1. INTRODUCTION

Several written sources dating from the 11th, 12th and 13th centuries tell about the discovery of North America by Icelanders and Greenlanders around the year 1000 AD. Some of the sources describe in some detail the route that these explorers followed on their voyages, and one can try to follow in their footsteps and possibly find evidence of where they went. Such an endeavour led the authors of this article to the village of Sop’s Arm in northern Newfoundland. A few kilometres from the village there is a system of five or six man-made pits in a row. After digging, each pit was measured at several metres long and a few metres deep and wide, and the authors believe that their purpose was to catch big animals, probably caribou/reindeer.

Many scholars have reasoned about the location of Vinland, the North-American destination described most elaborately in the written sources. Among the suggested places are New York City, Maine, Nova Scotia, New Brunswick, Labrador and Newfoundland. On these pages, we shall argue for the last mentioned location, that Vinland is Newfoundland.

One of the authors of the article, Kevin McAleese is only responsible for Aboriginal and non-Norse settlement history of the article and for his part in the field work on the Sop’s Arm pits.

The remainder of this article is organized as follows. After a short introduction, Section 2 gives an overview of the historical written sources on the Vinland excursions, which include one German and two Icelandic historical works from the late 11th and the 12th centuries, and two Icelandic sagas from the 13th century, Eiríks Saga and Grænlendinga Saga. Of the two sagas Eiríks Saga provides the more detailed description of the main settlement attempt on the North American continent, made by Thorfi nn Karlsefni and Gudríd Thorbjarnardóttir attempted settlement could be Sop’s Arm in White Bay on the North coast of Newfoundland. The system of pitfalls that was surveyed and excavated is close to Sop’s Arm. The pitfalls form an 82 metre long system that lies in an almost straight line. Individual pits are now 1.5–2.3 metres deep and 7–10 metres long. Two pitfalls were excavated by taking a section into them. Attempted radiocarbon dating of soil from two pitfalls was inconclusive. Considerable soil thickening of 55–110 centimetres since the pitfall construction was observed.
dealing with the location of Vinland. As some scholars have relied on Grænlendinga Saga we briefly repeat its storyline in Section 3.2. The archaeological site at L’Anse aux Meadows on Northern Newfoundland, where 1000 year old Viking houses were discovered in the 1960’s is discussed next. To give the reader some flavour of the many existing Vinland theories, four recent works on the subject are reviewed next, followed by a discussion of three particular plant species that have played an important role in these theories: vines, butternut trees and wheat. Section 3 concludes by describing the Vinland search of one of the authors of this article, dr. Jónas Kristjánsson (2005).

Now the article takes a turn and the attention is turned to hunting pitfalls. Such pitfalls were very common in Scandinavia in medieval times, but are also known from elsewhere in the world. Section 4 gives an overview about the sources on and the study of pitfalls that were formerly used to hunt deer, moose, wolves, bears and other big and small animals, and Section 5 describes the excavation of the Sop’s Arm pitfalls carried out by the authors of this article in 2010. Section 6 provides background information on the Aboriginal cultures that formerly occupied Newfoundland and what we know about their methods of caribou hunting. The section also tells briefly about the history of the Sop’s Arm community after its settlement by Europeans. Finally the article concludes with a discussion section.

2. THE MEDIEVAL NORDIC EXPLORATION OF NORTH AMERICA

2.1. SEAFARING FOLK
Iceland was uninhabited after the end of the last Ice Age but in the 9th century (or perhaps earlier) it was discovered by Scandinavian people and subsequently settled from Scandinavia and the British Isles. The primary written source on the time of settlement is Íslendingabók (Book of the Icelanders) written by Ari the learned in the beginning of the 12th century (Ari Þorgilsson 1122–1133; Halldór Hermannsson 1930). Íslendingabók is the oldest and considered the most trustworthy of the Icelandic historical sources dealing with the settlement period. According to Ari the first settlement was around 870 AD but this has been countered, in particular by Mar-grét Hermanns-Auðardóttir (1989, 1991) and recently by Páll Theodórsson (2009, 2010, 2011) who suggest a date before or around the year 700 AD. Their arguments include evidence from soil thickening and radiocarbon dating. Their interpretations are still being debated.

The Norwegians were at that time great shipbuilders and sailors. In Iceland there were no trees useable for big ships, but during the first centuries of settlement the Icelanders had access to seaworthy ships and went even farther west in search of new lands. They discovered Greenland in the 10th century, and according to the sagas Eirík the Red (Icel. Eiríkur rauði) from the west of Iceland settled there in 985 or 986. He named the land and said that a good name would encourage people to move there, as Ari the Learned writes in Íslendingabók. Eirík’s wish came true: in the years that followed many people moved from Iceland to Greenland, establishing two settlements located on the southwest coast of the country, the Eastern Settlement (Icel. Eystrabyggð) where Eirík built his farmstead Brattahlíð, and the Western Settlement (Icel. Vestribyggð). A thorough discourse on the history of the Icelandic settlement in Greenland is given by Seaver (1996).

Shortly before or around the year 1000 the Greenlandic settlers sailed further on and found the North American mainland. They attempted to settle there, on a land they named Vinland (Wineland), but the settlement was short-lived. The oldest account of this exploration is given by Adam of Bremen (ca. 1075), and the other primary written sources are the aforementioned Íslendingabók (1122–1133) and the two Icelandic sagas, Eiríks Saga Rauða (Sage of Eirík the Red) and Grænlendinga Saga (Sage of the Greenlanders) (13th century). These old sources will be discussed further in the next section.

Unfortunately the discussions in Íslendingabók and Adam of Bremen’s work are very brief, and Eiríks Saga and Grænlendinga Saga do not agree very well on the description of the voyages, making it difficult to tell an accurate story. But in short, it appears that either Leif the Lucky (Icel. Leifur heppni), son of Eirík the Red, or Bjarni Herjólfsson, whose parents had moved to Greenland, were the first Europeans to see the North American continent. According to both sagas it was Leif who was the first man to go ashore and explore the land, either on the discovery voyage or on a subsequent one. He named the land Vinland. A few years later, soon after the year 1000, Thorfinn Karlsenfni (Icel. Thorfinnur karlsefni, Þorðarson) and his wife Gudrid Thorbjarnardóttir (Icel. Guðríður
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Thorjardóttir voyaged from Greenland to Vinland with livestock and accompanied by several people (possibly 150) and attempted settlement. However, after a stay of two or three years they gave up, mostly because of clashes with indigenous people, and all sailed back to Greenland. Snorri, son of Thorfinn and Gudríd, was born in their first or second year in Vinland. Two or three years after coming back to Greenland the family moved to Iceland, where they settled down in Skagafjörður in North Iceland. Both sagas agree on these events, and both finish by naming three Icelandic bishops descended from the family; a great grandson of Gudríd and Thorfinn, and a grandson and a great grandson of Snorri.

There is also archaeological evidence for these journeys. In 1961 Helge and Anne Stine Ingstad started the excavation at L’Anse aux Meadows, eventually discovering a group of eight buildings built and used by Nordic people soon after the year 1000. We shall return to L’Anse aux Meadows in Section 3.3.

Many scholars have studied the attempted Nordic settlement of North America in Vinland, and speculated on its location. The most thorough recent overview of these studies is given by Gísli Sigurðsson (2004), who lists a total of 16 theories, the oldest from 1837 and the newest from 2000. Another fine survey of the earlier of these studies is given by Halldór Hermannsson (1936). In Section 3.4 below we shall look in some detail at a few of these theories.

2.2. MEDIEVAL WRITTEN SOURCES ON THE VINLAND EXCURSIONS

The history of the bishops of Hamburg (Adam of Bremen ca. 1075) says: “He [Sveinn, king of the Danes] spoke also of yet another island of the many found in that ocean. It is called Vinland because vines producing excellent wine grow wild there. That unsown crops also abound on that island we have ascertained not from fabulous reports but from the trustworthy relation of the Danes. Beyond that island, he said, no habitable land is found in that ocean, but every place beyond is full of impenetrable ice and intense darkness” (2002:219). The Nordic countries came under Adam’s diocese and his work is one of the main sources on the history of the Nordic countries in the 10th and 11th centuries. His informant on the tale of Vinland, as well as on various other parts of the Hamburg history, was Sveinn Ástrídarson, King of Denmark (ca. 1019–1076, Svend Estridsen in modern Danish). There were Icelanders at his court who could have enlightened him about Vinland, and another possibility is that Ísleif Gissurarson, the first bishop of Iceland, was his guest. Ísleif might even have met Adam, as he studied in Germany and received his installation as bishop in Bremen in 1056.

About half a century later Ari the Learned mentions Vinland in Íslendingabók but unfortunately only in passing. He includes this information: “Both east and west in the country [i.e. Greenland] they found human habitations, fragments of skin boats and stone implements from which it was evident that the same kind of people had been there as inhabited Wineland and whom the Greenlanders called Skrellings.” (Halldór Hermannsson 1930, p.64). It is generally accepted that Íslendingabók has been accurately preserved in manuscripts. Ari names Vinland as though it were a well-known place.

Yet another mention of Vinland is in the Icelandic annals from the year 1121 where it says that Eirík Upsi, the bishop of Greenland, voyaged in search of Vinland that year (Storm 1888:529). The notation about bishop Eirík was recorded contemporarily. There are few records of Greenland from this time and nothing else is known about Bishop Eirík, nor is anything known about the outcome of the expedition.

The main subject of Landnámabók (The settlement book, ca. 1150–1250) is the settlement of Iceland, but it also discusses Greenland and Vinland. The original version was written shortly before 1150 but material was added over the following century. The first part of Eiríks Saga (see below) is duplicated with small differences in Landnámabók, but the section on Thorfinn and Gudríd is not included. In addition Landnámabók mentions Vinland twice in passing, referring to it as ‘Vinland the good’ (Vinland hið góða) in both cases (The Hauksbók version of Eiríks Saga also talks about ‘Vinland the good’ in one place).

The most detailed sources on the discovery of Vinland and the expeditions are the two Icelandic sagas, Grænlendinga Saga and Eiríks Saga. The former has been preserved in the manuscript Flateyjarbók (ca. 1390), but the latter in two manuscripts called Hauksbók (ca. 1302–1310; Figure 1) and Skálholtsbók (ca. 1420–1450). Both of the Eiríks Saga manuscripts have been quite accurately dated by Stefán Karlsson (1964:119, 1970:137f), and the dates given here are from him. These dates have been taken up by Ordbog over det norrøne prosasprog (1989).
These two manuscripts are written up after older original sources. Hauksbók has evidently been shortened in places, and Skálholtsbók, despite being younger, mostly contains a version closer to the original except for mistakes that have crept into some passages (Ólafur Halldórsson, 1978, 1985; Jansson 1945). Both sagas have been printed many times. We refer the reader to the entries for Eiríks Saga and Grænlendinga Saga in the reference list at the end of this article for information on publications that we have relied on.

