

# The Significance of Remote Resource Regions for Norse Greenland

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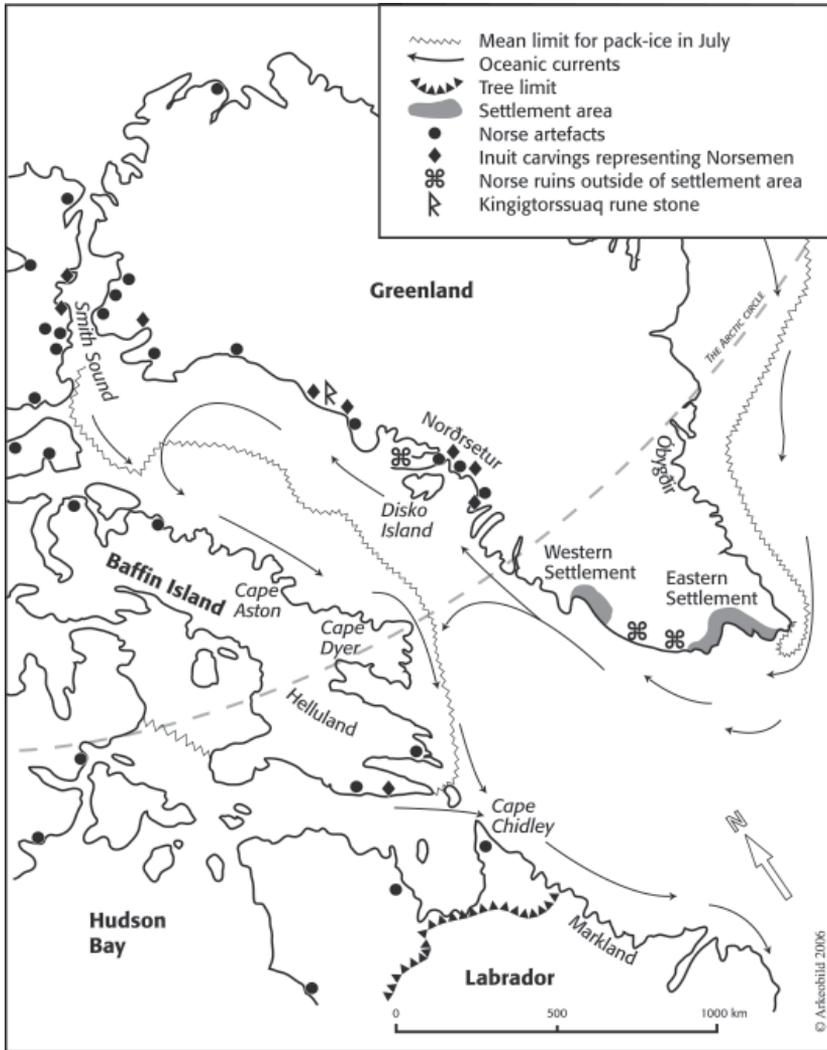
## Introduction

Today the great economic significance of outlying regions for medieval agricultural societies is well appreciated. In these peripheral – and often relatively extensively used – regions, hunting, fishing, summer grazing, and collection of fuel took place. The outlying regions were not distinct from the settlement areas. Instead they were part of a larger resource region and well integrated into the cultural, economic and social systems of the settlements.<sup>1</sup> In marginal regions, where the settlement areas were unable to support the population, the outlying regions were more important than in wealthier regions. The more marginal the region, the more remote were the outlying regions that were exploited. The most exceptional example of this can be found in Norse Greenland, where the economy seems to have been completely dependent on resources over 800 kilometres away from the settlements (Arneborg 1998, 2003; McGovern 1985; Seaver 1996, 2000). The dependence on such distant outlying regions can only

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The present article would hardly have been written without the rewarding conversations the author had the possibility to conduct with different scholars – especially Christian Keller and Kirsten A. Seaver – during the interdisciplinary conference *Dynamics of a Northern Society* in Copenhagen in May 2004. The author would also like to thank Seaver and the anonymous reviewers of *Scripta Islandica* for their valuable criticism and suggestions. The initiative for this article dates back to 2003 when the author was given the opportunity to participate in a stimulating discussion with Michael Nordberg after a seminar at the Museum of National Antiquities in Stockholm.

<sup>1</sup> The literature concerning the use of medieval and early modern outlying regions has in recent years become quite extensive. See, for example, Andersson, Ersgård and Svensson (1998) and the therein-cited literature.



Map 1: Map of Norse Greenland and its resource regions: the symbols marking Norse artefacts found outside the settlement areas represent one single artefact or several discovered at the same location. Note the pack-ice conditions in July and the oceanic currents which probably, to a considerable extent, influenced Norse navigation as well as resource exploitation.

be understood in the light of Norse Greenland being from an agricultural point of view the most marginal of all medieval societies.

