

# What the Norse Greenlanders Ate

## 2020

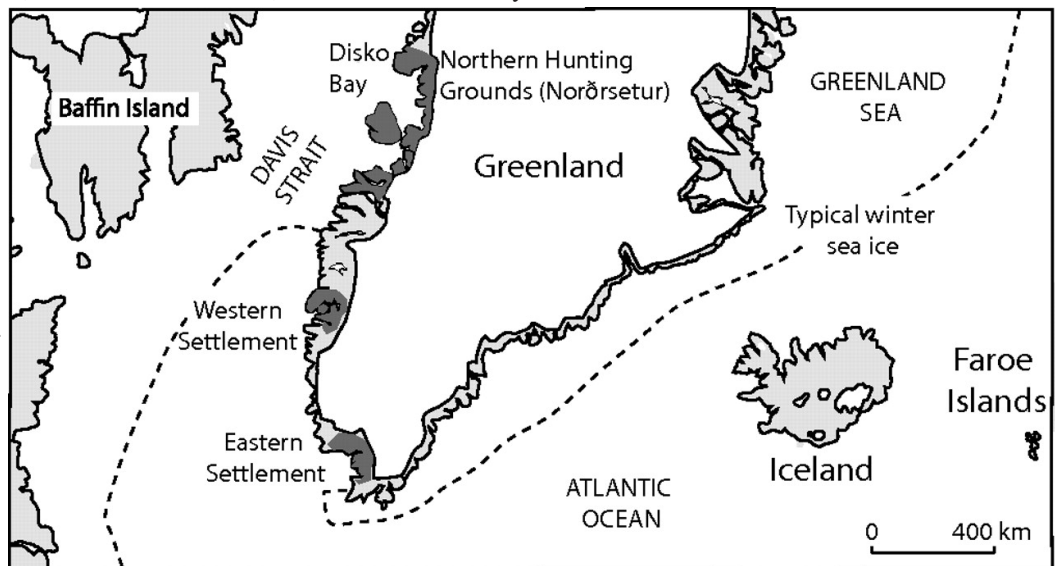
### Purpose:

The purpose of this paper is to list the type of food available by Norse settlers of medieval Greenland, exploring the food mentioned in the Greenland sagas, remains found in archeological digs, trace analysis of bones and what food was available to be eaten. There is some question as to how much food was available to the Norse and how nutritious it was. The US Military recommends that an average sized male adult should take in a minimum of 4,500 kcal per day during Arctic conditions.<sup>1</sup> Estimates of medieval European diet shows that the average farmer, during the Medieval Warm Period (the time period of the Norse occupation of Greenland) consumed between 2000 and 2200 kcal per day.<sup>2</sup> Nobel Prize winner Robert Fogel calculated that the Basal Metabolic Rate of “an adult male, 5’6” tall and weighing 140 pounds - that is, a fairly average fourteenth-century farmer - the BMR is 1,576 Calories<sup>3</sup> a day. Fogel’s calculation for the additional calories needed to perform any sort of labor is 720, for a total of just under 2,300 Calories a day.<sup>4</sup> Estimates of energy output can increase to 7,403 kcal for eight hours of chopping wood.<sup>5</sup>

Numbers such as these shed an interesting light as to medieval malnutrition. The human body can store up to 100,000 kcal within fat reserves, but those reserves will have to be replaced at some point. If the average European farmer was living most of the year at a caloric deficit, surrounded by rich farmlands, mild winters and long growing seasons, how could their Greenland counterparts have survived for almost five centuries? Many words can describe Greenland, but “rich farmland” would not be two that I would use. There is no doubt that the Norse managed to survive, the questions that I wish to answer are these: what food did that have available in order to not just survive, but to prosper. Where did they get their protein, vitamins and minerals, as well as their dietary fibre?

### Introduction to Greenland<sup>6</sup>

Greenland was first settled by Europeans in 986 by legendary Norwegian hot head Erik the Red (Eiríkr rauði Þorvaldsson). Exiled from Norway for multiple killings, he resettled in Iceland in 960 and in 982 was exiled for murder. Taking advantage of the forced vacation, Erik fol-



lowed up on a report, by Gunnbjörn Ulfsson, of a large landmass West of Iceland. Erik discovered a suitable base camp at the fjord now known as Tunulliarfik. From this base camp, Erik and his crew spent the following two years exploring the coastline. In 985, Erik returned to Iceland and convinced a few hundred people to immigrate to this new Greenland. In 985, he set out with a fleet of 25 ships with over 400 people, livestock and supplies. 14 ships arrived in the new land and two major colonies were established: the Eastern Settlement (or Eystribyggð) and the Western Settlement (or

- 1 King
- 2 Rosen, p157
- 3 A Calorie is 1000 calories or 1 kcal, in terms of energy extraction from food
- 4 Rosen, p157
- 5 Dietary Requirements
- 6 From various sources

Vestribyggð), the two best locations found to support farming, grazing and ship access. Several smaller settlements were established as the population increased, however, the total Norse population of Greenland never rose above 5,000; with around 1,000 at the Western Settlement and 4,000 at the Eastern at their maximum population density.

The Norse occupation lasted almost 500 years. They constructed multiple churches, a cathedral (with a Bishop<sup>7</sup>), a monastery and a nunnery. They constructed houses, barns, dairy and sheep farms; 400 stone ruins still remain. They traded falcons, eagles, polar bear hides, walrus ivory, narwhale tusks (passed off as unicorn horns) and walrus skin ropes for iron, tools, bells, stained glass, raisins, wine and other “luxuries”. We know that food staples were imported: wheat; barley; honey; but Norwegian and Icelandic trading vessels cannot carry that much cargo (estimated at 7 pounds per Greenlander per year, on average)<sup>8</sup> and did not make that many trips; perhaps two or three a year in the best of years. Certainly not enough trips to be the sole source of food for the Norse. As the weather grew colder, and the ice packs grew larger, and the North Atlantic grew rougher, the visits lessened until the island was cut off almost completely.

The Greenlanders could produce bog iron, but the method requires a great deal of wood, which has to be converted into charcoal.<sup>9</sup> Greenland did have alder and dwarf willow trees, but they grew slowly. Vinland and Markland<sup>10</sup> were nearby, but as the pack ice grew, journeys there became too dangerous and eventually stopped. Driftwood could have been plentiful if the ocean current co-operated: driftwood from Siberia washes up on Greenland’s shores today. The deforestation of Greenland increased soil erosion which reduced the number of acres available for hay and crops. As did over grazing by sheep, goats and cattle. As the climate of the North Atlantic grew colder, the summer growing season shrank; winters became longer and harsher and life became more difficult.

The remains of one farm are indication of how difficult life had become: the farmers killed and ate their entire livestock, including newborn calves and lambs, right down to the hooves. Their bones were cracked open to extract the marrow. The farmers even ate their dogs; the bones show knife marks indicative of butchering.<sup>11</sup> How desperate they must have been to eat their livelihood and their hunting dogs. When they made that decision they must have known that they were done for. Without sheep and goats, they would not have any fleece to spin into wool. Without hunting dogs, their ability to hunt down wild game would have been diminished. Without cows, goats and sheep, there would be no milk to turn into cheese and butter. Did these farmers decide to survive the winter and then leave for better lands in the spring? We do not know: they did not leave any written records.

One final note: I will avoid using the word ‘viking’ in this paper. Greenland was not settled by vikings. The best definition of the word viking would be ‘raider’. The settlers of Greenland were farmers for the most part, not raiders. They were from Iceland, Norway, Denmark and Sweden and as such, I will use the word ‘Norse’ to describe them. Any further usage of the word ‘viking’ will come from quoted sources.

## Nutrition

As mentioned in the purpose, the minimum daily Calories for Arctic conditions is 4,500 kcal/d. In addition to Calories, humans require certain vitamins and minerals for good health. Signs and symptoms of malnutrition include:

- Loss of fat (adipose tissue)
- Breathing difficulties, a higher risk of respiratory failure
- Depression
- Higher risk of complications after surgery
- Higher risk of hypothermia - abnormally low body temperature
- The total number of some types of white blood cells falls; consequently, the immune system is weakened, increasing the risk of infections.
- Higher susceptibility to feeling cold
- Longer healing times for wounds
- Longer recovery times from infections
- Longer recovery from illnesses
- Lower sex drive
- Problems with fertility
- Reduced muscle mass
- Reduced tissue mass
- Tiredness, fatigue, or apathy

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7 They did not construct the bishop, merely imported one as needed.

8 Diamond, p.240

9 Four pounds of wood can be reduced to 1 pound of charcoal.

10 Modern day Canada

11 Various sources

Irritability.<sup>12</sup>

All of these symptoms would be harmful to the Norse living on the knife's edge that was Greenland. People can survive one bad year; perhaps two without too many losses. But several bad years will reduce the overall population. The famine of 1308 to 1315 killed off 5 to 12% of the population of Northern Europe.<sup>13</sup> With a maximum population of 5,000 people, a 1% loss of life, in one year, could have been devastating to the Greenland colony.

A lack of vitamin A can result in night blindness and poor vision in dim light. Something required for the dimly lit homes and barns of Greenland.<sup>14</sup> "In the absence of adequate exposure to sunlight, a lack of vitamin D can cause rickets, which results in malformed limbs in infants and children because the bones fail to harden properly. A lack of vitamin C causes scurvy, with symptoms of bleeding gums and easily bruised skin."<sup>15</sup>

*"The diets of at least half of the population {of Europe} was deficient not just in calories (particularly for growing children) but in lipids, calcium, and vitamins A, C, and D; and they contained so much fiber as to block the absorption of minerals like calcium, magnesium, and zinc. This was a particular problem for women of childbearing age - and, since average age at death was under forty, it affected virtually all women. Half of the adult population of Europe was constantly pregnant, and therefore constantly in need of vitamins B12, C and folic acid. And that was when things were normal."*<sup>16</sup>

## Livestock

The Norse brought livestock with them to Greenland, namely cows, pigs, goats, sheep, ducks geese and horses. I will ignore horses as there was a Christian religious ban against the eating of horse flesh<sup>17</sup> and they were used for transportation and work.

*"Greenland's settlers started out with aspirations based on the mix of livestock maintained by prosperous Norwegian chiefs: lots of cows and pigs, fewer sheep and still fewer goats, plus some horses, ducks, and geese. As gauged by counts of animal bones identified in radiocarbon-dated Greenland garbage middens from different centuries of Norse occupation, it quickly turned out that that ideal mix was not well suited to Greenland's colder conditions. Barnyard ducks and geese dropped out immediately, perhaps even on the voyage to Greenland: there is no archaeological evidence of their ever having been kept there. Although pigs found abundant nuts to eat in Norway's forests, and although Vikings prized pork above all other meats, pigs proved terribly destructive and unprofitable in lightly wooded Greenland, where they rooted up the fragile vegetation and soil. Within a short time they were reduced to low numbers or virtually eliminated."*<sup>18</sup>

The lack of domesticated ducks and geese not only meant a lack of meat, but a lack of readily available, easy to gather, eggs.<sup>19</sup> But, as I will cover later, the Norse had a source for eggs. Cattle, sheep and goats were kept, with cows being the greatest in importance for status: The largest and wealthiest of the farms had the greatest number of stalls for milk cows. The greatest was on the Gardar farm which had a barn with room for 100 cows.<sup>20</sup> The meat of sheep was preferred over that of goats,<sup>21</sup> although none of the three animals were raised strictly for their meat.