As said above, Grænlendinga Saga and Eiríks Saga tell somewhat different stories. This is not surprising as they were written down about 250 years after the events that they describe took place. Many theories have been put forward about the relative age, accuracy and writing time of the two sagas. Grænlendinga Saga tells about various events that are not mentioned in Eiríks Saga, but the latter is much more detailed in its description of the Vínland expedition of our protagonist, Thorfinn Karlsefni (the story is in fact named Borfinns saga karlsefnis in one of the two manuscripts and some printed editions). For the most part scholars have relied more on Eiríks Saga when locating Vínland, with some interruption after the mid 20th century following the publication of Jón Jóhannesson (1956). The saga goes on to say that Leif salvaged some shipwrecked men, and was thereafter called “the Lucky”, and that he subsequently found his way to Brattahlíð in Greenland (1895:415, 1892–1896:432).

Leif the Lucky’s voyage. The saga is very brief in its telling of Leif’s discovery. “Leif set sail [from Norway] when he was ready. After sailing for a long time in changeable weather he hit lands that he had not expected. There were self-sown wheat fields and there grew vines. There were also trees called mösur [possibly maple]. He took something of all of these” (H adds: ‘some of the trees which he took were used for house building’). The saga goes on to say that Leif salvaged some shipwrecked men, and was thereafter called “the Lucky”, and that he subsequently found his way to Brattahlíð in Greenland (1895:415, 1892–1896:432).

Three ships set sail for Vinland. Thorfinn Karlsefni was an Icelandic farmer and merchant who sailed to Greenland shortly after the year 1000. He was accom-
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Figure 2. Possible NW-Atlantic destinations of the Viking explorers. The map shows the probable sailing route of Thorfinn Karlsefni and his men from Iceland to Greenland, on to North America, and back to Greenland and Skagafjörður in Iceland. Saga place names according to the theory of Section 3.3 are shown in italics. The modern place names reflect the many theories on the location of Vinland that have been suggested, as discussed in Section 3.4.

panied by his cousin Snorri and also, on another ship, by two other Icelandic merchants called Bjarni and Thorhall. Karlsefni stayed for the first winter at Brattahlíd with Eirík the Red and married Gudríd Thorbjarnardóttir, the widow of Thorstein Eiríksson, son of Eirík the Red. The wedding of Karlsefni and Gudríd would have taken place early in the year. “There was much merrymaking in Brattahlíd that winter, they played board games and told stories and had many other pastimes. People talked much about Karlsefni and Snorri going to search for Vinland” (this passage is in H: ‘They stayed in Brattahlíd that winter. People talked much about going to Vinland the good’). The story goes on to tell that they decided to sail south in search of Vinland the following summer. There were three ships, Thorfinn and Snorri on one, Bjarni and Thorhall on the second, and the third was captained by Thorvard, wed to Freydis natural daughter of Eirík the Red, and accompanying him were Thorvald son of Eirík, and Thorhall, who was called the Huntsman. “There were in all 160 people on the ships” (1985:423, 1892–1896:436).

Helluland. To begin with “they sailed to the Western Settlement, and from there to Bear Islands (Icel. Bjarneyjar). From there they sailed south for one day [tvō dagur in Icelandic, meaning two times 12 hours]. Then they encountered land and rowed ashore in boats to explore it. They found many large stone slabs (Icel. hellur) … and named the land Helluland” (1985:423). Clearly they wanted to try to follow the coastlines whenever they could. Bear Islands may have been islands near the current Sisimiut (former Dan. Holsteinborg), where the distance to Baffin Island is the least. Most scholars think that Helluland must have been the same as modern Baffin Island. When the ancient Greenlanders went seal hunting to the so-called Nordurseta in the Disco Bay, far to the north of the two settlements, they might have sighted the mountains of Baffin Island. We might add that the shortest distance between Greenland and Baffin Island is about 170 nautical miles, requiring a speed of 7.1 knots. The ships of the Greenlanders could well have sailed with this speed, or even considerably faster. Some modern day
replicas of viking age ships have been sailed as fast as 12 knots in favourable wind (Páll Bergþórsson 1997:128f) or faster (Figure 4).

Markland and Bjarney. “After that they sailed with a northerly wind” (H: ‘towards south and then south-east’) “for one day [tvō dægur], and again sighted land, with large forests and many animals. An island lay to the south-east off the coast, where they discovered a bear, and they called it Bjarney (Bear Island), and the forested land itself Markland (Forest Land)” (1985:423). The sailing direction (especially of H) fits well with the actual lay of the Labrador coast, and most scholars agree that Markland must have been some part of Labrador. Many of them also suggest that Bjarney is Belle Isle that lies north of Newfoundland. A difficulty with this idea is that Bell Isle lies 30 km off the coast, too far for brown or black bears to swim, and too far south for Polar Bears in summer. It may be noted that there are 10–15 Bear Islands in the world outside the Arctic, and that every one is less than 1 mile from land. Fortunately, there are many other islands along the Labrador coast to choose from. To be fair we should add that to sail from the point of Baffin Island closest to Greenland to the northern tip of Labrador would take almost two days at the speed discussed earlier. We must assume that 250 years of oral tradition has produced somewhat quicker ships.

Kjalarnes and Furdustrandir. “After sailing further for one day they saw land.” (in H this sentence is: ‘From there they sailed south along the coast for a long while.’). They came to a cape jutting out and rowed ashore in boats. They found a ship’s keel on the cape and named it Kjalarnes (Keel Cape). They sailed upwind along the coast, keeping the land to starboard. There were harbourless stretches, long beaches and sand flats” (H omits Figure 3. The major destinations of Thorfinn Karlsefni and his men in New-foundland, according to our supposition of Section 3.3. The place names of Eiriks Saga supposed by this theory are shown in italics.
‘harbourless stretches’). “They also gave the beaches the name Furdustrandir (Wonder Beaches) for their surprising length” (1985:423, 1892–1896:437). Four of the authors of this article find it most fitting that this new land was the same as modern Newfoundland, but the fifth one, Kevin McAleese considers that the Wonder Beaches are in southeast Labrador just north of Sandwich Bay. Thus the remaining part of this section must be considered to be the brainchild of the other four authors. As one sails along the east coast of Labrador this land comes into sight straight ahead. To explain the name given to the cape in the saga one should probably turn to etymology. Kjalarnes is a common place name in Iceland; the name is most likely derived from its shape. The saga’s Keel Cape could be the same as modern Cape Bauld, and Wonder Beaches would be the east coast of the Northern Peninsula. The description of that barren coast could scarcely be more fitting. Today the area is still mostly uninhabited and there is no road along the coast from south to north. From the west there is a single road across the peninsula to the isolated villages of Roddickton and Englee. Karlsefni would have had no wish to settle here. Regarding the duration of sailing we can take the stand that this has been added in Skálholtsbók to match the two sailing times mentioned before. Hauksbók states simply ‘for a long while’.

Vinland, Straumfjord and Straumey. “After this the coastline became jagged with inlets. They sailed into one of the inlets”. Now both manuscripts tell that they put ashore a Scottish couple who were with them, “and told them to run southwards to explore the country and return before three days’ time had elapsed.” In due time they came back, “one of them with grapes in hand and the other with self-sown wheat.” Obviously this is sup-
posed to tell us that they had now reached the Vinland discovered by Leif the Lucky. The saga goes on: “They sailed on until the land became jagged with fjords. They steered the ships into one fjord with an island near its mouth, where there were strong currents, and called the island Straumey (Stream Island). There were so many birds there that they could hardly walk without stepping on eggs. They called the fjord Straumfjord (Icel. Straumfjörður; Stream Bay), unloaded the cargo from the ships and began settling in. They had with them livestock of all kinds, there were mountains and beautiful landscape” (1985:424ff, 1892–1896:437f) (H omits the names ‘Straume’ and ‘Straumfjord’; Skálholtsbók uses ‘Straumsey’ and ‘Straumsfjord’. The story goes on to tell about the winter they spent in Straumfjord. It was a harsh winter, which explains why they wanted to sail further the following summer. As before, the saga’s description fits Newfoundland fairly well. But there are many fjords on the east coast and it is unclear which of them was Stream Bay. We shall return to that question in the next section, but now we carry on with the storyline of Eiríks Saga.

Hóp. “In the spring they planned the continuation of their journey” (this sentence is not in H). “It is said that Thorhall the Huntsman (H leaves out ‘the Huntsman’) wanted to go north past Furdustrandir in search of Vinland, but Karlsefni wished to sail south and east (H says ‘sail south’) of the country feeling the land would be more substantial the farther south it was, and he felt it was advisable to explore both.” (H omits ‘feeling…both’). The story goes on to tell that Thorhall and eight others sailed north along Furdustrandir and past Kjalarnes, after which “they sailed into a westerly gale that eventually carried them to Ireland where they were enslaved and Thorhall lost his life … Karlsefni, however, headed south along the coast, with Snorri and Bjarni and the rest of their company. They sailed a long time, until they came to a river which flowed into a lake and from there into the sea. There were wide sandbars stretching out across the mouth of the river and they could only sail into the river at high tide. Karlsefni and his company sailed into the estuary and called the land Hóp” (in Icelandic, hóp is a lake or a lagoon close to the sea, that may or may not be flooded with seawater at high tide). “There they found fields of self-sown wheat on the lowland and vines growing on the hills. Every stream was teeming with fish. They dug trenches along the high-water mark and when the tide ebbed there were halibut in them. There were many deer (dýr) of all kinds in the forest” (1985:427, 1892–1896:438f). Possibly the correct translation of dýr is ‘animals’, as in old Icelandic the word may mean either ‘deer’ (i.e. an animal of the Cervidae family) or ‘animal’, but according to Einar Ól. Sveinsson and Matthias Þórðarson 1935:227 the meaning here is deer.

Was Hóp the modern Gambo? One of the places that could fit this description is Gambo Pond, which is really a narrow lake about one kilometre wide and some thirty kilometres long. From this lake there flows a short and very shallow river, called Gambo River, into Freshwater Bay, which is an inlet from the Bonavista Bay. An excellent salmon river called Mint Brook flows into the lake about one kilometre above the head of Gambo River. A little later the saga says “they had built their houses up above the water” (upp frá vatninu) and some scholars take this to mean that Karlsefni and his followers took their ships into the lake and built their houses somewhere on its banks. As the Gambo river is not navigable, some take this as evidence that Hóp could not be Gambo. However, in modern Icelandic vatn means lake but in old Icelandic it may mean the water of a lake, of a river or of the sea. The saga never actually says that they brought their ships into the lake, and even suggests a little later, when the group is attacked by Skrellings, that the houses were near the river mouth.

