference for fish at Saurbekken, a location so far from the shoreline, becomes alluring when compared to other settlement mounds. At the inland settlement mound of Vestvatn, Misvær municipality, about 75 % were domesticated animals such as cattle (*Bos taurus*) and sheep (*Ovis aries*), again mostly sheep, and fish, seal and whale amount to about 25 % (Jørgensen 1984:168). A similar situation as that of Vestvatn can be found looking at the evidence at hand from Soløy. Again, mammal has the highest NISP, suggesting that mammals could have been preferred. Although, as already noted elsewhere, an underrepresentation of fish in the archaeological assemblage is expected and this may contribute to the apparent preference for mammals, and sheep/goat (*Ovis aries/Capra hircus*) in particular, at Soløy. What can be implied, is that a variety of fish was indeed part of the food subsistence strategy for the inhabitants of Soløy. This is interesting, as Soløy, like Saurbekken, is located further from the shoreline than most settlement mounds. However, unlike Saurbekken, the main subsistence at Vestvatn and Soløy appear to be domesticated animals, but with fish and marine mammals as an additional part of the economy.

Overall, inhabitants of Saurbekken and Soløy seemed to have a varied access to animals. At both sites, cattle (*Bos taurus*), pig (*Sus scrofa*) and bird bones are represented in the osteological assemblage, although bird bones in low numbers, so it is not obvious whether they were part of the food subsistence or their presence is more by chance.

Regarding food subsistence through time, a comparison between Saurbekken and Soløy provides some preliminary results. While the main subsistence at Soløy seems to remain stable throughout the settlement period, at Saurbekken a change from fish to mammal can be seen in the archaeological data.

Conclusion

Using NISP, it was possible to infer that Saurbekken was dependent on a mixed economy, utilising the environment to its advantage and securing an all-year sustainable food subsistence. This was found when the data was analysed as one assemblage, but also when considering food subsistence throughout the settlement period. This mixed economy also coincides with what is known from other settlement mounds.

For a more detailed analysis of the economy at Saurbekken, a secondary objective was to look for changes in diet through time, using an intra-site analysis of the animal remains from this Norse settlement. From the onset of settlement to around AD 1300, fish had the highest NISP of the bones and fragments. This seems to change after AD 1300, where NISP of fish was lower than that of mammal. Cattle (*Bos taurus*) dominates the latest phase, with three fragments more than that of sheep/goat (*Ovis aries/Capra hircus*). What can therefore be seen is a possible shift where the main subsistence changed from fish to mammal. Throughout the settlement of Saurbekken its tenants were reliant on a mixed economy.

The last objective was to investigate if Saurbekken took part in the consumer-producer market of stockfish. Looking at the material at hand, it is evident that the tenants indeed consumed fish and that fish played an important part of the diet, and it is believed that the occupants at Saurbekken consumed fish rather than produced stockfish for export.

Through the comparison of Saurbekken and Soløy, it is found that both settlements were relying on a mixed economy throughout occupancy. Of mammals, a potential preference for sheep/goats (*Ovaris aries/Capra hircus*) was noted, and despite both locations situated further from the shoreline than what was common for Norse settlers at the time, a reliance of fish was also visible in the archaeological record at both sites. At Saurbekken and Soløy, people seemed to rely on a mixed economy, from the land and the sea, throughout settlement period.

The taphonomic processes will always play a part in the assemblage left for the archaeologist to study, and with a relatively small-scale excavation conducted, only glimpses into the past life at Saurbekken can be provided. Moreover, taphonomic processes significantly influence the bones themselves. It has therefore been important to emphasise these processes and the limitations they have on the bone assemblage and thus the level of interpretations they provide. It is evident that the material is limited, and the results presented here can only provide indications of what was once present. However, even though only pieces of the entire death population are visible in the bone assemblages from Saurbekken, some interesting preliminary results has been obtained.

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Summary

The zooarchaeological material from the North Norwegian settlement mound known as Saurbekken is examined using the number of identified specimens. The aim is to gain knowledge about food subsistence strategies at the site, food subsistence strategies through the ages, and whether the settlement took part in the preparation and/or export of stockfish. Based on available material from Saurbekken, the main staple was fish from around AD 1000 to AD 1300, with a seeming change from fish during the last 50 years of settlement, towards an economy more predominantly based on mammals. Based on the evidence at hand, fish was an important part of the diet for the occupants as Saurbekken, but as the amount of material recovered from the excavation produced a small sample size, it was not possible to infer if the inhabitants partook in the stockfish industry.

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