*"But in Greenland, as elsewhere in the world where rich and poor people are interdependent, rich and poor people didn't all end up with the same average wealth. Instead, different people ended up with different proportions of high-status and low-status foods in their diets, as reflected in counts of bones of different animal species in their garbage. The ratio of high-status cow to lower-status sheep bones, and of sheep to bottom-status goat bones, tends to be higher on good than on poorer farms, and higher on Eastern than on Western Settlement farms. Caribou bones, and especially seal bones, are more frequent at Western than at Eastern Settlement sites because Western Settlement was more marginal for raising livestock and was also near larger areas of caribou habitat. Among those two wild foods,*

12 Beers, Berkow

13 Rosen. p.133

14 Far too little can result in xerophthalmia which causes ulcers in the cornea and permanent blindness

15 Miller-Keane

16 Rosen, p125

17 "You say, among other things, that some eat wild horses and many eat tame horses. By no means allow this to happen in future, but suppress it in every possible way with the help of Christ and impose a suitable penance upon offenders. It is a filthy and abominable custom." Talbot, p85-6

18 Diamond, p222

19 It also meant a lack of easy to gather feathers for pillows, quills and flights for arrows.

20 Various

21 Observation based on the ratio of cow to sheep to goat at large/wealthy farms versus small/poor farms: poorer farms have more goats than cows (as a percentage of total number of animals); richer farms had more cows than goats

*caribou is better represented at the richest farms (especially Gardar), while people at poor farms ate much more seal. ... As an illustration of these trends with some actual numbers, the garbage of the poor Western Settlement farm known as W48 or Niaquusat tells us that the meat consumed by its unfortunate inhabitants came to the horrifying extent of 85% from seals, with 6% from goats, only 5% from caribou, 3% from sheep, and 1% (O rare blessed day!) from beef. At the same time, the gentry at Sandnes, the richest Western Settlement farm, was enjoying a diet of 32% caribou venison, 17% beef, 6% sheep, and 6% goat, leaving only 39% to be made up by seal. Happiest of all was the Eastern Settlement elite at Erik the Red's farm of Brattahlid, who succeeded in elevating beef consumption above either caribou or sheep, and suppressing goat to insignificant levels."*<sup>22</sup>

The fleece of the sheep and goats would have been prized over their meat. The fleece would have been spun into wool thread and the thread into clothing or sails. "The average Viking housewife like Gudrid needed to clean, sort, and spin the wool of 100 sheep a year to produce clothing for her husband and children and their servants and hired hands (who were paid in food and clothing), along with bedcloths, wall hangings, tents for travel, packs and sacks, diapers, bandages and burial shrouds."<sup>23</sup> However, once the sheep or goat stopped growing decent fleece, it would have been killed and butchered for food.

All three animal types would have been kept for their milk, a far more valuable food source: You can only eat a cow once, but you can milk one for months. The milk was used to make butter, cheese, whey and a yogurt like substance called skyr. Whey was a popular beverage and was used for pickling<sup>24</sup> and was turned into a porridge-like "cheese".<sup>25</sup> "The cream was churned into butter, kneaded into a block, squeezed to get every last bit of buttermilk out of it, and stored in a box. Unsalted, it would sour, but keep for decades."<sup>26</sup> It is worth mentioning that animals only produce milk when they are nursing young: medieval cows could not be milked year round like modern dairy cows. The milk that was collected was then converted into food stock that could be stored for later use, particularly during the long winters. Skyr was stored in barrels and kept cold either in mountain streams or buried underground.<sup>27</sup>

As cattle do not produce wool, at least not the cattle available to the Norse, males are only useful for work (ploughing or hauling) and for making little cows. Realistically, a farm only needs one bull and only a few oxen<sup>28</sup> for labor. Any additional male cattle would have been a drain on the farm's hay stocks. "{Erik the Red} may have kept up to twenty cows. Since they had to stay in their stalls for 200 days of the year, they required 55 tons of hay, or 500 horse loads. ... He also kept goats, which can digest brush and scrub even better than sheep."<sup>29</sup> Unneeded male calves were fattened up and then, after weaning, slaughtered, as dairy farmers have done throughout history.

All of the animal was used; meat, intestines for sausage casing, the marrow from the bones, and the bones themselves could have been carved into more useful things. Anything that remained would have been fed to the dogs, boiled down into glue or used as fertilizer. The meat would have been smoked, salted, pickled or cured to last throughout the year. Farmers might also have had to cull their herds depending on how much hay and seaweed was harvested: too little hay and the farmers would have had to kill some of the cows to ensure that the remainder would have enough feed to survive the winter.

*"Meat was available from the livestock just at times of culling, especially in the autumn, when farmers calculated how many animals they would be able to feed through the winter on the hay that they had brought in that fall. They slaughtered any remaining animals for which they estimated that they would not have enough winter fodder. Because meat of barnyard animals was thus in short supply, almost all bones of slaughtered animals in Greenland were split and broken to extract the last bits of marrow, far more so than in other Viking countries. At archaeological sites of Greenland Inuit, who were skilled hunters bringing in more wild meat than the Norse, the preserved larvae of flies that feed on rotting marrow and fat are abundant, but those flies found slim pickings at Norse sites. It took several tons of hay to maintain a cow, much less to maintain a sheep, throughout an average Greenland winter. Hence the main occupation of most Greenland Norse during the late summer had to be cutting, drying, and storing hay. The hay quantities accumulated then were critical because they determined how many animals could be fed throughout the following winter, but that depended on the duration of that winter, which could not be predicted exactly in advance. Hence each September the Norse had to make the agonizing decision how many of their precious livestock to cull, basing that decision on the amount of fodder available and on their guess as to the length of the coming winter. If they killed too many animals in September, they would end up in May with uneaten hay and just a small herd, and*

22 Diamond, p233

23 Brown, N. M., p229-230

24 Wolf, p.82

25 "...scarcely a true cheese, as the curd element is almost if not entirely wanting." Nansen, p.64

26 Brown, N. M., p.146

27 Diamond, p234

28 A castrated bull

29 Brown, N. M., p.145

*they might kick themselves for not having gambled on being able to feed more animals. But if they killed too few animals in September, they might find themselves running out of hay before May and risk the whole herd starving.*<sup>30</sup>

## Seal

The Norse hunted for seal to supplement their meat supplies. They hunted for three species of seal: the harbor seal, which is resident year round and bears their pups in inner fjords in the spring; the harp seal and the hooded seal, both of which are migratory and arrive around May along the seacoast, away from the majority of Norse farms. “To hunt those migratory seals, the Norse established seasonal bases on the outer fjords, dozens of miles from any farm.”<sup>31</sup> Seals, once on land, would have been easy to net and kill. Like modern seal hunters, the Norse might have singled out the pups as easy pickings. Even in the water, the Norse could have caught their fill of seal: “The bottleneck where the fjords emptied into the ocean made the settlement a natural trap.”<sup>32</sup> Harbor and hooded seal are more frequently found near the Western Settlement than the Eastern.<sup>33</sup>

*“Seals were especially important to Inuit living on the northern shores of Labrador and Newfoundland dating back to the early 18th century when seal meat, which is high in fat protein and vitamin A, was a staple in the early Arctic-dweller’s diet and often prevented explorers from starving or getting scurvy during their hunting travels. (Some Antarctic expeditions like Ernest Shackleton’s Ross Sea party suffered from scurvy for lack of vitamins found in seal meat)”*<sup>34</sup>

Seal meat is high in Calories and fat. One ounce of harp seal meat contains 103 Calories with 63 coming from fat.<sup>35</sup> Compare that with 69 Calories for ground chuck, with 40 Calories from fat; 66 Calories, 28 from fat for mutton; 31 Calories, 6 from fat for goat and 34 Calories, 8 from fat for caribou.<sup>36</sup> Ounce per ounce, harp seal contained more chemical energy than other readily available meat. And adult males can grow up to 360 pounds,<sup>37</sup> which is a considerable return in investment. As I have quoted above, poorer farms ate more seal than land animals; why would wealthier farmers turn up their noses at so rich of a food source?

*“Having forced myself out of curiosity to taste seal while I was in Greenland, and not gotten beyond the second bite, I can understand why people from a European dietary background might prefer venison over seal if given the choice.”*<sup>38</sup>

*“The meat itself is bizarre. It’s deep and dark like duck or venison, but the animal has developed a totally different way of storing fat, due to its life in the cold North Atlantic. It doesn’t have marbling; instead, the fat is liquid, like oil, and permeates all of the meat. “When you handle seal meat it’s almost like a lanolin kind of feeling, your hands get so soft,” says Perrin. But that oil is also one reason seal hasn’t caught on away from the coasts where it’s caught: like many oils (walnut and flax come to mind), seal oil goes bad incredibly quickly; there’s no good way to preserve it. That’s why the native seal-hunting peoples of Canada tend to eat it raw; it’s not for religious purposes, it’s simply because seal meat has a very short lifespan and is best when freshest.”*<sup>39</sup>

*“Seal flipper tasted like bear meat cooked with seaweed: dusky, feral, tidal.”*<sup>40</sup>

*“Seal flipper pie as usually prepared is one of the worst things I have ever put in my mouth. Imagine dog legs frozen in open air, tossed into the bottom of a boat, stored in a freezer for months, cleaned to get rid of residual fat, and baked in a pot pie. I’ve had edible pie exactly once in 25 years, done by a grad student from a freshly-killed animal without freezing. Still tastes fishy. I’ll take a turkey pot pie any day.”* Dr. Steven M. Carr:<sup>41</sup>

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30 Diamond, p.224-5

31 Diamond, p.227

32 Francis, p21

33 Arneborg et al, Norse Greenland Dietary Economy, p.6

34 Smith

35 Lind

36 SELF

37 verious sources

38 Diamond, p.233

39 Nosowitz

40 Kauffman

41 Lind



Yum.

Keep in mind that the Norse were Christians, during this time period, and did not eat meat on fast days or during lent. That was okay as seals were considered “kosher” for lent and were, like beavers, swans, capybaras and alligators, treated as fish.<sup>42</sup> So, even though the wealthiest of the Greenlanders could have better fare on most days, they would have to choke down seal along with their poorer neighbors on meatless days.

## Whale

The Norse did not hunt for whale: they possessed no harpoons and the sagas do not mention any whale hunting around Greenland, but they did take advantage of washed up carcasses. The Saga of the Greenlanders give the following description, “Soon, they got their hands on rich and plentiful provisions when a large, fresh rorqual (whale) was stranded on the beach. After they had cut it up, there was no shortage of food.”<sup>43</sup> The Norse of Norway, Iceland and the Shetland Islands were whale hunters, but the technology and skill did not make their way to Greenland, which does make sense: the settlers of Greenland were farmers, not whalers, and whaling was not a skill one would just pick up. The Inuit were whalers but relations between the Norse and Inuit were never good enough for the Inuit to teach the Norse how to whale or to trade the all-important harpoons, air bladders and umiaks.<sup>44</sup> Also, the sea captains who visited Greenland were traders, not whalers, and if any whale hunters did stop off at Greenland for re-stocking or trade, it would not have been in their best interest to teach the Greenlanders how to hunt whale.