Back to Straumfjord. Karlsefni and his company stayed at Hóp for one winter only, or possibly just one summer, because the saga goes on to say: “some say that Bjarni and Gudríd stayed behind [in Straumfjord] and 100 people with them, but Karlsefni and Snorri went south with 40 men. They only stayed in Hóp for less than two months and came back that same summer”. This section indicates that Hóp was not too far from Straumfjord, and if the Straumfjord is in Newfoundland so is Hóp. Soon after their arrival they caught sight of natives there, and later “a fleet of canoes came rowing from the south”. At first, Karlsefni and his men traded happily with the visitors, but Karlsefni forbade the sale of swords and spears. The natives were particularly keen to buy red cloth. But fighting soon arose between the two parties, and even though the newcomers won the first battle with the help of their sharp iron weapons, they realised that “despite everything the land had to offer there, they would be under constant threat of attack from its prior inhabitants. They made ready to depart
for their own country.” So they returned to Straumfjord (1985:428ff).

Einfætingaland. Later that summer Karlsefni and some of his men set out to look for Thórhall the Huntsman. “They sailed north around Kjalarnes and on the west side keeping the land on their port side. They saw nothing but wild forest. When they had sailed some distance they reached a river flowing from the land east to west. They sailed into the mouth of the river and lay near to the south bank.” It is difficult to tell where on the west coast of Newfoundland this place was. The story now takes on a fairytale quality, with the natives attacking the group belonging to the race of One-Footers, and thus the name Einfætingaland. In this conflict Thorvald, son of Eirík the Red, was killed. At the end of this west coast description the story says: “There were mountains there that they believed to be the same as those of Hóp, and this was in good agreement, and the distance from Straumfjord was the same on both sides” (1985:431f). It is a little difficult to interpret this passage, but one possibility is that Hóp is a misprint for Straumfjord (where mountains were mentioned before), and that the distance from Straumfjord along the east coast to the northern tip was the same as the distance that they had sailed south again on the west coast.

Back to Greenland and Iceland. “They returned to spend the third winter in Straumfjord. Many quarrels arose, as the unmarried men sought to take the wives of the married men. Karlsefni’s son Snorri was born there the first autumn and was three years old when they left. When sailing from Vinland they were carried with southerly winds to Markland … They arrived back in Greenland and stayed with Eirík the Red that winter.” (H omits this last sentence). As already mentioned the story ends by telling that Thorfinn and Gudrid moved back to Iceland after another winter in Greenland, and that among their descendants were three distinguished Icelandic bishops of the twelfth century (1985:432ff, 1892–1896:442f).

3. WHERE WAS VÍNLAND?

3.1. WHERE WAS STRAUMFJORD?
After driving many times back and forth along the east coast of Newfoundland Jónas Kristjánsson, scrutinizing a map of Newfoundland, was struck by the idea that Straumfjord would indeed be a bay looking very small on the map, called Sop’s Arm, lying west from the head of White Bay. After this Jónas has been concentrating on this area, finding more and more arguments to suggest it is in fact the real Straumfjord. In support of this conclusion he points out the following:

(1) This is the first inviting place after you have passed Furdustrandir (the Northern Peninsula).

(2) No other place at the east coast of Newfoundland fits so well with the description of Eiríks Saga: „They steered the ships into one fjord with an island outside its mouth, where there were strong currents.” In no other fjord that we have seen at the east coast of Newfoundland is there one big island outside its mouth. And in Sop’s Arm there is a strong current in the channel at the north side of the island.

(3) „There were mountains there, and a pleasant landscape,” the saga informs us. No mountains can be seen near to any of the fjords farther southeast. But from White Bay one can, of course, see the Long Range Mountains.

(4) In the saga there seems to be a remembrance of their seeing the same mountains from the east coast and the west coast of the land; this they experienced when they sailed north of Kjalarnes and south along the west coast. Unfortunately there appears to be an error at this place in both manuscripts, where both Hóp and Straumfjord are mentioned. But if our interpretation in Section 2.3 is correct the mountains could be the Long Range Mountains, seen from White Bay and from the west, and so points to Sop’s Arm being the same as Straumfjord. This could not possibly apply to any of the more southerly fjords on the east coast.

(5) Finally the pitfalls near Sop’s Arm that we shall discuss at length later in this article, may have been dug by Thorfinn and his men. A local man, Kent Budden, drew the attention of Jónas to these pitfalls.

3.2. THE STORYLINE OF GRÆNLENDINGA SAGA
Since Grænleindinga Saga is cited by many scholars in the Vinland research publications discussed in Section 3.4 we briefly outline its storyline here. We provide page numbers to the Íslensk Forrit edition of 1935 (Einar Olafur Sveinsson 1935). Bjarni Herjólfsson was the first man to sight the New World lands, and they were subsequently explored by Leif the Lucky, who sailed with 35 men on one ship. Their first two waypoints were the same as Thorfinn’s in Eirik’s Saga, but this time the saga
indicates neither the duration nor the direction of the first two legs of the voyage, to Helluland, and then Markland. From Markland they sailed southwest for two days and discovered a cape with an island lying north of it. They landed west of the cape and there follows a description similar to that of Hóp in Eiríks Saga. The episode from that saga, when the Scots found grapes, is repeated here, except that this time the finder is Turkish. They built houses there, named the place Leifsbúðir (the Camp of Leif), the land Vinland, and stayed one winter.

The following year Thorvald, Leif’s brother, followed in his wake with 30 men. They sailed to Leifsbúðir, explored the west of the country the first summer and the east of it the next summer. On the way to the east side they broke their ship’s keel in bad weather near a cape that they named Kjalarnes. Once on the east side they reached some fjords and sailed into one of them. Thorvald said: “These are beautiful surroundings, and here I want to build my farm” (1935:254f). Unfortunately his wish did not come true. Soon after they met hostile natives, Thorvald was killed, and the rest sailed back to Greenland after staying a winter in Leifsbúðir.

One or two years later the newlyweds Thorfinn Karlesefni and Gudríd sailed to Leifsbúðir in Vinland with 65 men and livestock. They stayed there for two winters, but on both their second and third summer they had collisions with natives, and eventually sailed back to Greenland. Snorri Thorfinnsson was born the second year.

Finally the saga describes a fourth voyage to Vinland, led by Freydis, daughter of Eirík and wife of Thorvard, lasting for one year. The story concludes by telling about Thorfinn and Gudríd moving back to Iceland and listing their descendant bishops, as we have said earlier.

There is one interesting piece of information in Grænlendinga Saga which is missing in Eiríks Saga, regarding the latitude of Leifsbúðir. The saga says: “In this place the sun had a midpoint position and a mid-morning position in midwinter” (Icel. Sól hafði þar dagmálastáð um skammdegi; 1935:251). The words dagmálastáður and eyktarstáður are defined elsewhere in the old Icelandic literature to mean directions where the sun is at approximately 9 am and 3 pm in summer. This information enabled the historian Gustav Storm and the astronomer Hans Geelmuyden to work out in 1886 that in Leifsbúðir the shortest day is almost eight hours, and that they lie south of the 52nd parallel approximately (Páll Bergþórsson 1997:144ff). The 52nd parallel lies just off the northernmost tip of Newfoundland.

3.3. L’ANSE AUX MEADOWS
In the years surrounding 1960 the Norwegian explorer Helge Ingstad started to focus his attention on the northernmost point of Newfoundland where there was a small fishing village called L’Anse aux Meadows. Surely he would have been led on by some earlier authors and researchers, especially W.A. Munn who published a booklet on his ideas in 1914, that was reprinted several times. He writes: “They [i.e. Leif and his men] went ashore at Lansey Meadows, as it is called today, where there is plenty of grass” (Munn 1946:13). Guided by these words and with further information from contemporary local persons, Helge Ingstad and his wife Anne Stine, who was an archaeologist, carried out successful excavations at L’Anse aux Meadows during the years 1961–68. Many Nordic turf houses built for various purposes were discovered and also a smithy where the Vikings produced iron from sod and turned it into rivets and other crude but useful objects (Ingstad, H. 1965, 1985; Ingstad, A.S. 1977, Ingstad H. & A.S. 2000).

In the 1970s further excavations on the site were conducted by the Canadian Parks Service, chiefly under the direction of the archaeologist Birgitta Wallace. A museum was founded at the site, where some of the discovered artefacts are displayed, and this has become an important tourist attraction. Birgitta has described the L’Anse aux Meadows research in a recent book (Wallace 2006).

Ingstad also had trouble with the name Vinland. The northernmost place where wild grapes grow is also in New Brunswick. At first Ingstad believed that the land had been named after other berries, native to Newfoundland. Later he adopted the view that a Swedish professor, Sven Söderberg, elaborated in a lecture delivered in 1898 and published in a newspaper article in 1910, that Vinland was in fact Vinland. In Old Norse vin means ‘grassland’ or ‘pasture’. The word appears in various Nordic
3.4. THE MODERN DAY SEARCH FOR VÍNLAND

In addition to Munn and the Ingstads, scores of scholars have written on Vínland and the travels of Nordic men thither, and offered conjectures on where Vínland was and where else the excursions took Leif the Lucky, Bjarni Íslenzki, Thorfinn Karlsefni and others. And, as expected, the writings after 1960 incorporate L’Anse of Meadows as one of the way stations. As mentioned before the main sources are the two sagas that disagree considerably on the route and course of events. In addition the sagas’ descriptions are often vague, giving the scholars ample freedom. The result is of course that no two researchers agree when they then try to follow the old travellers.

It would take too long to repeat all of these theories here. Consequently we shall only discuss the results of four contemporary people who have published notable books on the subject that has caught people’s attention. We shall in particular discuss their writings about Thorfinn Karlsefni and his settlement attempt, which has also been the centre of our attention. Regarding the results of others, we refer to the book of Gísli Sigurðsson, which, apart from giving a textual overview, contains a useful table of the different ideas of the scene of the sagas which have been proposed (2004:271–278).

Páll Berghóðsson: Vinlandsgátan (1997). The Wine-land Millenium (2000). Regarding Karlsfni’s journey, Páll Berghóðsson follows Eiríks Saga which he interprets thus: Karlsefni first sails north along the west coast of Greenland and then across the Davis Strait where the distance to Baffin Island is the shortest. This is Helluland. Then he and his men sail along the coast of Labrador, which is Markland, all the way to the island of Antico-

sta, which is Bjarney. From there they sail across the bay to Cape Breton Island, and the island’s eastern tip, Cape Breton, is Kjalarnes. The east coast of Nova Scotia is the saga’s Furdustrandir, and the Bay of Fundy is Straum-


Mats G. Larsson: Vinland det goda (1999). Larsson takes both Eirik Saga and Grænlendinga Saga into account as far as possible in his theories (Larsson 1992, 1999). He has Karlsefni depart Greenland near the West-
ern Settlement (current Nuuk), much further south than Páll Berghóðsson. He thus places Helluland on the east coast of Labrador (1999:52f). Contrary to many others his Markland is Newfoundland, which he says was never a popular target for colonization after 1500, and likewise, Thorfinn sailed past it (1999:63). He has Karlsfni sail east of Newfoundland and west along its south coast all the way to Cape Breton, which is Kjalarnes. From there the voyage continues to the strait between Cape Breton Island and Nova Scotia where Larsson places Straum-

Gísli Sigurðsson: The Medieval Icelandic Saga and Oral Tradition (2004). Gísli tries to place the new lands according to both sagas as far as possible. Although he does not set forth a definite location for all the saga names, he places Leif’s Vínland in the southern Gulf of St. Lawrence, in and around Prince Edward Island and the Miramichi Bay. He goes on to speculate that Straumfjord may have been Bay of Fundy and Kjalarnes may be at the north of Cape Breton Island. He is even more cautious in placing Hóp, but suggests that it is fairly far south, possibly somewhere on the coast of New England.

Birgitta L. Wallace: Westward Vikings (2006). Birgitta Wallace led the final excavations at L’Anse aux Mead-
ows and then organized and directed the Viking museum there. She has been active in publicizing the results of the extensive investigations. In her book, Wallace gives several arguments supporting the view that Straumfjord, Leifsbúdir, and L’Anse aux Meadows are all the same place. She then goes on to place Hóp at the mouth of the Miramichi River in northeastern New Brunswick. Finally Wallace goes on to discuss Helluland and Markland, and decides like many others that they were Baffin Island and Labrador (Wallace 2006:97ff).

Some of these people, in particular Gísli Sigurðsson and Mats Larsson may be influenced by Grænlendinga
Saga that says that Thorfinn and his company sailed to the southwest from Markland, whereas the Hauksbók version of Eiríks Saga says they sailed south, supporting our view. Both Wallace and Larsson assume that Straumfjord is a strait rather than a fjord, in contradiction to the meaning of the word fjord (fjörður). A strait is called sund in old Icelandic. In the next section we discuss three more issues where we disagree with some of the theories put forward in the four books.

Finally, it is worth mentioning an interesting recent discussion of the Vínland voyages, which emphasizes in a history of science manner the effect that they had (or didn’t have) on the geographical world view in the middle ages (Sverrir Jakobsson 2010).

3.5. GRAPES, BUTTERNUTS AND WHEAT
All the four books discussed in section 3.4 place Hóp, and the first three of them also Straumfjord, further south than we do, in New Brunswick, Nova Scotia or New York. All of them are influenced by the talk about grapes in the sagas. There is no doubt that the saga authors meant grapes when they wrote vínber, but it is quite possible that the meaning of the word was different 250 years before, and that this has confused the oral preservation of the sagas. In Sweden and Denmark grapes were never called vínber, but instead a German loan word was used, druvor or druer. In both modern and medieval Swedish vinber means either redberrys (röda vinber) or blackcurrants (svarta vinber). Newfoundland has always been a prolific berry country, and Leifur could have been talking about any of the many native berry varieties. This view was held by many early Vinland researchers. W.A. Munn (1914) thought that Leif’s berries were in fact squashberries (Figure 5).

Another argument for Straumfjord and/or Hóp being further southwest are the butternuts that were found at L’Anse aux Meadows, discussed in the last section. We do not really see any trouble here. We agree with other researchers that Nordic people probably excursed from L’Anse Methods to the modern New Brunswick, but believe that Thorfinn and Gudrid went elsewhere.

Many theories have been advanced concerning the self-sown wheat said to have been found in Vinland. Some have claimed that this is nothing more than a fairy tale, echoing the dreams in ancient and medieval times of the existence of a paradise island somewhere outside the known world. Adam of Bremen’s account bears the mark of such ideas, but in later years it has often been the case that people have tried to find some domestic plant that can fulfil the conditions needed to confirm the accounts of Eiríks Saga and Grænlendinga Saga. For a long time the likely explanation was that this self-sown wheat referred to wild rice (Zizania palustris), which has been an important part of the Indian diet for thousands of years. It grows, among other places, in Nova Scotia, but there are no records of it having thrived in Newfoundland. However, recently a new theory has been put forward that the self-sown wheat does not refer to wild rice but rather to wild rye (Elymus virginicus). This idea has two advantages with respect to our theory. Firstly, the wild rye can grow in many places in southern Canada, and secondly, it can resemble both wheat and barley as well, as rye Larson (1999) discusses this at length.

3.6. IN THE WAKE OF KARLSEFNI
One of the authors of this paper, Jónas Kristjánsson, has made 9 journeys in the wake of Karlsefni, the first one to Greenland in 1996 and since then eight times to Newfoundland. The first two of these were made in order to carry out research for a historical novel with Gudrid as the main character (Jónas Kristjánsson 1998). The remaining seven he made during the years 1999–2010, deliberately in search of some evidence of the location of Straumfjord.
and Hóp, where Karlsefni and his men had winter stays and where one may consequently hope to find ruins of the houses that they built (Figure 6). All the other authors of this article have accompanied Jónas on one or more of these expeditions. At first the search concentrated on Notre Dame Bay and Bonavista Bay. The most likely places were photographed both from the ground and from the air, and vehicles ranging from canoes and quad bikes to motorboats, aeroplanes and helicopters were used. The last two trips however concentrated on Sop’s Arm, a small fjord on the west side of White Bay, which is the first bay south of Furdusstrandir, if we are correct in believing that these are the east coast of the Northern Peninsula. In addition to this we have searched for and asked about old Nordic artefacts in several museums in Newfoundland, but unfortunately to no avail so far. Many people have helped us during our journeys in Newfoundland, and some of them are mentioned in the acknowledgements at the end of this article.

The most important elements that drew our attention to Sop’s Arm were the strange pits which Helge Ingstad describes in his books (1965:238f, 1985:277f). Ingstad visited Sop’s Arm in the year 1961 and found the area “very favourable”. One of the local people, Watson Budden (Kent Budden’s uncle), took him to the location of the pits about two or three kilometres west of the village. Mr. Budden thought that those pits had been used for hunting caribou in the distant past, and Ingstad agreed with this opinion, and said that they reminded him of several such pitfalls that were common in Norway in olden times. Ingstad points out that there is no record of Inuit having used this method for caribou hunting.

We traced Helge Ingstads steps, and we did in fact meet Watson Budden in 2009, when he was 91 years old. His nephew took us to the pitfalls. We found five pitfalls, and a probable sixth that may have been filled in recently. We shall return to the discussion of the Sop’s Arm pitfalls in section 5.
4. A SURVEY OF HUNTING PITFALL RESEARCH

It is tempting to suppose that the pitfalls in Sop’s Arm were dug by Nordic people. Such pitfalls were very common in Scandinavia in the middle ages and even into modern times. However, they also seem to have been fairly common in some other places, mostly in the western part of North America and central part of Asia, at least in later times (18th and 19th century). Moreover pitfalls dug in the snow were used in Arctic Canada. The sources on the pitfalls differ significantly. In Norway and Sweden the pitfalls still exist and have been studied archaeologically. Tens of thousands of pitfalls are known in each country dating from the last several thousand years. On the other hand, evidence of the North American and Asian pitfalls exists, as far as we are aware, only in the writings of explorers that visited the respective ethnic groups, many in the period 1760–1930. We have carried out a moderately extensive study of the scholarly literature on hunting pitfalls and shall report here on what we have discovered.

First we would like to say a few words about nomenclature. In English it is most common to refer to pitfalls, but the phrases trapping pit, hunting pit and pitfall trap are also sometimes used. Norwegian uses the words fangstgrop (pl. -groper), fangstgrav or dyregrav, in Swedish the word fängstgrop (pl. -gropar) seems to be most common, and German uses Fallgrube or Fanggrube (pl. -gruben). A pitfall for hunting wolfs is called varggrup in Norwegian and ulvegrav in Norwegian.

Another naming issue relates to the animals being caught in the pitfalls. Reindeer and caribou are in fact the same species (Rangifer tarandus), reindeer being used in Europe and Asia and caribou in America. The American moose and the European/Asian elk are the same species (Alces alces), and so are the slightly smaller East-Asian wapiti and the American elk (Cervus canadensis).

4.1. HUNTING PITFALLS IN SCANDINAVIA

Four recent fairly comprehensive writings on Norwegian pitfalls are a report on reindeer pitfalls in the Setesdal Vesthei conservation area in southern Norway (Bang-Andersen, 2004), the overview report of Olsen (2006), written in connection with a recent effort to have these pitfalls placed on UNESCO’s World Heritage List, an MSc thesis in archaeology written by Monica Klaussen (2008) which deals primarily with pitfalls in the Troms region in northern Norway and an article by Per Jordhøy (2008), dealing primarily with two large pitfall systems in the Dovre region in Southern Norway. In this and the following section we summarize the findings of these and other sources.

The use of pitfall systems was very common in Scandinavia in the middle ages, and several authors have concluded that pitfalls were the most important method of hunting reindeer, and greatly contributed to the reduction of reindeer herds (Hvartnér 1965, Ingold 1980:63f, Bang-Andersen 2004:9, Jordhøy 2008:83, Klaussen 2008, Olsen 2006:35). One can guess that near reindeer populated areas every farm had them in the Viking era. From our study of the literature we conclude that the number of known pitfalls in Norway is probably between 50 and 100 thousand (see also Jordhøy 2009), whilst an official source puts the number of registered pitfalls in Sweden at 40 thousand (Länssstyrelsen 2009). This makes pitfalls one of the most common archaeological features in Scandinavia.

Kinds of pitfalls. The Scandinavian pitfalls are of two types, pitfalls with vertical walls built of stone, and pitfalls excavated in earth. Excavated pitfalls, as the ones in Sop’s Arm, are in fact much more common in Scandinavia, although the second type, being more conspicuous, have sometimes received more attention. The stone built pitfalls are more common in the south of Scandinavia. The pitfalls have frequently been dug in series, as pitfall systems, sometimes as few as two, but up to several hundred or even thousand. The systems are usually laid across reindeer migration routes (Jordhøy 2008:81, Olsen 2006:63, Klaussen 2008:7).

Method of usage. It is believed that when the pitfalls were in use they were connected end to end with fences made with poles, branches and twigs, and locations where stakeholes have been found between pitfalls have been reported (Klaussen 2008:6, 69ff, Olsen 2006:25). It is also possible that corridors cut in the vegetation may have been used to guide the animals to the pitfalls (Olsen 2006:25). It is believed that the hunting often took place with active participation of the hunters, who drove the animals towards and into the pitfalls (Klaussen 2008:6).