There were enough washed up carcasses that the Norse were able to fashion furniture from whale bones and to use baleen to lash together their boats.<sup>45</sup> Even one whale carcass per year would have been seen as a boon. A bowhead whale can grow up to 100 tonnes; if washed up freshly dead, it would provide enough meat to feed all of the Norse on the island for months.

*“Laxdaela saga describes a new settlement in Iceland as an excellent location, because there was “an abundance of stranded whales and plenty of salmon, and good fishing-grounds year round”. In the depth of winter and the grip of famine, whales provided resources that the land could not, when men were otherwise unable to provide for themselves. Gul-thoris saga depicts a whale that feeds many farms in the north of Iceland as the end of winter: “a whale drifted ashore on an island called Hvallatur...Thorir went out and cut up the whale. He took some of it home, but game some to the people of the district. A large part of the whale still lay there which had not been cut up.”<sup>46</sup>*

One ounce of bowhead meat contains 130 Calories with 116 coming from fat, 3.5g of protein, a good deal of Vitamin A, Omega fatty acids and calcium while one ounce of blubber<sup>47</sup> contains 244 Calories, with 243 from fat, and 14% of one’s daily intake of cholesterol.<sup>48</sup> Various sources on the Internet state that whale meat tastes like moose or reindeer, and that the blubber does not. I found references comparing the taste of blubber to congealed gravy, to walnut oil flavored bubble gum, to, in the words of scruffycat on Yahoo Answers, “As to taste....ever smelled the rubber padding under a VERY old and worn carpet? That’s exactly what it tasted like to me....or rather what the juices tasted like, as I could not bite an actual piece off to chew.”

## Game

Greenland also had a number of wild animals that the Norse could hunt. Caribou,<sup>49</sup> Arctic hare and fox.<sup>50</sup> The hare and fox could have been hunted by bow and arrow, slings, traps, or even with the Greenland gyrfalcon, which were caught and exported to falconers across Europe. While hare and fox don’t provide much meat, anything to break up the monotony of seal meat would have been welcome. Their pelts were also collected and exported.<sup>51</sup>

*“Ameralik and Kangarsuneq Fjords still have the best caribou hunting in Greenland, in the mountains behind the Western Settlement. The Norse killed animals that walked by the farms even in the dead of winter, as the caribou scratched through the snow to find reindeer moss, and used valley bottoms for shelter from winter storms. The Norse*

42 Goldman and Smith

43 Somerville; McDonald, p.317

44 Large kayaks designed for whale hunting and cargo transportation

45 Vebaek, p.67

46 Hudon, p.85

47 Called muk tuk in the Inuit language.

48 SELF

49 North American reindeer

50 Barraclough

51 Barraclough and Cranz, p.73

*had two types of dogs, one of medium size presumably for herding, and a larger type like a long limbed deerhound. These large dogs drove the caribou down to the fjord to kill, or through lines of waiting hunters, and even brought down wounded animals on their own.”<sup>52</sup>*

The Norse also traveled north to what was called the Nordrseta to hunt for walrus and polar bear. Although, perhaps not strictly for food.

*“Walrus and polar bears were virtually confined to latitudes far to the north of the two Norse settlements, in an area called the Nordrseta (the northern hunting ground), which began several hundred miles beyond Western Settlement and stretched farther north along Greenland’s west coast. Hence each summer the Greenlanders sent out hunting parties in small, open, six-oared rowboats with sails, which could cover about 20 miles per day and could hold up to a ton-and-a-half of cargo. Hunters set off in June after the peak of the harp seal hunt, taking two weeks to reach the Nordrseta from Western Settlement or four weeks from Eastern Settlement, and returning again at the end of August. In such small boats they obviously could not carry the carcasses of hundreds of walrus and polar bears, each of which weighs about a ton or half-a-ton respectively. Instead, the animals were butchered on the spot, and only the walrus jaws with the tusks, and the bear skins with the paws (plus the occasional live captive bear), were brought home, for the tusks to be extracted and the skin to be cleaned at leisure back in the settlements during the long winter.”<sup>53</sup>*

An adult walrus can weight up to 2,200 pounds; polar bears can weigh as much as 1,600 pounds.<sup>54</sup> Assuming that half of that weight was usable meat, two or three kills could fill a boat. However, this appears to me to be waste of valuable resources and manpower: Four to eight weeks of travel time, plus the time for hunting, for a ton-and-a-half of meat? Plus the supplies necessary to accomplish that mission. That time could have been spent gathering seabirds and their eggs, fishing, collecting seaweed and edible plants, or making repairs to houses and barns. I think that these hunting parties were going after more valuable product than meat. We do know that live polar bears were captured and given as gifts. The Saga of Einar Sokkason tells of a Kolbein Thorljetsson who, in 1126, sailed to Norway with a live polar bear that he gave as a present to King Harald Gilli.<sup>55</sup> “In the Hungrcaka it is stated that Bishop Isleif gave Emperor Henry III a polar bear which had come from Greenland, and this bear was ‘the greatest treasure’. In 1123 Einar Sokkason shipped a bear, along with his cargo of walrus-hides and ivory, which, as already been explained, in due course he presented to the King of Norway, in order to gain the latter’s support for the establishment of a bishopric in Greenland.”<sup>56</sup> I would guess that it was much easier to capture and transport a cub than an adult, still: not a boat ride I would want to take.

But, the occasional live bear aside, the pelt of a polar bear was more valuable than the entire carcass. A shipload of polar bear pelts was sent by the Western Settlement in 1327 for taxes and tithes and “was easily converted to twenty-eight pounds of pure silver in Bergen for the Holy See.”<sup>57</sup> I’m willing to bet that the bears were skinned and only their pelts were brought back. I was unable to find out the weight of a polar bear pelt, but after checking with various hunting and taxidermy forums, a 6.5 foot black bear pelt, with the head and paws attached, weighs between 50 and 60 pounds. I estimate that a 10 foot polar bear pelt, with the head and paws, would weigh well over 100 pounds. A six-oar boat could carry up to 30 pelts, with some meat for the return voyage. The hunters most likely sustained themselves on the meat, which, apparently, tastes like mutton.<sup>58</sup>

Walrus were also hunted for other things than meat.<sup>59</sup> Walrus tusks were very valuable when access to elephant ivory was restricted. Excavations of the cathedral at Gardar, built in the 12th century, uncovered gaming pieces and a crozier head made of walrus ivory.<sup>60</sup> I was unable to find a picture of the mentioned crozier head, but there appear to be hundreds of pictures of medieval crozier heads made from walrus ivory from all parts of Europe. Outside of the cathedral grounds, pieces of ivory are very rare, although pieces of walrus skulls and jaws carved into gaming pieces are common enough, it suggests that long-range trade in ivory was so important that little to none of it was used locally. “Ivory was an export product, in the production of which everyone in the Norse settlement participated as evidenced by the extraction detrius found in almost every household. It was valuable enough that almost none was kept for domestic production.”<sup>61</sup>

*“In A.D. 1327, a load of walrus tusks from Greenland was sold in Bergen. ... This was the Peter’s Pence and the*

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52 Francis, p25

53 Diamond, p.241

54 Various sources

55 Various sources

56 Marcus, p.92

57 Seaver, p.92

58 Cranz, p.73

59 I asked Google what walrus meat tastes like: “a bit like horse meat with a slightly fishy taste.”

60 Logan, p.60

61 Leone; Knauf, p.211

*six-years tithe, a crusade tax which eventually helped finance King Magnus Eiriksson's 1340ies crusade against Novgorod .... The load of tusks may be estimated to 802 kilograms, suggesting ca 520 tusks representing some 260 animals. ... The computed value of the 520 tusks from A.D. 1327 runs into something like 780 cow equivalents, or nearly 60 metric tons of stockfish. ... A record from A.D 1311 shows that a total of 3,800 Icelandic farmers paid their (tax of) 20 ells of vaðmál (woollen cloth). The value that went to the king has been estimated to 317.5 cow equivalents, making the total (Greenlandic) payment twice as much, i.e. 635 cow equivalents. ... Thus the value of the Greenland tusks from A.D. 1327 (representing the six years' tithe) was worth more than the annual tax from nearly four thousand Icelandic farmers.*<sup>62</sup>

Not just the tusks; walrus hide was also valuable. "Its hide is thick and good to make ropes of; it can be cut into leather strips of such strength that sixty or more men may pull at one rope without breaking it."<sup>63</sup> Recent finds suggest that Iceland's walrus population was driven to extinction due to the value of the hides, tusks and meat.<sup>64</sup> Many of the Norse sagas speak of the value of walrus-hide ship's ropes and belts.<sup>65</sup> Walrus hide ropes were used for ship's rigging and anchor lines due to their natural strength and water resistance.<sup>66</sup> Like with polar bears, valuable cargo space could be filled with walrus heads and hides rather than with entire animals. The meat of the skinned and beheaded walruses would have been consumed by the hunters and it's blubber burned for fuel, as I don't think the hunters would have brought very much firewood with them.

*"Walrus and polar bear bones are found in small numbers on almost every Norse site investigated, in both settlement areas, and on both inland and coastal farms. This unexpected distribution, like the distribution of seal and sea bird bones, suggest the working of a social rather than a biological mechanism. ... the most common walrus bone elements come from the skull around the tusk (maxilla) or the peg-like post canine teeth behind the tusk. ... Scapula and rib fragments suggest that while most of the walrus bone brought back was associated with tusk butchery units, some meat bearing elements also reached some farms participating in the hunt. The polar bear elements are mainly those associated with final finishing of raw skins removed elsewhere."*<sup>67</sup>

We know that the extraction of the tusks and teeth was a cottage industry throughout Greenland:<sup>68</sup> jaw bones were divided out to a multitude of households so that many people could extract the valuable teeth, most likely over the winter when people were stuck indoors. I believe that the tusks, which can grow up to three feet in length and up to 12 pounds in weight, were used to pay the island's taxes and tithes and the teeth, which are only around 2 inches in length, were the property of the workers; sort of a national salary that each household could use to purchase luxury items from visiting merchants.

## Birds:

Greenland is home to a number of bird species year round and is the nesting site of many migratory bird species, all of which could have been hunted for meat, feathers and for eggs. "They collected guillemots in late summer, butchering the partly flightless sea birds in a seasonal glut, before taking advantage of seasonal caribou migration in the autumn."<sup>69</sup> Middens of three Norse farms near the head of the Ameralik fjord contained nearly 30,000 bone fragments dated from around 1000 to 1400. 201 of these bone fragments were from ptarmigan and 124 from a variety of guillemot. The middens also contained bones from two species of divers, whooper swan, white-fronted geese, Icelandic gull, and several other species.<sup>70</sup> Birds could have been caught with nets or traps; I do not think that the Norse hunted the smaller birds with bow and arrows, but they could have used hunting gyrfalcons.