Dimensions of pitfalls and layout of systems. Jordhøy (2008) describes the investigation of two pitfall systems, one with 1547 pitfalls in Dovrefjell and the other with 325 pitfalls near Fagerhaug (both are about 100 km south
of Trondheim). The average length of the pitfalls is 4.3 m (Fagerhaug) and 5 m (Dovrefjell) and the average depth is reported as 1.0 m. Jordhøy also says that in many cases wood was used to make vertical walls in the bottom part of the pitfalls. It may also be noted that Jordhøy’s article contains a list of 34 reports on pitfall studies in Norway. Klaussen (2008:38ff) has a very interesting section on dimensions of a system of 66 pitfalls in Ástu in the Troms region of northern Norway. These measure between 2.5 and 10 m in length, 0.5 and 8 m in width and 0.2 and 1.2 m in depth. They are separated by between 1 m and 100 m. Another system of 214 pitfalls at Ávževuoddos in Troms is also discussed at length. For these pitfalls only so-called inner length and inner width are given and unfortunately the meaning of these is not defined. The range of the supplied dimensions is 2.5–5 m length, 1.5–3.6 m width and 0.5–1.4 m depth. The system is divided into 4 subsystems, A, B, C and D. System A has 135 pitfalls, separated by between 1 m and 50 m (average separation 6.5 m), stretching over 800 m as the crow flies but 1260 m including all double stretches and side arms. System B is 65 m long and has 8 pitfalls separated by between 1 m and 12 m (average separation 4.5 m), system C consists of a line of 51 pitfalls with 1–12 m separation stretching over 350 m, and D is 430 m long with 19 pitfalls separated by 10–42 m (average separation 21 m).

Elk pitfalls. A few of the studies that we have investigated discuss pitfalls for elk (i.e. moose). They are in general larger and at lower altitudes than reindeer pitfalls (Olsen 2006). Another difference is that reindeer pitfall systems are typically along the direction of valleys and elk systems lie across valleys, because reindeer migration routes normally lie across valleys whereas elk routes lie along them (Jordhøy 2008). Jordhøy also says that nowadays the reindeer migration has ceased completely.

4.2. THE AGE OF SCANDINAVIAN PITFALLS.

Pitfalls have been used to hunt reindeer in Scandinavia for several millennia. Sommerseth (2011) does not discuss pitfalls at length but gives the important information that 24 pitfalls have been radiocarbon dated in northern Norway, and that the results span the period BC 2600 to AD 1200, with a reference to her own PhD thesis (2009), whilst Skandfer (2009) discusses a large number of pitfall systems in Finnmark dating at least 4500 years in the past. Ingold (1980:118) reports that massive systems of pitfalls came into use in Norway in the 8th century AD and that these were important as merchandise in exchange for cloth, grain, salt, metalware and spirits. During the 1950’s and 1960’s an effort was made to systematically register, measure, and date the Norwegian pitfalls, this work originally being led by Ernst Manker (Klaussen 2008; she has five references to Manker’s publications in the years 1953–1961).

Radiocarbon dating of pitfalls is often problematic because suitable dating material can seldom be found through pitfall excavation (Bang-Andersen 2004:44-46). Two possibilities are to date material (usually soil) from the pitfall bottom, so-called terminus ante quem dating, giving a minimum age, and dating material (possibly wood or charcoal) that has been covered by the bank of soil displaced when the pitfall was constructed, so-called terminus post quem dating, giving a maximum age (Bang-Andersen 2004:51, Olsen 2006:35, Klaussen 2008:28). Both of these methods have been used to date Scandinavian pitfalls. Klaussen (2008) presents six radiocarbon datings from the Ástu system and four from the Ávževuoddos system. Five of the Ástu datings are post quem and these give radiocarbon ages in the range 2100–4900 years and the remaining one is ante quem providing a radiocarbon age of 100 years. The post quem datings use wood or charcoal, but the ante quem one uses soil. All the Ávževuoddos datings are ante quem using soil, two give radiocarbon ages of 80 and 110 years and two give negative ages (dates in the future).

Bang-Andersen presents nine datings from the mountains west of Stavanger, four post quem and five ante quem ranging from 3290±90 BP to 570±50 BP (2004:51). The pitfalls in the Dovre region discussed by Jordhøy (2008) have mainly been in use in the Viking period and early middle ages. He provides references to sources with dating information.

During the Viking Age hunting pitfalls were considered so precious that, according to tradition, they outvalued even the farmstead when inheritance was partitioned (Ese 2008:23).

4.3. THE SOURCES OF BIRKET-SMITH ON PITFALLS IN AMERICA AND EURASIA

A major source on the sources on pitfalls outside Scandinavia is Birket-Smith (1929). His book contains no less than 49 references to published sources on pitfalls (including page numbers), mostly in North America and
Northern Eurasia. Of these, 11 are on pitfalls in Europe, 18 in Asia, 1 in Africa, 16 in North America and 3 in South America. Ten of the references appear in footnotes (1929:2:158) and the rest in a table, where the ethnic group employing the pitfalls is listed, but no further information given (1929:2:326f). The sources are published in the period 1683–1928, 1 in the 17th century, 6 in the 18th, 16 in the 19th and 26 in the beginning of the 20th century.

The indigenous North American groups mentioned are the Navajo and the Hopi of Arizona and New Mexico, the Yurok, Achomawi and Atsugewi of California, Chinook and Twana of Washington State, Menominee of Wisconsin, Blackfoot of Alberta and Montana, Mandan of North Dakota, and the Nuu-chah-nulth, and St’at’imc of British Columbia. The Asian groups mentioned are the Nenets, Komi, Udmurt, Mansi, Tatars, Nanai, Evenks, Kolyma and Itelmen of Russia, the Nuristani of Afghanistan and Pakistan, the Uriankhai of Mongolia, the Nanai and Manchu of China, the Ainu of Japan, and finally Norwegians and Lapps. In addition Birket-Smith reports pitfall use in Ecuador, Peru, Brazil, Venezuela, Europe north of the Alps, ancient China and Africa. In order to compile the foregoing information, we have relied on Wikipedia to determine the modern country names of the ethnic groups’ homes, as well as to translate a few obsolete group names used by Birket-Smith to modern practice.

Birket-Smith states that the record of pitfall use in North America is incomplete. He says that pitfalls dug in the ground have never been employed neither by the Inuit in northern Canada and Greenland nor the Chipewyan of central Canada (1929:2:68f; 1929:2:157). The Inuit did, however, dig pitfalls in snow, as discussed in section 4.4 (Figure 7). Birket-Smith mentions that pitfall use has been reported in California and at a few locations in South America, he talks of its widespread use in Scandinavia and Siberia, and that it is known in China, central Asia near the Caspian sea, Africa, and Europe north of the Alps (1929:2:157f; Figure 8).

We have inspected 35 of the 42 non-Lapp sources referenced by Birket-Smith. They range from mentioning Pitfall use in passing to giving a half page detailed description of the pitfall construction and usage. We found Birket-Smith’s information to be quite accurate. We found mention of pitfall use in all the sources that we inspected, and only one or two minor errors (in page numbers/ethnic groups). Regarding the kind of animals caught, 7 sources mention deer, 6 mention bears, 3 wapitis, 3 wolves, 3 reindeer, 2 foxes and 5 other species (wolverines, markhors, wild sheep, wild boars, geese).

In order to give some flavour of what the sources say we provide four examples. Pallas (1771–76:257) writes about the Mansi (formerly Vogul) of central Russia, in our translation from the German: “Each Vogul community has built a fenced in enclosure in the wood, 10 or 12 km wide, using twigs and young spruces or pines fastened between fence stakes. They are very protective about the

Figure 7. Snow-dug pitfall in NW-Canada as pictured in Hanbury (1904). Such pitfalls are discussed in Section 4.4. Their use is known in NE America, but earth-dug pitfalls appear to be unknown except in Sop’s Arm.
security of these enclosures and make sure that no-one from the neighbourhood cuts wood or grass there, grows anything, or steals wild animals that they have caught. At certain intervals there are openings in the fence, some are equipped with deadfall traps and some with pitfalls, intended to catch wild animals. Sometimes an elk cow with its calves is caught in these pitfalls, and it even happens that a reindeer falls in. James (1888:239) writes about the Manchu of Manchuria: “One day Fulford had a nasty accident. Threading his way along a deer-path in a forest, he stumbled on to a pitfall twelve feet deep, which had been set for deer, and instantly crashed down through it. Luckily it was so narrow that he could check his fall with his elbows, or he might have hurt himself seriously. The pit was so admirably concealed with leaves and twigs, no one could detect it.”. Kroeber (1925:309) writes: “Deer can not have been especially abundant in the dry habitat of the Achomawi, so that their development of a particular method of taking the animal, in addition to those common to all the Californian tribes, is interesting. This device, as simple in plan as it must have been laborious in execution to a people operating only with sticks and baskets, was to dig concealed pits, 2 or 3 yards deep, in the runways. These holes, which were a great nuisance to the settlers until abolished by their edict, were numerous enough to give its name to Pit River”. Finally a short paragraph. Lewis (1906:158) says about the natives of Columbia Valley in Washington: “Game was killed with bow and arrows or caught in traps, snares, dead falls or pits”.

4.4. OTHER SOURCES ON PITFALLS OUTSIDE FENNOSCANDIA

Apart from Birket-Smith, another publication that we have come across, having several references to sources on pitfalls around the world is Jordhøy (2009). His reference list is different in that he reports on sources on trapping systems: (i) pitfalls, and (ii) fences leading the animals off precipices/into lakes, without stating which reference discusses which kind of system. He does however name the continents; he has 11 references for Europe, 2 for North America, 2 for Greenland, and 3 for Africa. We have only checked his North American and Greenlandic references. The North-American ones are Ingold (1980) and probably Gordon (2005) - we say probably because Jordhøy refers to Gordon 2004, and the item is missing from his reference list; Gordon (2005), however, appears in the proceedings of a workshop held in 2004. Ingold discusses pitfalls dug in the snow by the Inuit of Arctic Canada (see below), but Gordon does not mention pitfalls. The Greenland references are Rosing (1956) and Nellemann (1969). For both of these Jordhøy must be referring to non-pitfall trapping systems, because Rosing says explicitly that he has not discovered any mention of pitfalls in Greenland (1956:104), and Nelleman says that the [snow-pitfall] method is not known in West Greenland (1969:143).

Olsen (2006) mentions pitfalls for wild boar in Japan, trapping systems for gazelles in the Middle East and reindeer pitfalls in Siberia (2006:7), pitfalls for large mammals in Africa (although he doubts that any “large permanent structures” exist, 2006:74f). He also mentions “hearsay” of trapping systems for moa in New Zealand, mammoths in North America, and llamas in South America (2006:77) and concludes that no permanent trapping systems have existed in any of these places.

Use of pitfalls dug in the snow in northern Canada is fairly well documented and we have already mentioned this method. Birket-Smith describes in detail the construction of pitfalls in the snow, about 10 feet deep covered variously with a thin snow roof or a layer of faggots.
and moss. Snow or moss moistened with urine is used as bait. These pitfalls can take up to three animals it is reported (1929:1:108). Other authors confirming the digging of snow pitfalls by the Inuit of Canada are Olsen (2006:7), Nelleman (1969), Balikci (1970:39), and Ingold (1980:64) who reports that use of pitfalls dug in the snow was widespread among the Canadian Inuit. Of course no archaeological evidence of snow-dug pitfalls exists. Note that many of these authors refer to the Canadian Inuit as “Central Eskimos”.

One more source on North American pitfalls is Cooper (1938:12). He says that he met a Chipewyan informant who said he had used a pit for trapping caribou (actually contradicting our reference to Birket-Smith in the second paragraph of Section 4.3 above).

Finally, for the sake of completeness, it should be mentioned that Devereux (1966) mentions a possible (single) “caribou pit”, about 25 feet across, some 50 miles upriver from Port Blandford on the Northwest River in East Newfoundland. We do not have any more information about this, nor do we know whether it really is a hunting pitfall.

5. EXCAVATION OF THE SOP’S ARM PITFALLS

In July 2010 the authors of this article travelled to Sop’s Arm to investigate, measure and excavate the pits that have already been mentioned several times in this article. We were guided by Gerald Budden (Watson Budden’s son). The site is located north of the Main River, 2–3 km west of the coastal community Sop’s Arm in White Bay on the eastern coast of Newfoundland (Figure 9). This is certainly one of very few sites in existence outside Scandinavia with archaeological record of pitfall hunting, possibly the only known one. Later in 2010 a report was written which provides a more detailed description than the present article (Bjarni F. Einarsson, 2011).

5.1. TOPOGRAPHY

The site consists of a system of five evident pitfalls in an almost straight line running from northeast to southwest extending over a distance of 82 m, on a wood covered rock shelf bounded by two adjacent valleys. The Main River runs through one valley and the road from Sop’s Arm to the village of Jackson’s Arm through the other. The pitfall row is roughly parallel to this second valley on the slope of its northwestern side. A power line crosses the pitfall system and one pit has been damaged and a sixth pit has apparently been filled up during its construction. We have numbered the pits from 1 to 6 (NE to SW), with the filled-up one being no. 3 and the damaged one no. 4 (Figures 10–12).

It seems likely that a caribou migrating routes lay across this valley (c.f. the comment at the end of section 4.1 above). In fact caribou droppings could be seen in the area during our field trip, right between pits 3 and 4.

5.2. PREVIOUS WORK ON THE PITFALLS IN SOP’S ARM

In Helge and Anne Stine Ingstad’s publications on their research in L’Anse aux Meadows they say that in 1961 a local man, Watson Budden, showed them some pits in the Long Range Mountains which he believed were ancient deer hunting pitfalls: “We went there, walking for an hour through vigorous spruce forest with areas of tall birches and alders. We found four pits, quite close to one another. They were surprisingly large, at rough estimate 3 metres deep, about 4 metres long at the top, and almost as wide. There was no doubt about their great age, a spruce grew at the bottom of one of them, and we also found some
Figure 10. Pit no. 5. The pit is in the path of the power line discussed in Section 5. The bush growth is not mature because of regular clearing to avoid trees reaching too close to the power line.

Figure 11. Pit no. 4 during the exploration. The area was cleared of bushes before the start of the excavation. The rock in the lower left may have fallen in during the power line construction. The visible layers in the side of the ditch can be seen more clearly in Figures 17 and 18.
charcoal there, probably deriving from a forest fire. Watson said that these pitfalls lay in the migratory route of the caribou. The animals passed this place in the spring, when they were on their way north to the slopes of Long Range Mountains, and again in November or so, when they moved south to the big lakes, such as Red Indian Lake.” (1965:238f; 2000:277f).

As to the question of who dug and used these pitfalls the Ingstads believed that there was a possibility they could be the work of Nordic people. They did not believe that they were the work of Beothuk Indians or their ancestors since they used alternative hunting methods, where the animals were driven into fenced folds where members of the tribe would be waiting for them. Moreover, hunting pits of this kind were previously unknown in Canada, Alaska and Greenland. Furthermore they could not be the works of modern hunters as no information can be found that they hunted caribou in this manner.

In 1965 the archaeologist Helen Devereux surveyed the site, guided by Watson Budden, and possibly again in 1966, with Watson’s cousin, Alfred Budden. She subsequently wrote a two part report (Devereux 1966), which describes seven pits, and there can be little doubt that at least some of them coincide with the pits described in the current article. It is however for many reasons difficult to match individual pits discussed in the report to our observations. A trial excavation was made in one of the pits as part of the 1966 project and its section measured up and drawn. The stratigraphy observed was similar to what we observed in pit 1 but the excavation revealed nothing concerning the pit’s age, type or who dug it. Devereux conjectures that a number of people took part in driving a herd of animals into the pits during the caribou migration, and that the animals would have to be killed before they could scramble up the sides of the pits to freedom. We agree with these conjectures, and add the possibility mentioned in section 4.1, that the pits were connected with fences. Devereux’s report is discussed again in section 7 below.

5.3. METHODOLOGY
All six pits were measured as they appear in the landscape today with a measuring tape, giving cross-sectional and longitudinal profiles, as well as the shapes of the pits.
as seen from above. In addition the distances between pits were measured with tape, and the directions of the pits as well as directions of lines connecting their ends were determined using a compass. The locations of the pits were determined with GPS. Magnetic declination of 21°W was taken into account.

After inspecting all the pits a decision was made to dig a trench across pit 4, from one side to the other, as opposed to either excavating it fully or half-sectioning it. Among the reasons for choosing pit 4 was that it was the largest pit in the area that had been cleared of wood because of the power line. As mentioned earlier the pit had been somewhat damaged during the power line construction. A trench, 0.5 m wide, was dug across the pit for measuring, photographing and drawing. Soil samples were collected from the bottom of the pit, immediately above the layer that formed its bottom after it was constructed.

During the excavation of pit 4 we realized that we would have time to excavate another pitfall using the same methodology, and chose pit 1. In this case we only dug a trench from the deepest point to the outer edge of one side. Soil samples were collected as for pit 4.

5.4. RESULTS OF THE INVESTIGATION

Dimensions layout and shape of the pits. The layout of the pits is shown in Figure 13. The figure shows that the pit system forms an almost perfectly straight line from NE to SW. The distance between pits ranges from 1 m (between pits 1 and 2) and 14 m (between pits 2 and 3). Pit 2 is the largest and pits 5 and 6 are smallest. The aerial-view-shape and the cross-sectional and longitudinal profiles of the pits as they are now is shown in Figure 14. We note that the width of the pits ranges from 3 m to 6.5 m, their length from 7 m to 10 m, and their depth from 1.5 to 2.3 m.

Investigation of pit 1. The pit measured approximately 5 by 10 m with a depth of 2 m. These figures are not very precise as it is difficult to define the limits of the pit. The trench was dug from right across the centre of the pit, in a direction more or less from NW to SE. The entire pit was covered in a black organic layer with small remains of leaves and twigs. Underneath there was a greyish-black, sandy layer on top of another black organic layer, which covered the original bottom of the pit. The bottom layer was submerged in groundwater which we removed using buckets in order to be able to finish the excavation. The pit turned out to have a funnel shaped design, its lower part having much steeper sides than the upper part. No artefacts were recovered. A distinguishing feature of the pit was the uniformity of the soils and stratigraphy, and it was fairly simple to excavate. The sample taken from the bottom of the pit was numbered 5. A diagram in scale 1:20 was made (Figure 15) and the excavated profile was also photographed (Figure 16).

Investigation of pit 4. This pit measured approximately 4 by 9 by 1.90 m and there were much more stones and gravel in this pit than in no. 1. This pit was also funnel shaped. The stones that were found at the pit bottom had most likely accumulated after the pitfall fell out of use, but it cannot be excluded that some of them formed some part of the pitfall’s structure from the beginning. There was a large spiked rock at the bottom, whose function might have been to injure animals that fell in. As before a 1:20 diagram was constructed and photographs taken (Figures 17 and 18). Four samples were taken from the trench wall, numbered 1–4. Sample no. 2, intended for
Figure 14. Cross-sections, profiles and top-view outlines of the five studied pits as they were at the start of excavation in July 2010.

Figure 15. Diagram of the profile of pit no. 1. The funnel shape is clear. The combined thickness of layers 1, 2 and 3 at the center of the pit, 55–60 cm, represent soil thickening since the pit construction.
Figure 16. The profile of the excavated ditch in pit no. 1. Photograph taken towards north-east. The white arrow points at the layer boundary believed to be the surface after the pit was originally dug. The dark layer above this boundary is soil that has gathered there since that time. Notice that considerable soil thickening can be observed in the center of the pit; see Figure 15.

Figure 17. Diagram of the profile of the excavation in pit no. 4. As in Figure 15 the funnel shape is clear. The thickness of layer 4 in the center of the pit is 80–110 cm, possibly indicating soil thickening since the pit construction, although the damage done during the power line construction admittedly makes it difficult to reach precise conclusions.
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5.5. RESULTS OF RADIOCARBON DATING

Radiocarbon dating of soil samples is a very inexact science. We have already seen the difference between the post quem and ante quem dates obtained for the Norwegian pitfalls in section 4.2, the former giving ages of 2000–5000 years and the latter corresponding to unrealistically young samples. Observe that it is not only the sampling location that distinguishes these: all the former were wood or charcoal and all the latter were soil samples.

The problem with dating soil is that there is constant rejuvenation of C14 in the soil, through humification (bacteria take up carbon from the groundwater), earthworms, plant roots, and possibly even chemical reactions that CO2 in the groundwater enters (Scharpenseel 1992, Wang et al. 1995). The difference between the real age and the radiocarbon age can be very substantial. Wang et al. present a figure (1995:286) where a sample of forest soil with a real age of 5000 years at 40 cm depth gives a radiocarbon age of 1000 years, and another 5000 year old sample at 20 cm depth is only 500 radiocarbon year old. Results in the same vein are presented in two graphs by Becker-Heidmann (1989:133f). In the first graph a true soil age of 1000 years corresponds to a radiocarbon age of 1000 years, and in the second one (which is reproduced by Scharpenseel, 1992:544) there are several curves, and a middle one shows a true age of 1000 years corresponding to a radiocarbon age of 100 years. Another article dealing with this subject gives an example of forest soil from 40–50 cm depth in southern Brazil, for which „total soil organic matter“ gave a radiocarbon age of 820 years, but the real age was probably 2500–3000 years (Pessenda 2001).