It goes without saying that bird's eggs have almost everywhere been collected and eaten. Brunnich Guillemont's eggs are "twice as big and just as good to eat as hen's eggs, and yield 1988 calories per kilogram as opposed to 'medium quality beef' which yields only 1358 calories per kilogram."<sup>71</sup> Ptarmigan eggs are about the size of those from quail,<sup>72</sup>

62 Frei, p.446, quoting from Keller 2010, 5-6

63 The King's Mirror, p.140

64 Frei, p.441

65 Although most of the sagas refer to walruses as whales.

66 Marcus, p.50

67 Vebaek: Narsaq p.66-7

68 Various sources

69 Francis, p.29

70 Vaughan, p.38-9

71 Vaughan, p40

72 Hosking



but they lay clutches of 8 to 10.<sup>73</sup> The Icelandic gull egg is the size of two modern chicken eggs.<sup>74</sup> While we don't know if the Norse Greenlanders preserved their eggs, by cooking and pickling them, or if they only ate them fresh; the Inuit of Greenland still stash eggs under rocks to freeze them. Weeks or months later, the frozen eggs were retrieved, shelled and eaten raw.<sup>75</sup> 18th Century Icelanders preserved eggs by packing away fresh eggs in certain kinds of ashes, which preserved them for several months;<sup>76</sup> while there is no evidence that the Greenlanders did this, it does appear to be a low-tech method of preservation well within the capability of the Greenlanders.

Hunting eggs would have been easier; just chase the birds away and take them from the nests. For birds that nested along steep cliffs, it would have been a bit dangerous to get to the eggs, but Icelanders had a tradition of hunting eggs on cliff faces.<sup>77</sup> There is no reason why Greenlanders would not have continued this tradition.

## Fish:

Surprisingly, this is a controversial subject. Well, as controversial as the designated hitter rule.<sup>78</sup> Discussions of whether or not the Norse of Greenland ate fish range from polite statements, both for and against, to screaming matches on Internet forums. We must look at the existing evidence, both for and against the possibility of the Norse catching and eating fish.

In the 'against' column, there is a distinct lack of fish bones, in proportion to the bones of animals and birds. "Even at the GUS site, which yielded the largest number of fish bones - 166, representing a mere 0.7% of all animal bones recovered from the site - 26 of those bones come from the tail of a single cod, and bones of all fish species are still outnumbered 3 to 1 by bones of one bird species (the ptarmigan) and outnumbered 144 to 1 by mammal bones."<sup>79</sup> There are many who support the theory that the Greenlanders made a conscious decision to avoid fishing, for some reason; Diamond, Dugmore, McGovern, et al. The various incarnations of this theory propose that the Norse did not eat fish for some taboo reason, or they were convinced that the fish was harmful, or that they spent their time hunting seals instead of fishing. There is no evidence to support any of these theories.

There is also the nature of fish hooks. Medieval Norse, apparently, only fished with a hook and line, not with a net<sup>80</sup> and there is a distinct lack of both fish hooks and sinkers from any of the excavated sites in Greenland. Thomas McGovern, currently a professor of environmental archaeology and zooarchaeology at Hunter College, concluded that because of the lack of hooks and sinkers, and the comparative lack of fish bones, the Norse did not make use of the abundant fish on and around Greenland. I do wish to point out that the lack of evidence is not proof that the evidence was never there.

A poor argument on the 'for' side is that of course the Norse ate fish, why wouldn't they? Well, a bad case of food poisoning can keep one away from a particular type of food for life. A charismatic person could have convinced others that fish were bad in much the same way that tomatoes and potatoes took so long to be adopted by Europeans. I will admit that the argument that the Greenlanders avoided fish due to religious reasons is difficult to support, as the significance of fish in the Catholic faith. I would also say that the counter argument to the missing fish bones that makes the case that the soil of Greenland is acidic and small, fragile fish bones just don't last long in the ground just doesn't add up. Yes, the soil is acidic but small, delicate bones of birds and some of cod have been preserved. Fish bones have survived in the middens and sewers of Pompeii and Herculaneum for twice as long as those on Greenland. It is a poor argument.

There is no reason to assume that the Norse 'only' fished with fish hooks, Jared Diamond recounts his visit to Greenland in seeing a Danish tourist who had caught two 2 pound char with her bare hands.<sup>81</sup> The Norse had hands just as quick and clever as the above mentioned tourist: there is no reason why they could not have caught a slow fish with fast hands. There is also no reason why a Greenlander would not use a seal net to catch fish: just because that's not how Icelanders fish doesn't mean Greenlanders wouldn't try it. Unfortunately isotopic data of human remains cannot distinguish a between seal and fish in terms of diet<sup>82</sup> so we cannot make any definitive conclusions as to what marine life the Norse actually ate and archaeologists will be debating this issue for quite some time to come.

*"In Iceland, fish (both marine and freshwater) were an important wild resource (McGovern et al., 2007; Sveinbjörn-dóttir et al., 2010), but this does not appear to have been the case in Greenland. Fish bones are so rarely discovered*

73 Various sources  
74 Hosking  
75 Vaughan, p.41  
76 Williams, p.186  
77 Williams, p.186  
78 I'm against it.  
79 Diamond, p.229  
80 Seaver, p.34  
81 Diamond, p.229  
82 Various sources

*in Norse contexts in Greenland that Dugmore et al. (2012) have hypothesized that the earliest Norse Greenlanders may have made a conscious decision to avoid fishing and to focus on sealing. This, they argue, was a pragmatic way of addressing a probable subsistence gap in early spring (McGovern, 1994), which was filled by the harp and hooded seals that arrived with the drift ice in the fjords of southern Greenland. Indeed, there is much persuasive evidence to support such a conclusion, such as the paucity of fish bones in middens and lack of any material culture relating to fishing (Dugmore et al., 2012). Yet, this overlooks the fact that the absence of fish bone may be a result of the Norse treatment of waste and the preparation of fish products, which would have been cleaned at the fishing grounds (Arneborg et al., 2012b). Furthermore, it fails to explain the near absence of freshwater fish, which could have been exploited with ease (especially in Vatnahverfi). Ívar Bárðarson made reference to ‘a great fishing lake’ in his Description of Greenland (Ingstad, 1966), which suggests fish may have been of greater importance to the Greenlanders than the archaeofaunal record currently suggests.”<sup>83</sup>*

*“Fish Bones are extremely rare on Norse sites in Greenland, in contrast to their abundance in contemporary context in Iceland. The single specimen from I17a upper is a galid (cod family) vertebra.”<sup>84</sup>*

*“Fish and molluscan remains are rare in the Vatnahverfi, as they are in most collections from Norse Greenland.”<sup>85</sup>*

*“Fish bones are very rare in the excavated assemblages, which has given rise to a debate as to whether the Norse Greenlanders fished at all. The apparent lack of fish bones may well reflect the handling of refuse or methods of fish preparation. For example, fish could have been cleaned at the fishing grounds. The majority of the bone assemblages derive from midden deposits outside the farm buildings. It is possible that dogs, foxes, or ravens may have eaten the fish bones lying on these refuse dumps. In contrast, all finds from GUS derive from inside the building complex itself. Here, meticulous sieving of deposits from the house floors resulted in the retrieval of relatively large numbers of fish bones, and there is no doubt that the Norse did exploit the rich fish resources for dietary purposes. Sculpin (*Myoxocephalus scorpius*), arctic char (*Salvelinus alpinus*), capelin (*Mallotus villosus*), cod (*Gadus morhua*), three-spined stickleback (*Gasterosteus aculeatus*), and halibut (*Reinhardtius hippoglossoides*) are all represented in the bone assemblages from GUS.”<sup>86</sup>*

*“The marine element should derive first and foremost from seal according to the animal bone assemblages found in middens in Greenland Norse settlements. Fish bones are nearly absent in the collections. This may, however, be explained by taphonomic biases such as the well-known poor preservation of fish bone and its appeal as a food source to both birds and domestic animals like dogs. It is hard to believe that the Greenland Norse did not tap the very rich resources of fish in the fjords, as did their relatives all over the North Atlantic and in Norway. Future isotope research may shed light on the extent to which fish actually formed part of the Greenland Norse diet.”<sup>87</sup>*

*“Both seaweed and fish were abundant, not at least the herring-like ammassat (capelin/*Mallotus villosus*), which can at many places close to the Norse farmsteads be “scooped” out of the water with buckets. It is therefore surprising that a study of isotopic nitrogen and carbon values in Norse animal husbandry show them - apart from the pigs and dogs - to have a minimal marine intake (Nelson et al. 2012). Although marine fodder could taint the taste of meat and milk, it is hard to believe that the Norse would have led the valuable and hard-to-replace livestock starve to death rather than to have them survive with an unpleasant aftertaste. If disbanding with a paradigm of arctic marginality, could this be taken to indicate that other supplemental fodder resources were preferred and sufficient? However, foraging for other fodder sources at distance from the farmsteads must also have been labor intensive.”<sup>88</sup>*

*“..given Norse traditions in fishing and curing cod, in which head and spines were preferably removed before the cod were hung across wooden poles to dry. Fish entrails apart from the valuable livers were often used as fertilizer, while other fish scraps - dried and crushed heads and spines included - would have been food supplements for both people and animals. A large codfish head is still considered a delicacy in both Iceland and Norway.”<sup>89</sup>*

I think that the Greenland Norse did exploit fish, both fresh and salt water varieties. They certainly made enough

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- 83 Ledger, p.31
  - 84 Vebaek: Narsaq p.67
  - 85 Vebaek: Vatnahverfi p.96
  - 86 Arneborg, et al, Norse Greenland Dietary Economy, p.7
  - 87 Arneborg, Change Of Diet, p.165
  - 88 Madsen, p.245
  - 89 Seaver, p.34

references to it in the surviving sagas. A line attributed to Leif Erikson is “Greenland is like a poor gnawed fish-bone and Vinland is like a huge sturgeon brimming with oil and stuffed with roe”.<sup>90</sup> Greenland was settled by Icelanders, a people with a rich history of fishing and unlike whaling, which requires specialized skill and tools, fishing can be done by almost anyone. Not only did early descriptions of Greenland mention fish, but so did Eirik’s Saga about Vinland, “There was a vast number of animals of all kinds in the forests, and every river was full of fish. They dug pits by the shore, and at low tide there was halibut in these pits.”<sup>91</sup> The translators, Helge and Anne Stine Ingstad, make the following note: “This is an ancient Norse method of fishing, employed in northern Norway, but the saga is on the wrong track when specifying halibut, a deep water fish - this method was employed when catching flounder.”<sup>92</sup> If the Greenlanders did not eat fish, why would they make note of how many fish there were in the Vinland rivers? That would not be of any interest for a people who did not eat fish. That would be like selling property to vegans by telling them that the rabbits are so tame they will hop right into the oven. The Norse Greenlanders, in my opinion, ate fish and recognized how abundant the fish were in and around their home.