After making all these precautions, we now return to Sop’s Arm. The radiocarbon dating analysis of the two samples was carried out at the AMS 14C Dating Centre at the University of Århus in Denmark, and we received the results in August 2011. The results are shown in Table 1.

According to the information we received from the University of Århus, the negative radiocarbon age of sample #2 can be explained by a calibrated date at the very beginning of the nuclear bomb testing in the late 1950’s, as shown in the table.

6. HUMAN OCCUPATION OF NEWFOUNDLAND AND LABRADOR

Newfoundland and Labrador settlement history begins approximately 9000 BP, with small groups of Amerindian people moving northeast from the St. Lawrence Gulf and the Maritime Provinces into the Strait of Belle Isle. These early settlers were following the retreat of the last glaciation, the Late Wisconsinan (Stopp 2002:303, Tuck 1976:1f).

6.1. OVERVIEW OF NEWFOUNDLAND AND LABRADOR ABORIGINAL CULTURES

Maritime Archaic Indians (MAI). By the time they arrived in southern Labrador these Amerindians were well adapted to hunting marine resources. Their coastal habitation and burial sites reflect their Maritime orientation. Faunal remains from these sites contain sea mammal and sea bird bones. Their ground and chipped stone weapons and tools were designed to hunt and process marine resources. They brought this marine adaptation to north/northeastern Newfoundland about 5000 BP, and are aptly designated the “Maritime Archaic Indians” (Renouf 1999:20).

Living along the coast also provided the MAI with caribou that travelled there seasonally and in the near shore interior. The MAI utilized caribou antler and bone for tool making, and likely used skins for clothing and tent covers. In Labrador their seasonal mobility took
them into the interior where they could obtain additional resources such as small land mammals, freshwater fishes and berries. But perhaps the most important interior resource were the region’s large caribou herds (Stopp 2002:303).

Intermediate Indians (II). About 3500 years ago the MAI started to disappear from the archaeological record, for reasons unknown. Their culture was replaced by a 2nd group of Amerindians in the ancient cultural sequence, designated by archaeologists as “Intermediate Indians” Occupying parts of Labrador for about 2000 years, the II probably originated in the Gulf of St. Lawrence region, though that is less well understood than for the MAI (Stopp 2002:303).

Their settlement of central and southern Labrador was not as expansive as that of the MAI, but they occupied locations both coastal and inland, from the Strait of Belle Isle north to the Hebron area on the north Labrador coast. The coastal portion of the II seasonal round is reflected by sites on the inner islands of coastal bays. These locations would have protected them from the harsh weather on the outer coast. From these “open water/warm season” sites they could fish for salmon, char and gain access to sea bird populations and migrating seals (Stopp 2002:303).

Their interior sites provide evidence for a reliance on caribou, though hunting small land animals, such as porcupine, was likely done as well. The caribou population during this period may have gone through an expansion. Around 3500 years ago the Labrador environment underwent a slight warming period compared to current times. This warming helped to expand the open spruce woodland environment (Stopp 2002:303), which in turn would have supported significant numbers of caribou. By 3000 BP however the climate cooled somewhat, making for a more challenging environment for Intermediate Indian people.

Palaeoeskimos. While the II were occupying south and central Labrador, a group of arctic-adapted people moved into northern Labrador from the high Arctic. These first Palaeoeskimos were descended from an ancestral population that had crossed the Bering Strait ca. 4500 years ago. They settled most of the high arctic and arrived in Labrador about 3800 years ago. Of the different waves of Palaeoeskimos, the Groswater, named after a prominent Labrador bay where some of their “type” sites were located, were one of the first. More “waves” of Palaeoeskimo followed, and by about 3000 BP they occupied most of the Labrador coast and reached the Island of Newfoundland. A 2nd major Palaeoeskimo group, the Middle Dorset, arrived about 2000 years BP.

All the Palaeoeskimos were skilled sea mammal hunters, especially proficient at hunting harp seals. They also practiced some caribou hunting on coastal Newfoundland (Renouf 1999:29), and occasionally in the Island’s “near interior”, i.e. the geographic/cultural space between the coast and the far interior, where people have access to resources of both the coast and of the interior (Reader 1996:126; Linnamae, 1975). Palaeoeskimo occupation in the region ended about 600 years BP (Renouf 1999:28).

Late Prehistoric Indians. During mid-Dorset times
another Amerindian group appears in Labrador and on the Island of Newfoundland, called the Late Prehistoric Indians. These Amerindians practised a mixed economy, procuring both maritime and terrestrial resources, including caribou. Some of their ancestors may have been one of the groups of “Skrellings” encountered by the Norse in Vinland. They relied quite heavily on a lithic material from northern Labrador called “Ramah Chert.” They and mid-Dorset people may have traded this stone because the latter group had the source quarries in what is understood to be “their” territory (Odess et al. 2000:202–204).

Innu. Some of the descendants of the late Prehistoric Indians have been called, in more historic times, the Montagnais and the Naskapi by Europeans, though today we know them by their own name, the Innu. Innu people relied heavily on caribou for subsistence, clothing, shelter (skin covered tents) and tool making. In fact caribou are the foundation for both the real and spiritual worlds of the Innu (Mailhot 1997:7,132,147,167).

Other land mammals such as bear, beaver, porcupine and moose were taken, along with anadromous fish. Procurings all these resources was done using canoe and snowshoe. The Innu were historically mobile around Labrador and in Quebec, living in various camps in season. That characteristic mobility continues today through extensive kinship ties throughout the Quebec-Labrador Peninsula (Mailhot 1997:31–36). Today many Labrador Innu reside in two principal communities, Sheshatshit and Natuashish.

Beothuk. Late Prehistoric Indians on the Island of Newfoundland appear to have been ancestors to the Beothuk people who occupied the Island in historic times, and who Europeans encountered from the 15th century onward. The self-named “Beothuk” were known for their significant reliance on caribou, especially in the 18th and 19th centuries (Pastore 1992:28–32, 40f). They often hunted the animals at river/lake crossings in the fall. They would direct the animals, sometimes with extensive fences of brushwood and decoy markers, to cross at locations where they could be speared from canoes, and/or along the shore. Tragically, the Beothuk went extinct in the early 1800s as a result of death from European diseases, conflict with European settlers and the concomitant loss of access to territory and resources (Marshall 1994:258). The name “Thule” reflects the area in northwest Greenland where some of their early houses were first excavated in the early 1920s by members of the Danish, pan-Arctic, Fifth Thule Expedition. The Thule originated in eastern Alaska, and over a 300 year period they settled much of arctic Canada and Greenland. (McGhee 1991:16, 1996:20–23). These Inuit were especially skilled sea mammal hunters.

From their pioneering sites and small numbers in northern Labrador, the Thule Inuit moved south over a 200 year period to cover the whole of the Labrador coast, arriving in the Strait of Belle Isle ca. 1550 AD. At that time they encountered Basque whalers/fishers who had arrived from Spain (Pope 2008:30). Thule Inuit in Labrador were specialists at capturing marine resources, especially whales, seals and char, though caribou were also hunted. But their Labrador Inuit descendants also practiced an interior caribou hunt in the fall. This activity was characterized by parties of Inuit journeying up and into Labrador’s interior plateau to hunt the region’s caribou herds. This was part of an Inuit seasonal round which also included families moving to the outer coast in spring, and to the inner coast in the summer.

6.2. ABORIGINAL METHODS OF CARIBOU HUNTING

Evidence that all the groups discussed in the previous section hunted caribou in both Labrador and on the Island of Newfoundland consists of faunal remains, tool (weapon) parts, hearths and tent rings located near caribou hunting grounds or within specific habitation sites.

Stone alignments that appear to be caribou “drive lanes” have been recorded (Thomson 1986:31–37). At White Point bordering Saglek Bay, northern Labrador, Thomson noted rock/boulder alignment features that he interpreted as “caribou fences” for directing the animals, and possibly a “caribou trap” - a special kind of rock feature (1989:31–37). He was unable to firmly attribute a cultural affiliation to the maker/user of these features. But given the abundance of caribou over the last 5000 years, and the rich Aboriginal settlement history of the region, Thomson saw caribou hunting of an “ambush type” as a significant seasonal activity by all of the cultures who settled the area. In historic times there is also documentary evidence and oral history for both the Innu and Inuit that describes corrals of wood/stone to contain caribou and “blinds” to help conceal caribou hunters.
Despite this broad range of Aboriginal and Inuit caribou hunting practices and related features, one method for capturing caribou that appears largely absent in Newfoundland and Labrador in particular and generally in the western and northern part of North America, is the use of pitfalls. Specially made depressions in the ground that would be used to trap and/or confound and confuse migrating caribou have rarely been recorded (cf. the ref. Birket-Smith 1929:2:68f; 1929:2:157 already mentioned in Sec. 4.3 above; Cooper 1938).

We have seen in section 5 that pitfall hunting was widespread in Scandinavia during the Viking age. However, it appears to be rare in Newfoundland and Labrador, apart from the pitfalls of Sop’s Arm. Further research may bring the reasons for this to light.

6.3. SOP’S ARM SETTLEMENT: 18TH–20TH CENTURY
Although Aboriginal settlement did occur near or at Sop’s Arm, little of that ancient history is currently known. What is known is that small numbers of Europeans (French) and Newfoundland fishers have lived around Sop’s Arm, White Bay for about 200 years.

English merchants first built fishing premises on Sops Island, just offshore from Sops Arm, ca. 1763. But by 1786 they were evicted by the British Navy as part of a British effort to support management of the migratory French cod fishery in White Bay. This part of the Newfoundland coast had been designated as the “French Shore” through late 18th century British - French treaties enacted to end conflict over control of North America. As a result, English fishers were forbidden to settle in Sops Arm. But over the next few decades a few English fishers returned to the area to set up fishing premises. Eventually the community of Sops Island was established, one of the earliest English settlements on the “French Shore.”

Fishing dominated the economy up to the early 20th century, but by then a logging industry was established in the region. Sops Island grew to about 300 people in the early 1950s., when an economic decline set in and the community dwindled quickly. By then the community of Sop’s Arm had become established, and it expanded instead as a result. The transition from one community to the other was part of the initial Provincial government effort to resettle more isolated fishing communities in locations where government services could more easily be provided (Memorial University, 2003–2005). Currently the community of Sop’s Arm numbers about 200 people, many of whom work seasonally in fishing, the wood industries, tourism and migratory work outside the region/province. Over the last twenty years Sop’s Arm has experienced a fair population decline, as with many rural Newfoundland and Labrador communities.