*“Additionally, fish abounded in both the fjords and mountain lakes; Lysufjord got its name from lysa, a type of cod, while Agnafjord came from agn, or fishing. Perfect suited for a windy, cold, and bright climate, Atlantic cod ended up on racks drying into stockfish in Greenland, and provided food on voyages and hunts “spread with butter or blubber for more calories.” Nine years before Diamond’s comment about the Norse having a prohibition against eating fish, Kristin Seaver, a naturalized American writer of Norwegian birth, solved the issue of the Norse supposedly not eating fish in her 1996 book The Frozen Echo: Greenland and the Exploration of North America ca A.D. 1000-1500. Medieval Norwegian sites also lacked fish bones and fish heads, for these were too valuable to throw away; rather they were ground into valuable protein powder to feed cattle and horses. From her own childhood, Seaver remembered Norwegians grinding fish bones into protein powder for human use during World War II.”<sup>93</sup>*

*“ Next lies Eijnerfjord, and between it and Rampnessefjord there is a large farm which belongs to the king; the farm is called Foss, and there stands also a costly church dedicated to Saint Nicholas, which the king holds to rent. Nearby is a large island with huge fish, and near it a great lake. When rains come water flows in and out; here are countless fish lying on the sand. When one sails into Eijnerfjord there lies on the left a bay which is called Tordzualsviigh, and further into the fjord on the same side is the little promontory which is called Kleinengh, and further still a bay called Grauevigh. Further still is a large farm called Daler which belongs to the cathedral, and on the right side, as one sails into the fjord to the cathedral, which is at the end, there is a large forest that belongs to the cathedral, and that provides all of its income, both large and small. The cathedral owns all of Eijnersfjord, and also the large island which lies off the fjord and is called Renøe, so-called because in autumn countless reindeer run there; hunting is by common rights, but not without the bishop’s permission. On this island there is the best soapstone, which in Greenland is of such good quality that it is used to make pots and pans. It is so consistent that fire does not damage it, and it is made into vessels large enough to hold ten or twelve tuns. Further from land lies an island called Langhøø, and on this island are eight large farms; the cathedral owns all of the islands except the tenth, which belongs to Hualzer church’. Ivárr Bárðarson’s Description of Greenland (75-97), mid-late 14th c. AD”<sup>94</sup>*

*Fishing did take place as evidenced by fishing gear like hooks and sinkers that have been found in Norse ruins in Greenland (Veback 1991:12-13), parts of nets that have been found in ruins in the Western Settlement (Arneborg 2004:269), and sources which mention processed dry fish (Halldorsson et al, 1935:290). However, buildings that can definitely be linked to fish processing have not been found. ... Helge Ingstad suggested that the Greenland Norse cooked the fish bones into a thick soup and either ate it themselves or fed it to the cows, or that they used the leftovers from the fish processing as a fertilizer on the hay fields (Ingstad 1992 109). Both methods are known from Norway and Iceland. This kind of bone soup was in Iceland called brudningur or strjugur and was made from fish bones, mainly the skull...After all the fish meat was had been eaten from the skull, it was submerged in whey, which made it soft and edible.”<sup>95</sup>*

It is also worth noting that the Greenlanders had plenty of methods for preserving fish, from freezing it underground, to pickling it, to drying it. All it would take would be a cold and windy climate and someone who knew what to do. Someone from Iceland perhaps, where the process of turning freshly gutted and cleaned cod into stockfish was well known. “Stockfish requires no salt, an expensive commodity in medieval Europe, which in turn means that no extra in-

90 Barnes, p152  
 91 Ingstad; Ingstad, p.90  
 92 ibid  
 93 Francis, p.24-5  
 94 Frei, p.445 and Madsen,p.77  
 95 Guðmundsson, p71

vestment was needed. The resulting high-protein product was ideal for consumption during long voyages when drinking water would be at a premium and cooking a high-risk endeavour.”<sup>96</sup>

## Crops

Just as controversial as fish is the subject of grain: did the Norse grow crops in Greenland? “The Kongspillet<sup>97</sup> in the early 1200s proclaimed: ‘But most of them do not know what bread is, and have never seen bread!’”<sup>98</sup> The Norse, in other places, did grow a variety of crops, cereal and otherwise; wheat, oats, barley, rye, cabbages, onions, peas, beans, hops and flax, for linen. At all Norse sites, the importance of crops diminished the farther north one traveled.<sup>99</sup> The wetter and colder the climate, and the reduced amount of daylight, the more problematic crop growing became.

There is no evidence of Greenlanders growing the traditional vegetables of the Norse, at least not on a long term basis, and it is unlikely that the soil of Greenland could have supported such cereal crops to sustain a population of 3,000 to 5,000 people year after year. “We know they grew the sort of crops they would have grown in Norway, France, England and Ireland - crops that may have been too intense for the soil.”<sup>100</sup>

*“As to whether any sort of grain can grow there, my belief is that the country draws but little profit from that source. And yet there are men among those who are counted the wealthiest and most prominent who have tried to sow grain as an experiment; but the great majority in that country do not know what bread is, having never seen it. ... You ask what the inhabitants live on in that country since they sow no grain; but men can live on other food than bread. It is reported that the pasturage is good and that there are large and fine farms in Greenland. The farmers raise cattle and sheep in large numbers and make butter and cheese in great quantities. The people subsist chiefly on these foods and on beef; but they also eat the flesh of various kinds of game, such as reindeer, whales, seals, and bears. That is what men live on in that country.”<sup>101</sup>*

Modern cereals and vegetables do grow on Greenland; in greenhouses and in small, fenced off fields in the south of the island. Soil for the greenhouses was shipped in from Canada and modern fertilizers are required for the barley to grow without depleting the soil of nutrients.<sup>102</sup> The soil of Greenland was, and still is, very fragile and susceptible to erosion and over growing. Barley production has only been recently started using modern varieties bred for resistance to cold weather and to have early maturity, such as Tiril and Arve.<sup>103</sup>

*“The mountains in South Greenland consist primarily of acidic rocks such as granite, gneiss and sandstone. Soils that develop from these rocks are acidic and low in nutrients. Many types of soil have a limited capacity to absorb water, and occasionally there is a lack of precipitation, particularly in the inner fjord areas. Droughts occur during the summer, causing low coarse fodder yields and economic difficulties. Permafrost, which is defined as soil that is at or below the freezing point of water (0°C) for at least two years, is found sporadically in the lowlands of South-west Greenland.”<sup>104</sup>*

There has been little evidence for grain farming until recently:

*““We excavated the rubbish heaps down to the bottom layers, which date from the time the settlers arrived,” says Henriksen, whose team took 300 kg of samples for further analysis. “The sample we took from the bottom layer of a heap contained grains of corn. The grains had been close to a fire and were charred, which preserved them.” From their shape and size, the grains of corn were identified as barley with complete certainty. And they came from agricultural production. Wild barley is not strong enough to grow in Greenland, says Henriksen, who also rules out imported barley, as even small quantities of grain would be too much for the cargo hold of the Vikings’ ships. “If the corn had been imported, it would have been threshed, so finding parts of grains of barley is a very strong indication that the Vikings grew their own corn,” he adds. The find also confirms researchers’ theory that the Vikings tried to continue the form of life they knew so well from their original homes.”<sup>105</sup>*

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96 Seaver, p.33

97 King's Play

98 Francis, p.23

99 Various sources

100 Mason

101 King's Mirror, p.143-145

102 Wrigley

103 Reykdal; et al, p.22

104 Reykdal; et al, p.20

105 Hildebrandt



*“Archaeobotanical studies have never played an important role in the analysis of Norse resource utilization, and our knowledge of the Norse use of plants and berries is virtually non-existent. Knud Krogh (1982:103) reports on pollen of oats found in the turf wall that surrounded the small 11th-century church at Brattahlid, showing that the Norse Greenlanders, at least in the first period of settlement, grew or tried to grow cereals for either porridge or bread. At GUS in the Western Settlement, a fragment of a quernstone made of local material was found bordering an 11th century fireplace. This find, quernstones from other farms, and a single fragment of a baking plate - unfortunately without provenance - confirm that the Norse Greenlanders may have made bread, though not the leavened bread made with yeast which is mentioned in the King’s Mirror, but flat bread called leiv (Norwegian). Leiv was made from flour kneaded with water and baked in the hot ashes on flat baking plates.”<sup>106</sup>*

It is worth noting that the oldest bread oven found on Greenland is a French design dating to the end of the 18th century, however “large ovens or stoves, interpreted as either bath stoves or drying kilns for grain, were found at four of the farms – Ø64a, Ø64c, Ø71 and Ø167”.<sup>107</sup> Flat bread was most like cooked over or next to a fire.<sup>108</sup>

*One millstone has been found at each of the farms Brattahlid, E66 South Igaliku and Hcalset and at least four at Gardar. GUS was first settled ca. AD 1000 and in the second oldest archaeological level a millstone was found. Helge Ingstad points out that millstones turned by hand in Norway were also used to mill different kinds of wild plants, mosses, roots and fish bones which were used in bread and porridge. Not all quernstones were meant for imported grain. Discs made of soapstone for frying crisp bread have been found at several of the same sites.<sup>109</sup>*

*“Aside from these weedy species agricultural plants such as the cereals barley (*Hordeum*-type) and oats (*Avena*-type) were introduced. *Hordeum* appears more frequently in pollen diagrams (Erlendsson, 2007) whilst *Avena* is much rarer and where identified, such as at Ketilsstaðir, it is often interpreted as a weed within the barley crop (Erlendsson et al., 2009). Given the difficulties of identifying cereal-type pollen (Andersen, 1979) it is possible, that some of the *Hordeum*-type could be *Elymus arenarius*, a native wild grass historically used as a substitute for cereal in times of famine (Guðmundsson, 1996). A single occurrence of *Linum* (flax) has also been noted (Einarsson, 1963), which is similar to a rare occurrence of the plant at the site of Sandnæs in the Western Settlement of Greenland (Fredskild and Humle, 1991).”<sup>110</sup>*

*“The common perception is that cultivation of cereals in southern Greenland was not viable as a result of the harsh climate (Barlow et al., 1997). Documentary evidence from the Kings Mirror, a Norwegian manuscript dating to the early 13th century, records that some of the wealthiest Greenlanders at least attempted to grow grain (Larsen, 1917), although whether this can be substantiated is a matter of debate. Böcher et al., (1968) suggest that four cereal crops - *Hordeum vulgare*, *Hordeum distichum* (barley), *Secale cereale* (rye) and *Triticum aestivum* (bread wheat) - can be found in southern Greenland today. Of these there is plentiful evidence that *Hordeum vulgare* will, and is, grown today, but does not necessarily ripen (Schofield et al., 2007; Edwards et al., 2008; Moetzfeld per com., 2010). Additionally, Fredskild (1978: 37) suggests that ‘the south Greenland sheep farmers today grow barley, rye and oats for hay and ensilage’. Therefore it is plausible to assume that early Norse settlers made similar efforts to cultivate grain. Indeed, there is a growing corpus of ecofactual evidence to suggest that at the very least the Norse Greenlanders had access to cereal grains.”<sup>111</sup>*

*“The Greenland Vikings certainly played a part in their own demise, not just through the over-farming mentioned above, but also through destroying native vegetation for farmland and cutting turf that was not as rich in minerals as they were used to. Thanks to a heavy reliance on livestock farming, trees and crops may have been trampled by introduced livestock in the fragile winter months; there is soil evidence from the lakes and rivers that many nutrients were simply washed away. We know this from the extensive palynology (pollen analysis) and radiocarbon dates that show a severe change in the topography and the crops that were being planted between the Viking arrival at the end of the 10th century, and the early 14th century where it all went wrong, replaced native trees on a mass scale.”<sup>112</sup>*

*“It has previously been discussed whether it was at all possible to grow barley to maturity in southern Greenland during the Norse period (Hansen 1991). Experiments conducted in 1997 by local agricultural consultant Kenneth*

106 Arneborg, et al, Norse Greenland Dietary Economy, p.7

107 Ledger, p5, also p9.

108 Roua and Tara

109 Nedkvitne, no page number

110 Ledger, p.38-9

111 Ledger, p.48

112 Mason



*Høegh showed that Norwegian and Icelandic barley types can reach germination maturity in the inner, warmest regions of the Eastern Settlement (K. Høegh 2011, pers. comm.). The climate during the beginning of the Norse period was as warm as at the present day or slightly warmer (Arneborg 2005) and would not have prevented barley cultivation.*<sup>113</sup>

It is very difficult to distinguish between natively grown cereal crops and imported varieties. While it was possible for Norse traders to bring ship loads of grain to Greenland, it is unlikely that they could have brought enough, year after year to feed the masses on the island. Also, it would not have been economical to transport cereals prior to threshing: not only would have taken up too much space aboard the open decked longships, but it would have been very difficult to keep dry on the voyage from Iceland. Once wet, cereal straw suffers from rotting unless it can be dried out. If grain were imported, it would have had to have been threshed and sealed in water proof containers.

But, this should not be an issue. Oak barrels can be made water tight, and in the absence of readily available timber, barrels would be especially useful to store food, and valuable in their own right. We do have evidence that grain was sent from Norway to Iceland and to Greenland. Trade ships could carry enough grain to make life better for the Greenlanders, although I do not think that they could have feed the entire island year after year. The WHO, UNICEF, and other global health organizations, estimate that 40kg (105#) of wheat is required to feed a family of five people for one month, assuming that 80% of their calories will be provided by the wheat. This is about 2 bushels of wheat corn. Norse ships varied in size and it is estimated that they could carry between 4 and 40 tons of cargo, depending of the design and size of the ship. Assuming that half of the weight would come from the containers, we can estimate that a large trading vessel could carry around 900 bushels of corn. This is enough to feed 180 families for a month, if they lived mostly on bread, porridge and beer. With the availability of meat, dairy, fish, and local flora, this grain allowance can be stretched well beyond a month.

*It is worth noticing that a number of mill-stones have been discovered in the East Settlement, especially around Gardar. Though it is possible that the Greenlanders received cargoes of grain from Europe, from which they ground their flour; it is, on the whole, more probably that it was meal which was actually imported to Greenland; in view of the fact that it was flour, rather than grain, which was generally imported to Iceland.*<sup>114</sup>

If the Norse did grow barley, which it appears that they did towards the beginning of the colony, it was most likely grown in small quantities, in enclosures no bigger than their ability to weed and irrigate the crop. The grain would have to have been tightly fenced in to keep hungry sheep, goat, caribou, and cattle out. I also believe that there would have been a competition of time between any barley that was grown (ploughing, harrowing, planting, weeding, and threshing), and the amount of work needed to reap, dry, bundle and transport hay used for winter fodder. Examining the importance of livestock, I will conclude that once the soil in these enclosures became depleted of nutrients, and grain yields dropped below the ratio of work to yield, barley farming was discontinued almost everywhere on the island. My guess is that, eventually, barley might have been grown solely to make the bread used for communion:<sup>115</sup> I feel that it is more likely than the Bishop, priests, the wealthiest of landowners depended on imported corn to provide enough bread, year round, while everyone else depended on native lyme grass.

*In the first centuries the Norse Greenlanders could pay for imports of [grain, malt, iron, timber]. But in the decades after ca. 1330 the international demand for walrus products declined. The Inuit pushed southward and made it risky for the Norse to continue their hunting expeditions to the Disco region. These two developments made the Norsemen cease their production of walrus products for export, and they could no longer pay for imports which they felt were necessary. The Norse Greenlanders must have experienced a gradual decline in their quality of life, and Norse Greenland became a less attractive place to live.*<sup>116</sup>

## Alcohol

It is vitally important for us to understand that the number one pain reliever, in medieval Europe, was alcohol. It was readily available at all social and economic levels and even beer brewed with a small ABV<sup>117</sup> can help ease the aches and pains of manual labor. The Norse of Greenland could not, like us, pop a couple of Aspirins after a hard day's work of hauling in fishing nets. Alcohol is not a requirement for life on Greenland, but access to it would make life slightly better. As I have previously discussed, cargo ships could bring in beer and wine, but certainly not enough to provide a reliable

113      Henriksen. p.429

114      Marcus, p71

115      Something that could not be substituted with seal meat.

116      Nedkvitne, no page number

117      Alcohol by volume.

source for everyone. Nor could they provide a yearly stock to be brewed for the entire island. Various sources state that communion wine was generously donated by some in Norway for the high sacrament. Do we have any evidence that alcohol was brewed in Greenland?

*According to Konungs skuggsjá, many Greenlanders never ate bread. The same goes for brewing material: hops, malt, and yeast. There is good evidence for the importance attached to these last items by the Norse chieftains. Hosting social gatherings where there was plenty to eat and drink was important for their status. According to Fostbraedra saga, one of the chieftains brewed large quantities of beer before Christmas to add to his merit because there were seldom drinking parties in Greenland.<sup>118</sup>*

*Thorkell [of Brattahlid] soon came down to the ship directly it was moored and bought from the captain and crew the things he wished to have. He bought all the malt that they had, and other things which were hardest to procure in Greenland. Next century, in 1131, after the merchant Arnbjorn had been wrecked on the east Greenland coast, and his nephew Ozurr came out the claim his inheritance, a similar custom prevailed. "They [Ozurr and his friends] got the Eiriksfiord from Norway, and men came down to meet them and do business."<sup>119</sup>*

*The same point is illustrated in episodes from two Islendingasögur. The Icelandic merchant Karlsfni stayed one winter at Brattahlid. He then told his hold Eirik Raudi that "on our ship is both malt and grain", and he gave some of it to Eirik so that he could prepare a Christmas feast. Those present "thought they had never seen such generosity (rausn) in a poor land (in fatoku landi)". The malt and grain were part of the commercial cargo to be sold in Greenland; it had not been brought to Greenland as a gift for Eirik Raudi.<sup>120</sup>*

*When Christmas drew near, the chieftain Thorkell at Brattahlid brewed beer (mumgat) since he wanted to arraign a Christmas feast. He did so to obtain honour, since feasts with beer are far between in Greenland. He invited his friends to stay there during the Christmas holidays.<sup>121</sup>*

*According to Pals saga biskups, Bishop Jon smyrill Arnason of Gardar had learned to make crowberry wine from King Sverrir Sigursson. In Iceland, on his way to Greenland, he taught some Ice Landers this art, and without a doubt, his flock in Greenland benefited also from his knowledge. Crowberries are plentiful in Greenland, so there would have been no shortage of material. We know nothing of the quality of the [wine], but it is fair to assume that merchants selling European grape wine would have been welcomed as before.<sup>122</sup>*

*But the pope's flexibility had limits. In 1237 the archbishop told the pope that in some churches in the Nidaros province it was problematic or impossible to obtain bread of wheat and wine of grapes to be used at Holy Communion. People therefore made bread of whatever material was at hand and used beer or other beverages instead of wine. The archbishop was anxious that this would make the sacrament of penance invalid. The pope answered that only bread of wheat and wine of grapes were to be used at Holy Communion. This prescription may have been impossible to practice in Greenland and the Faroes. The Norwegian King Sverrir (1177-1202) was born and been educated as a priest on the Faroes. He taught his foster son Jon, who was to become bishop of Greenland, how to make wine from crowberries...It cannot be dismissed that Greenlandic priests used wine from crowberries in Holy Communion despite the pope's prohibition.<sup>123</sup>*

*Syra was made from skimmed milk and rennet (curdled milk from the stomach of a newborn calf). The calf was killed before it had ingested anything other than its mother's milk and the stomach removed and hung up to dry with the milk still in it. Once dried, it was placed in a vat of salt water or whey for two weeks. It was then removed to another vat and mixed with boiled skimmed milk and left to cool (Fernando-Guerro-Rodriguez, 19-20). This mixture was known as misa (alternately defined as a kind of buttermilk or as curdled milk), which was a popular food, and a by-product of the process of making misa was syra, the liquid skimmed off the misa after it had cooled. The syra was left to ferment for upwards of two years before it could be served. It is said to have been highly acidic and although frequently consumed it does not seem to have been very popular. One would not serve syra to an honored*

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118 Guðmundsson, p67

119 Marcus, p72

120 Nedkvitne, no page number, quoting from Arneborg et al, 2012(b) pp128 and 130-131

121 Nedkvitne, no page number, quoting from Gulathing-lov 20, printed NGL, 1, p11

122 Guðmundsson, p67

123 Nedkvitne, no page number

guest, for example, because it was considered the drink of the lower classes who could not afford mead or ale.<sup>124</sup>

*Malt for the brewing of ale was imported, chiefly from Norway, although the records mention the importing of both grain and malt from Orkney. Other imported food material are seldom mentioned, although there was some importing of honey and flour. ... After the coming of Christianity, communion-wine became a necessity, but it was sometimes in short supply when trading vessels failed to arrive. For this reason, Icelanders began in 1203 to make berry-wine as a [substitute]. Bishop Jon of Greenland taught the Icelanders how to make this wine from crowberries [which] was then used for communion services to some extent until 1237, when the pope forbade the practice.<sup>125</sup>*

The key components to brewing ale are a source of sugar, water, heat, yeast and time. With imports of barley flour and malt, they certainly had access to sugar. Water was plentiful. I would imagine that each household would have always has a fire burning. Yeast grows wild in Greenland.<sup>126</sup> Time the Greenlanders had plenty of. In addition, there were plenty of native plants that could have been used to flavor the ale in lieu of hops. For wine, there were plenty of crowberries once someone taught the farmers and hunter how to turn them into alcohol. Syra was a by product of cheese making. There is no reason why the Norse would not have made alcoholic beverages whenever they could. And if they could make alcohol, they could make vinegar, which can be used for food preservation, dye fixing, as well as for medicinal purposes.