7. DISCUSSION AND CONCLUSIONS
This article is in fact double barrelled, describing two independent projects that are at the same time closely interwoven. In the first part we discuss how we make use of medieval texts by interpreting descriptions in the Icelandic Sagas on landscape and sailing routes of the Nordic explorers. Our main focus has been on the journey of Thorfinn Karlsefni to Vinland which is recounted in the saga of Eirík the Red, Eiríks Saga. We put forward new ideas and arguments that Karlsefni’s main base, Straumfjord, and other place names mentioned in the saga, such as Furdustrandir and Hóp, agree best with the lay of the land in Newfoundland. The second part deals with the archaeological research on hunting pitfalls and the survey and excavation we made on the pitfalls found in Sop’s Arm in Newfoundland. Because such pitfalls were common in Viking age Scandinavia and rare in North America the question arose whether these archaeological remains might be of Viking origin. If this was so, their location would also agree with our ideas about the location of Karlsefni’s ‘Straumfjord’ and give motivation to search for other Viking remains in the area.

The Viking voyages to Greenland and North America have for long fascinated both professional scholars and amateur historians, and they have been a continuous source and inspiration to fiction writers in stories of adventure and exploration. However, despite widespread knowledge about these journeys, it is for many reasons knotty to use the historical sources in archaeological and historical research. The main difficulties lie in the facts that the sources were mostly written some centuries after the events took place, and that the sagas are partly works of fiction. Most scholars today agree that the Icelandic sagas in general are a mix of fact and fiction, in many ways like modern day historical novels. The problem is making a distinction between the fact and the fiction.

The stories of the Vinland voyages were so significant that one must suppose that they were common knowledge.
in Iceland and even in Scandinavia in the 11th and 12th centuries. When weighing up the value of the sagas for archaeology, one may remember that they actually led to the discovery of the Viking site at L’Anse aux Meadows.

We believe that although accounts of events may change considerably in oral preservation, the knowledge on sailing routes was of particular importance for sea-faring people, and that special effort was made to preserve such information. The sagas’ description of sailing routes from Scandinavia to Iceland and Greenland are thus mostly accurate, and probably also to Helluland and Markland, which most scholars agree are Baffin Island and Labrador. But after that peoples’ interpretations begin to diverge. The descriptions of the sailing route to Vinland are so vague that any two researchers seem to reach different conclusions when trying to outline it on a modern day map. Even the authors of this paper have different ideas, as already mentioned in the subsection on Kjalarnes and Furdustrandir in section 2.3. Most researchers think that Vinland was in the lands south of the St. Lawrence Bay, the reason being that wild vines and grapes are found there but not in more northerly lands such as Newfoundland.

However, we think that in the language of Leif Eiríksson vinber did not necessarily mean grapes, but could have meant some of the delicious berries that grow in Newfoundland (see Section 3.5). If following Eiríks Saga, like we suggest here, we take the route from Markland straight to the south, reaching the northern tip of Newfoundland, and then follow the east coast of that country we arrive where Leif the Lucky might have landed when he hit Vinland the good. The lay of the land fits quite well to Eiríks Saga’s description of the landscape. Kjalarnes would be at the northern tip of the Northern Peninsula, and its long eastern coast would be the saga’s Furdstrandir or Wonder-Beaches. That is a fitting name for this scarcely populated 200 km coastline. The sailing leads us into the White Bay and to a small fjord with a big island outside its mouth called Sop’s Island. The pitfalls are located at the bottom of this fjord. This would in fact be the first inviting place after the long journey. Our suggestion is that this could be the Sagas Straumsfjord where Karlsefni and his men went ashore to build their base and the island would be Straumshey. The location of Hóp must then have been further south in Newfoundland. Hóp, meaning a lake close to the sea, could fit with today’s Gambo Pond, which is a lake with a very short and shallow river flowing into the Freshwater Bay, an inlet from the Bonavista Bay.

For the past several years Dr. Jónas Kristjánsson has made many expeditions from Iceland to Newfoundland in search of Viking settlement remains, with the aid of descriptions in the Icelandic sagas on landscape and sailing routes. When exploring the lay of land in Sops Arm in August 2008, the research team was guided to several earth dug pitfalls, which the locals believed were used to catch caribou. A small scale investigation had been carried out before, when the archaeologist Helen Devereux surveyed the area in July 1966. She identified 7 pitfalls and her conclusion was that they were all produced by the same agent. She proposed three alternatives about their existence: 1) they were formed by natural forces, 2) their purpose was mineral exploration or 3) they are “of Indian origin and constructed for the purpose of taking deer”. The Norwegian explorer Helge Ingstad also examined these pitfalls in 1961 and believed they had been constructed on a Norwegian model to hunt caribou. This fascinating site caught our interest immediately but it was clear that an archaeological investigation was needed to get more information about the pits and hopefully their origin. The survey and excavation was carried out in the summer of 2010 and can in fact be regarded as a separate project. The archaeological material talks for itself and is dealt with in the second half of this article.

The pitfalls that we investigated lie in an almost perfectly straight line from NE to SW, making a system of five pits extending over a distance of 82 metres. Unfortunately one pitfall has been damaged because of the construction of a power line crossing the pitfall system, and it is likely that there is a sixth one which has been completely filled up with earth. The pitfalls have different sizes, ranging from 3 to 6.5 metres in width, 7 to 10 metres in length and 1.5 to 2.3 metres in depth. Two pits were excavated by taking a section into them for analyzing their stratigraphy and shape. Among interesting conclusions were their funnel shape in design, the lower part having steeper sides than the upper part. They were obviously dug by hand and Devereux’s first alternative about their existence, that they were made by natural forces can be ruled out. Her second alternative, seems also very unlikely, that funnel shaped system of pits of a considerable size were made for mineral exploration, especially considering that such pitfall systems are well known in many countries for animal hunting. We therefore agree with her
third alternative and think it is by far the most likely explanation for their existence. But like we have stated, we do not share her conclusion that they were necessarily “of Indian origin”.

In Scandinavia, pitfalls for hunting reindeers can be counted in tens of thousands, making them one of the most common archaeological features in the area. This hunting technique has been used for several thousand years and was prevalent in the middle ages, in particular in the Viking age. In Norway it seems that massive systems of hunting pits came into use around the 8th century. Most of them were earth dug like in Sop’s Arm but sometimes they were made with stone walls. The current depth of the pits in Sop’s Arm is somewhat more than the depth of the existing pitfalls which we have information about in Scandinavia, where they are usually are not much more than 1 metre. Apart from this depth difference the Newfoundland system seems to be very much in line with how pitfalls were made in Scandinavia. There can be many explanations of the difference: possibly the pitfalls in Newfoundland were originally larger than the Scandinavian ones, maybe they are younger, and maybe soil thickening has for some reason been slower. Maybe the reason is that caribou are somewhat larger than reindeer.

Hunting pits were widespread in Scandinavia but there are written sources about pitfalls elsewhere in the world, in fact from every continent. Our interest focuses on their usage in North America and especially NW-America and Newfoundland. As discussed in the overview of the aboriginal cultures of Newfoundland and Labrador in Section 6, archaeological evidence stretching back 9000 years shows that most of these tribes depended upon caribou hunting to some degree. After going through this material our main conclusion is, that despite a broad range of caribou hunting practices amongst Aboriginals and Inuits, the use of pitfalls appears to be absent in Newfoundland and Labrador. According to the discussion in Section 4 there are also no written sources on pitfall use anywhere in the western part of North America. It seems that pitfalls dug in the snow were used by Canadian Inuits in NW-America but not earth-dug ones.

Knowing that Nordic people were in the area around 1000 AD, it is tempting to suppose that the Sop’s Arm pitfalls are of Viking origin. The making of such pits demands huge labour and the use of metal tools would come in good hand. It must however be admitted that this is no hard evidence. As said earlier in this article, radiocarbon datings of pitfalls in Norway shows their age to go back four or five thousand years, well before the dawn of the bronze age in Scandinavia which did not begin until around 1700 BC. The Achomawi of the current California also did not have any metals; yet they employed pitfalls extensively as discussed in Section 4.3.

By excavating the pitfalls in Sop’s Arm we were hoping that they could be accurately dated. Possibly remains of wooden constructions could be found, as there are examples of in Norway. That would have given an opportunity of dating, for example by dendro analysis and/or radiocarbon dating of wood. Another possibility was to find artefacts, even iron nails or some other evidence that iron tools were used. Unfortunately nothing of that kind was found. That left us with a much more unreliable method of dating, i.e. radiocarbon dating of soil samples. In Scandinavia, two methods have been used in these circumstances: taking a sample (often soil) from the bottom of the pitfalls, giving a minimum age (*terminus ante quem*) or by taking the dating material (usually wood or charcoal) underneath the bank of soil that came up when the pitfall was constructed, giving a maximum age (*terminus post quem*). These methods have given very different results, the former often an unrealistically young age and the latter a very old age.

In the current study soil samples from the bottom of both the excavated pits at Sop’s Arm were radiocarbon dated. One sample actually gave a negative radiocarbon age and the other one gave a radiocarbon age of 185 years, corresponding to the likely calibrated date range 1735–1806 (56%). The negative age sample came from pit no. 4, and this was probably a rather bad choice for excavation, because it was more damaged by the power line construction than we thought in the beginning. The second sample came from pit no. 1, which was in good shape. However its bottom lay below the ground water level, making it difficult to collect a good sample and probably escalating rejuvenation of the soil as discussed in Section 5.5. As discussed there, radiocarbon dating of soil tends to give a substantially lower age than is real, due to constant rejuvenation of the soil’s carbon, trough e.g. humification, earthworms and plant roots. Our conclusion is to take the radiocarbon dating of the Newfoundland pitfalls with great reservation.

In summary our research leaves us with many questions and only incomplete answers. Who made the pitfalls in Sop’s Arm? If they are of Nordic origin, as we think is
quite possible, why were they constructed here? Further research could provide information about how the Viking explorers exploited the land. Did the dwellers of L’Anse aux Meadows dig these pits 230 km away from their base, or can we expect to find dwelling houses somewhere near Sop’s Arm? Further investigation at the pitfall site and a search for the remains of the houses belonging to the Nordic explorers might answer some of these questions. Regardless of the answers, the pitfall system at Sop’s Arm is the only site outside Scandinavia known to us with archaeological evidence of this once important hunting method for many of the world’s people. An extensive exploration is clearly called for.
Icelandic names are listed in alphabetical order by first names. Range of years (e.g. 1100–1110) given with sagas and other medieval sources denotes that it is generally accepted that they were originally composed (some time) in these years. Range of years for manuscripts denotes a generally accepted time for their writing. When a year is preceded with ca. the inaccuracy may amount to a few years (or even decades).


Eiríks Saga Rauða, 13th century. The Hauksbók text (cf. Section 2.2) is printed verbatim in Eiríkur Jónsson and Finnur Jónsson 1892–1896 and the version in Einar Ól. Sveinsson and Matthias Börbarson 1935 is also based primarily on that text. The Skáholtsbók text appears in Ólafur Halldórsson 1985, and in English translation in Kunz 1997a.


Flateyjarbók, ca. 1390. Manuscript GKS 1005 fol.


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