## Seaweed

The shores and shallows of Greenland contain seaweed, which can be used for food for both humans and animals. The Norse collected and dried seaweed in barrels.<sup>127</sup> “The inhabitants of both Iceland and the Faroe Islands seem to have learnt how to supplement their diet with edible seaweed, as witnessed by the words slafak ‘sea-lettuce’, from OIr. slabac, and Icel. myrikjani ... which clearly derives from a Gaelic word (a variety of local forms exist, e.g. mircean in Scots Gaelic.”<sup>128</sup> “Dulse {seaweed} was used as a trading commodity on Iceland since the 700’s. ... Written sources, namely sagas and law codes, record the use of seaweeds as human food on Iceland as far back as the 10th century. ... For the preparation of a meal, seaweed was mixed with butter or lard and served with dried fish....”<sup>129</sup>

*“Burnt residue of knotted wrack ... was found in many samples from most of the middens from both coastal and inland farmsteads, for example at Ø36 which is located 5 km from the coast. Its presence in the domestic middens shows that it was commonly used in Norse households. Seaweed can be used for insulation, fuel or animal feed but is also very tasty (author experience) with a high vitamin and mineral content (Pedersen 2011) and may therefore have been a beneficial part of the diet. The use of knotted wrack as feed for sheep is known from Norway (Pedersen 2011) but isotopic analysis of animal bones from Norse farms in Greenland shows that marine fodder was not used (Nelson et al. 2012).”<sup>130</sup>*

Greenland is home to a number of edible species of seaweed aside from dulse: winged kelp, sugar kelp, bladder wrack, and knotted wrack. Inuit of modern Greenland still forage for these varieties. While not very Calorie laden, (12 Calories per ounce) seaweed is loaded with needed vitamins and minerals. That same ounce of raw kelp contains Omega 3 and 6 fatty acids, vitamins A, K and folate, a small amount of Vitamin C, pantothenic acid, choline, calcium, magnesium, phosphorus, potassium, sodium and selenium. As well as plenty of iodine.<sup>131</sup> No goiters for our seaweed eating Norse. Seaweed also contains plenty of soluble fiber, something that would be seriously lacking in an otherwise all meat diet: up to 7.7g per 100g of seaweed.<sup>132</sup>

*“A number of edible species of seaweed or marine algae occur along rocky shores of the arctic seas and several are used regularly, if mostly in times of scarcity, by the Eskimo. In Greenland, several species, including Rhodymenia palmata and Laminaria spp. are eaten raw, dipped in boiling water or with seal oil. Rodahl (1950) estimated that 50 per cent of the vitamin C intake of the east Greenland Eskimo is derived from marine algae.”<sup>133</sup>*

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124 Mark  
125 Johannesson p307  
126 Admin and Krebs  
127 Seaver, p.32 and Mouritsen, p.14  
128 Bandle, p.328  
129 Mouritsen, p.14-6  
130 Henriksen. p.429-30  
131 SELF  
132 Tiwari; Troy, p.350  
133 Porsild, p.34

Since seaweed contains salt, both sodium and potassium salts, it is possible to produce salt by burning seaweed and extracting the salt from the ashes.<sup>134</sup> “The salt found in seaweed attracts both bovines and caprines - it is mesmerizing to watch Icelandic sheep devouring fresh seaweed down by the shore when they have only to walk a few steps up a sloping shore to reach green grass.”<sup>135</sup> Sheep in the Orkenys are still feed seaweed and their meat is famed for its salty flavor.<sup>136</sup>

## Wild Plants

In addition to growing European crops, at least for a brief time, the Norse would have had access to many of Greenland’s native, edible plants. Not only did the settlers gather berries and mushrooms, but they raised linseed, knot grass, chickweed, lyme grass, angelica and Iceland moss.<sup>137</sup> There are no known poisonous mushrooms, berries or roots native to Greenland<sup>138</sup> so anything that grew was safe to eat, although not all of it would have been tasty or nutritious.

*“Finds from the midden deposits at the Sandnes farm in the Western Settlement indicate that the Norse also exploited edible plants. For example, seeds of crowberry (Empetrum) and mountain cranberry (Vaccinium) were found in small heaps highly reminiscent of human feces. Seeds and other macro-remains of knotgrass (Polygonum), corn spurrey (Spergula) and flax (Linum), which may also have played a role in the human diet, were present in the midden deposits as well (Fredskild and Humle 1991:77-80). In the midden at Niaquusat in the Western Settlement, pollen of Flax and spurrey was found. Spurrey is not an indigenous plant in Greenland, but is a common weed of Northern European grain fields, and the plant may have come to Greenland along with imported corn (Sørensen 1982:302). Flax is represented by both pollen and macro-remains and was most probably grown locally. It may have served as either animal fodder and/or for making linen.”<sup>139</sup>*

The Norse would have had access to scurvy grass,<sup>140</sup> which can prevent and cure scurvy due to its high levels of vitamin C. Scurvy grass is not unique to Greenland as it grows throughout Canada, Iceland and northern Europe, however, due to the Arctic’s shorter growing season and reduced sunlight, the scurvy grass of Greenland is not as potent as that of lower latitudes. David Nicholson, writing for the Royal Society in the 18th century, said that the taste of the whole plant was, “as insipid as the colewort or beet.”<sup>141</sup> Dr. Richard Mead wrote that a Dutch sailor, disabled by scurvy, was put ashore in Greenland and, after partaking of scurvy grass, was cured.<sup>142</sup>

*“It was the first herb I found in Spitzbergen, when we landed the first time; it was so small I could hardly discern it to be scurvy-grass, but afterwards we found it in it’s full perfection, and it seeded in the month of July. It is observable, that the leaves of this herb have but little sharpness at Spitzbergen, and therefore is much weaker than the scurvy-grass of our countries, so that we eat it instead of salad at Spitzbergen, which we could not do our scurvy-grass.”<sup>143</sup>*

*“It is of interest to note that, although native plants have never been extensively used by whites living in the Arctic, those eaten-mostly in emergencies-have generally been different species from those used by the aborigines, and, in the light of our present knowledge of vitamins, of lesser value. Thus there are numerous examples in the narratives of arctic expeditions of the uses made of lichens-especially “rock tripe” or “tripe-de-roche” of the early Canadian Voyageurs-besides mushrooms, puffballs, and scurvy grass (Cochlearia), none of which is ever eaten by aboriginal tribes. Likewise, berries such as the mountain cranberry or cowberry ( Vaccinium Vitis-Idaea), bilberry or whortleberry (Vaccinium uliginosum), and to a lesser extent baked-apple (Rubus Chamamorus) are perhaps among the most frequently and most readily used vegetable foods of white men living in the Arctic, whereas these fruits are generally ignored by aboriginal peoples who prefer the crowberry (Empetrum) which, in turn, is not favoured by whites.”<sup>144</sup>*

Since the Norse did not leave us any cookbooks, we don’t know what, exactly, they ate. I have collected a list of native plants that are edible by humans and would have been available to the Norse. This list comes from various sources.

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|-----|---|
| 134 | Various sources   |
| 135 | Seaver, p.38  |
| 136 | Tiwari; Troy, p.358                                     |
| 137 | Francis, p.23 and Seaver, p.32                          |
| 138 | Porsild, p.17   |
| 139 | Arneborg, et al, Norse Greenland Dietary Economy, p.7-8 |
| 140 | Of the species Cochlearia                               |
| 141 | The Philosophical Transactions..., p.391                |
| 142 | Mead, p.124   |
| 143 | White, p.50   |
| 144 | Porsild, p.17   |



Crowberry: these berries were, and still are, an important part of Inuit diet and grow abundantly to latitude 70°N. They can be eaten fresh or can be frozen and stored all winter. A good source of ascorbic acid. And, as I have discussed, can be turned into wine.

Arctic bilberry: similar to European bilberry. Can be found almost as far north as crowberries. Not only a good source of ascorbic acid, but they are a traditional herbal remedy to treat diarrhea. The National Institute of Health states that the leaves are “possibly effective for problems with the retina of the eye for people with diabetes or high blood pressure.” WWII pilots stationed in England, reported that eating bilberry before night raids improved night vision.

Mountain cranberry or cowberry: related to the lingonberry. Found in bogs and wet pastures. Contain vitamin A, C, B1, B2 and B3, as well as trace elements.

These berries can be converted into jams and jellies, all three contain enough natural pectin, although I do not think the Norse would have had access to sugar cane. Most likely they were eaten whole, squeezed for their juice, mixed in with porridge or baked within bread.

Angelica or kvan: found from Canada, east to Greenland, Iceland, Ireland, Scotland and Scandinavia. This is a very versatile plant. The roots are fragrant and can be found in modern pot pourris. A yellow dye can be extracted from the roots. The stems are used in herbal cough drops. They are candied and used in breads and cakes. The stems taste similar to juniper berries and are used to flavor gin. Young stalks can be substituted for celery stalks. The seeds are used to flavor Vermouth and Chartreuse, and the leaves, which are alkaline, are often added to other dishes to neutralize acidic ingredients.

*“In the southern parts of east and west Greenland the kvan (Angelica Archangelica) is common along brooks, and in sheltered spots in the fiords may grow to a height of 6 feet. The tender, young leaf-stalks and flowering stems are considered a great delicacy and, when available, are eaten raw in great quantities. Because the kvan does not grow near the open sea coast, where most Greenland towns and villages are situated, and because this vegetable is in such great demand, long journeys are regularly undertaken by the Greenlanders to obtain it. The kvan is equally relished by the Danish residents who generally eat it cooked and creamed. Incidentally, the frequency with which the word kuaneg occurs in Eskimo place names antedating the present colonization of Greenland, shows that the Eskimo borrowed the Scandinavian word kvan from the language of the medieval Norse settlers of Greenland. Since the ancestors of the present Greenland Eskimo arrived in Greenland after the Norse, they could have had no previous knowledge of the kvan, and clearly adopted both the word and the eating of this plant from the Norse. This is of particular interest because it shows that some, at any rate, of the early Norse-Eskimo contacts were not hostile.”<sup>45</sup>*

Bladderwrack: actually a seaweed found along the coast. Made up of liquid filled globules. When freshly harvested, the liquid tastes like “salty grape juice.” In the 19th and early 20th centuries, a wine was made, in Wales, of bladderwrack and grape juice. The seaweed can be boiled and eaten, but in the last 100 years, it has been used primarily as fertilizer and animal feed. The juice, and the leaves, contain iodine and salt.

Broad-leaved willow-herb: the flowers can be eaten raw as a salad. The leaves are only edible when cooked and taste like spinach.

Flax was grown by the Norse in southern Greenland, not only for linen, but for the seeds, which could be pressed for their oil for a multitude of uses: from medicines, to cooking oil, to fueling lamps, or eaten by humans and livestock. 100g of Flax seeds contains 42g of fat, 29g of carbohydrates and 19g of protein, which gives 534kcal. By comparison, 100g of mutton gives 155kcal of energy.

Hairy fernweed: modern Chukchi turn the stems into a sauerkraut like dish. The rootstocks can be boiled into a soup base.

Hairy stonecrop: A variety of the Sedum family, which is found throughout Europe. The leaves can be eaten raw or cooked, but it is recommended that they should only be eaten when young in the early spring, otherwise the flavor is harsh and unpleasant. The leaves have mild pain relieving properties. It is written that it can cure scurvy, but the plant contains little to no vitamin C.

Water hemlock or musquash root: Not a food, but small doses of hemlock do have some benefits, such as lessening cramps and muscle spasms and reducing lung inflammation due to bronchitis or asthma. It has also been used as a treatment for severe coughing.

Labrador Tea: grows in swamps and wet places of northern Europe, Asia, and America. The leaves are rich in vitamin C, gallic acid and tanins. The leaves have a pleasant odor to humans: they repel moths as they contain ledum camphor. In Russia, the leaves are used for tanning leather. Water infused with the leaves can be used to kill body lice and fleas. German sources indicate that leaves were added to ale before widespread use of hops. And the leaves contain some narcotic properties that are released when the leaves are boiled in water or alcohol.

Lyme or couch grass: grows throughout Europe. In the same family as rye, millet, barley and wheat. The roots have a sweet taste, somewhat resembling liquorice. The seeds can be harvested like those of wheat, rye and barley, how-



ever, unlike its more cultivated cousins, lyme grass doesn't hold onto its seeds until the stalks have been harvested and threshed: the seeds have to be harvested before they fully ripen and are blown off of the stalks by wind. Once harvested and removed from the stalks, the corn can be ground into flour or boiled to make pottage. With the addition of the enzyme amylases, the starch can be converted into sugar which yeast can then convert into alcohol.<sup>146</sup> There are no records of the Norse doing so, but it is possible. Lyme grass could also have been mixed with imported barley or wheat to stretch out grain supplies. The caloric yield of lyme grass was measured and proved to be 419kcal per 100g. Barley flour gives 350 kcal per 100g. Lyme-grass ground to a flour was normally mixed with milk and consumed as porridge or soup up until modern times. It could also be made into a dough, fried, and consumed as something like a johnny-cake.

Marsh Fleabane: found in swampy places and grows well in manured soil. The young leaves and flowering stems may be eaten as a salad or cooked as a potherb. The leaves contain tannins and volatile oils that, while smell nice, give a bitter taste, like hops. Can be used to eliminate body odor or bad breath.

Marsh Marigold or "cowslip": native to wetlands in Europe and North America. The leaves can be cooked as eaten like spinach, but they must be boiled in fresh water several times as they contain heborin, which is an irritant and a mild poison. Was used up until modern times as a purgative and a wart remover. The flower buds can be pickled and used as a substitute for capers.

Mouse ear chickweed: an herb with pairs of smooth-edged leaves with a white flower. The leaves have an anise like flavor. The leaves can be eaten raw or boiled and are best before the plant starts to flower.

Mountain Sorrel: grows on shaded slopes from mountain sides to as far south as New England. Leaves and stems are edible, although acidic when young. When cooked it looks and tastes like cooked spinach.

Mushrooms: There are no known poisonous species of mushrooms in Greenland. The birch bolete, slippery jack, and Arctic bolete grow to hand size and are reported to be meaty and flavorful.

Roseroot: found in southern Greenland. You can eat the young leaves raw in a salad as it adds a slightly bitter taste to mixed greens. They can be cooked like spinach and the stems can be cooked as one would asparagus. Roseroot gets its name from the rose like smell of the plants roots, when they are dried. High in vitamins A and C.

Shrubby cinquefoil: varieties are found throughout Europe. The five-leaved flower can be found in medieval heraldry and carved into French churches. Tradition says that picking a perfect flower on a Wednesday when the moon was waxing and then pressing it in a Bible would produce a charm that would protect a house from witches. I couldn't find out what it tastes like: all of my references relate to medicinal uses. Documentation dated to the 11th century detail that the whole plant can be used for inflammations, sore throats, joints pain, toothache, bruises, running sores, and "to cool and temper the blood and humours in the body." Modern Greenlanders use its dried leaves as a substitute for tea.

Snakeweed or bistort: grows almost everywhere in the northern hemisphere. The ancient Greeks wrote about it and its uses. It apparently doesn't have much of a flavor other than "starchy". The roots are full of tanins and starch; enough starch that they can be pounded into flour. Its seeds are oily can be pressed like rapeseed. A traditional dish, that is still eaten in Westmorland, is a pudding made mostly of bistort roots, nettle leaves and oatmeal.

Star Chickweed: young leaves tastes like baby spinach. Loaded with beta-carotene, Vitamins C and B complex, zinc, iron, manganese, calcium, potassium, phosphorous, selenium silica, magnesium and sodium. Nicholas Culpeper, writing in his 17th century Herbal, says that Chickweed is a "fine, soft, pleasing herb."

Taraxacum dandelion: very similar to the dandelions plaguing our lawns. The whole plant is rich in vitamins A, B complex, C and D, iron, potassium and zinc. They can be used to reduce mild fevers and as a mild laxative. The root can be roasted and then ground to make a coffee substitute. The leaves can be used to make ale and wine, if one had sugar and the right sort of yeast. The leaves can be make into soup and taste like mild endive.

Woolly and Arctic fernweeds: their roots are sweet and can be eaten like young carrots: raw or cooked. The stem can be boiled as a pot herb and its flowers contain a sizeable amount of sweet nectar.

*"Among the most easily recognized edible lichens are certain rock lichens of the genera Gyrophora and Umbilicaria - commonly known as "rock tripe" or "tripe-de-roche" - and a few species of Cladonia and Cetraria, often mistakenly referred to as "moss" or "reindeer moss". The former, as the name implies, grow on rock or boulders to which their irregularly shaped, saucer-like, leathery, brown, green, or black fronds are attached by the centre. When dry they are hard and brittle, but in damp weather become soft and cartilaginous and in this condition are easily detached from the rocks. The "mossy" kind grow on the ground, often among other plants, and sometimes form dense and almost pure carpets. The most important of these are the Iceland moss (Cetraria islandia), said to contain 80 percent "lichen-starch", besides some protein and fat, and "reindeer moss" (Cladonia rangiferina, Cl. sylvatica, and Cl. alpestris). These are low, bushy, coral-like lichens. The first is dark brown, its fronds strap-like, crisply ciliated on the edges while the fronds of "reindeer moss" are more coral-like, composed of round, hollow gray or greenish-gray, branches. These lichens, too, are brittle when dry and are best collected when moist. After parboiling with soda, the*

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146 Lyme grass seeds do not start producing amylases until they are ripe and fall off of the stalks, making the window of self-malting very narrow. However, barley malt contains amylases as does human saliva.

*lichen should be dried, preferably in an oven, until brittle and then powdered; this may be done by rubbing between the palms of the hands, or by pounding, or better yet by a grist mill. The powdered lichen, if put to macerate in water overnight, will jell when boiled with water or milk. One pound of powdered Iceland moss will produce four quarts of jelly similar to blancmange and is considered very nutritious and digestible. In Iceland and in northern Scandinavia, Iceland moss is used in puddings and in soups; and formerly, in times of scarcity, flour prepared from this and other lichens was added to the bread-flour. The moistened lichen-flour will not form a dough unless mixed with a small quantity of wheat-flour. Very tasty biscuits may be prepared from equal parts of lichen- and wheat-flour. The starch-like substance contained in the lichen may be fermented, and in Scandinavia formerly found a limited use in the manufacture of alcohol.*<sup>147</sup>

## Conclusion

When I started planning this paper, I was certain that Greenland was a caloric wasteland. That the Norse had very little food available to them; mostly meat. I had thought, based on cursory reading, that the Norse were constantly dying of scurvy and rickets. However, it would appear that they had access to a wide variety of food and could have had a rich and varied diet. As I had stated, we don't have any written sources of meal plans or recipes, but I feel that it is unlikely that the Norse would have eschewed plants and animals found in Greenland, particularly when much of those plants and animals were already part of the Norse culture of Iceland, Great Britain, Norway and Scandinavia. If the Norse took advantage of all of the food resources that I have listed in this paper, they would certainly have had not only the required 4,500 kcal/day, but all of the necessary vitamins and minerals needed for a healthy diet.

To be certain, the weather of Greenland can change at the drop of a hat.<sup>148</sup> Too much rain and hay yields suffer, which would impact the number of animals that can be kept through the winter. Too long of a winter means the animals need to be kept indoors longer and require more hay. Too cold of a summer and ice drifts can block access to the seal hunting grounds. Too cold of a winter and the bird, caribou and seal migration patterns can shift to less accessible areas. Too dry of a summer and edible plants might not be available. The colonies could survive one or two bad years (in a row), but they did not have the resources to survive, intact, beyond that. A biblical seven year famine, such as what hit Northern Europe in the early 14th century, would have decimated the Norse on Greenland beyond the ability to recover without a major influx of new colonists and herd animals. By the time the Norse reached that point of desperation, there was little to no interest in immigrating to Greenland. Recent theories have been gaining popularity that once walrus were found to be so plentiful, the purpose of Greenland shifted from farming and land ownership to ivory hunting. The theory is that farming was just a means to support the hunting of walrus. As long as elephant ivory wasn't available in Europe, walrus ivory was worth its weight in silver. Enough money was in the hands of Greenlanders that they could afford to import luxuries from Europe: barley, honey, wine, iron, timber, the latest clothes and fashion accessories. Merchants could load a ship with tons of common goods and exchange them for a small amount of high value ivory, hides, falcons, and rope, which they could then sell for sky high profits. However, once trade with Africa and the Middle East opened up, and premium elephant ivory started to flow into Europe, the desire to make the perilous journey across the North Atlantic, particularly when loaded down with tons of cargo, ebbed and vanished. Soon trading vessels came only once a year, or once every other year. Some sources state that towards the end of the colony, trading ships from Norway weren't seen for a full decade.

The image I have of Greenland is similar to that of the gold rush towns in Western America: people might live in Greenland for a few years, hunting Walruses, and then leave with a bag of ivory that could be exchanged for a great deal of silver elsewhere in Europe. Unless you wished to buy land and either farm or raise livestock, why stay in Greenland if you could make good money and set yourself up like a lord elsewhere. As long as there was ivory to be desired, there were plenty of ships to and from Greenland. But, like the gold rush towns, once Europe shifted back to Elephant ivory, no one was interested in traveling to the middle of nowhere, and the inhabitants left for richer places.

We cannot deny that the climate of Greenland at the end of the colony, sometime between 1450 and 1500, had changed to such an extent that the Norse farm and gather system could not produce enough food to support the population. Skeletons of the last of the Norse Greenlanders do show clear signs of malnutrition which coincided with the end of the Medieval Warm Period: shorter, wetter summers and longer, colder winters. The Norse did not adapt to this new climate and continued to rely on dairy products from non-native animals that required more fodder than what could be gathered or grazed. In addition, the shorter growing season, coupled with the fragile ecosystem, meant that less grass could grow before it could be reaped and dried into hay. This was compounded by the necessity of the walrus hunt, which took a certain percentage of the male population away from the farms for weeks at a time, which meant fewer hands to gather food for the winter.

147 Porsild, p.34-5

148 Various sources

*One account, Grænlandie vetus chorographia 'a afgömlu kveri, copied in a seventeenth-century Greenland account, even gives the rowing time to the hunting grounds in 'days' row' for a six-oared boat. This record indicates that it took fifteen days' row to reach the northern hunting ground around Disko Bay from the Western Settlement, and twenty-seven days' row from the Eastern Settlement. If hunting parties left the settlements in June (after the main seal hunt) and returned in late August (in time for the hay harvest) this would leave only eleven weeks for the Western Settlement Norðurseta hunters and as little as seven weeks for the Eastern Settlement hunters (McGovern 1985a, 305). These estimates suggest significant problems in allocating boats and human labour in this small society, which also needed to carry out communal seal hunting in the early spring in the outer fjords of the two settlement zones and the vital late summer hay harvest on the home farms. Unlike Icelandic marine fisheries (which, in terms of agricultural labour requirements, could take place during the winter's low season), the Greenlandic long-range walrus hunt imposed serious scheduling conflicts with the hunting/farming subsistence economy.<sup>149</sup>*

And with the lack of overseas grain and iron, life became more and more uncertain. Eventually a tipping point was reached and first the Western, then the Eastern colony collapsed and the Norse either died of malnutrition or cold, or fled Greenland for warmer pastures.<sup>150</sup> But, while the weather was nice, the Norse thrived on Greenland for some 450 years, well fed and, presumably, happy with their lot in life.

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149 Frei, et al, p8

150 We have no record of hundreds of penniless Greenlanders showing up in Iceland or Norway with only the clothes on their backs. We can assume that the departure, from Greenland, was gradual, one ship load at a time, or the people who left brought as much walrus ivory with them to buy a new life for themselves. We can also assume that many Greenlanders might have been lost at sea, due to storms, rough weather, ice, and other maritime dangers.

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