The narrow, uneven strip of land between the Inland Ice Cap and the ice-choked North Atlantic off the southwest part of Greenland allowed an agricultural settlement in two sheltered fjord-systems. During the late 10<sup>th</sup> century, Icelandic colonists (*landnámsmenn*) settled in these areas, the Eastern Settlement (*Eystribygð*) in the extreme south and the Western Settlement (*Vestribygð*) further north (see Map 1). In 1124, Greenland was given its own episcopal see, which was to be the farthest outpost of Christian Europe and the northern European agricultural society until the Norse Greenlanders vanished without a trace some time during the late 15<sup>th</sup> or early 16<sup>th</sup> century for reasons still largely unknown (Brink 1991; Fyllingsnes 1990; Gad 1967; Keller 1989; Seaver 1996). It cannot be emphasised enough that Norse Greenland was an outpost for agricultural settlement: the conditions for animal husbandry and agriculture were marginal at best. Greenland lay far beyond the limit of economically viable grain cultivation even during the ‘Medieval Warm Period’ and the inhabitants had to rely on haymaking and fodder cultivation, thus making animal husbandry possible (Christensen 1991; Hansen 1991; Vésteinsson, McGovern and Keller 2002).

Many of the resources that the Norse Greenlanders relied on for subsistence were to be found outside the close radius of the farms, as, for example, caribou (*Rangifer tarandus*), seal (*Phoca*), fish and driftwood (McGovern 1979). Hunting seems to have been a communal and co-ordinated activity, with hunting methods increasing in efficiency with the number of participants, and comprising an important part of the Norse seasonal round of activities (see Table 1). Especially the communal spring seal hunt seems to have played a significant role (McGovern 1979: 165–166 *et passim*; Vebæk 1991: 10–11). Archaeozoological material from excavated Norse Greenlandic farms shows that an average farm consumed somewhere between ten and thirty seals per year and stable carbon isotopic composition ( $\delta^{13}\text{C}$ ) analyses indicate a gradually increasing reliance on a maritime diet (Arneborg *et al.* 1999: 157–168; McGovern 1985: 279, 304).

Two of the most prominent experts on Norse Greenland, Jette Arneborg and Thomas H. McGovern, have in their research stressed that the economic and social system in Greenland cannot be fully understood unless both the agricultural subsistence economy – in which seal and caribou hunting is included – and the long-range ‘cash hunt’ in the High Arctic

Table 1: The approximate length of the seasons in the Western Settlement, indicating the seasonal round in Norse Greenland. The table was developed by the author and is based mainly on McGovern (1979).

Activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spring seal hunt					●	—————	●					
Caribou hunt									●	—————	●	
Grazing						●	—————		●			
Hay making								●	—————	●		
Sheep milk production					●	—————	—————	—————	—————	—————	●	
Cattle milk production					●	—————	—————	—————	—————	●		
Construction work					●	—————	—————	—————	●			
Navigation <sup>a</sup>						●	—————	●				
Norðrsetur hunting						●	—————	●				
Markland voyages							●	—————	●			

<sup>a</sup> Due to the risk of frequent autumn storms, the author has shortened the navigation season by two months, in contrast to most other scholars who have taken the ice conditions into consideration only when assuming the length of the navigation season.

are taken into consideration (Arneborg 1998, 2003; McGovern 1979, 1985). It is the exploitation of the remote resource regions that is the subject of this article.

The resource regions that will be featured are primarily the rich hunting grounds called *Norðrsetur* ('Northern Places') on the central west coast of Greenland and *Markland* ('Forest Land') along what is now the coast of Labrador.<sup>2</sup> The purpose of this article is to highlight the significance of these outlying regions for the economic and social conditions of the Norse settlements in Greenland. While Jette Arneborg (1992: 19–20) maintains that the Norse Greenlanders were never able to integrate Markland as a resource region into their economy, Kirsten A. Seaver (1996, 2000) has asserted the opposite.<sup>3</sup> The latter appears to be correct regarding this point, but at the same time, it should be emphasised that there are good reasons to assume that the resource region of Markland was used much less than *Norðrsetur*. Clarifying the reason for this – something that has not yet been sufficiently dealt with – is one of the article's main aims.

<sup>2</sup> The stay in *Norðrsetur* was sometimes, according to *Grænlands Annál*, called *Norðrseta* (Halldórsson 1978: 50).

<sup>3</sup> Arneborg (2003: 171) seems to have changed her opinion on this matter due to recent archaeological finds.

## Norðrsetur – The Northern Hunting Grounds

Jette Arneborg (2003: 165–166) and Thomas H. McGovern (1979: 160–165) maintain that the large farms, often with churches, were the social and economic heart of Norse Greenland. The position of the chieftains depended on the control of pastureland as well as on the importation and distribution of imported commodities. Trade with Europe was a necessity for the Norse to be able to maintain their European cultural identity (Arneborg 2003: 170 *et passim*; Gad 1967: 152–155). Access to export products was therefore vital. Having control over these meant, in a longer perspective, control over imports. Agricultural output in the settlements did not produce very notable items of export allowing peripheral Greenland to be integrated into the European trade system (Arneborg 1998, 2003; McGovern 1985: 284 *et passim*).<sup>4</sup> Homespun woollen cloth (*vaðmál*) was the Icelandic staple item of export and would, due to the similarity in domestic economies, of course also have been available in Greenland. Skins from cows, caribou and seals would have been surplus products as well. However, commodities such as woollen cloth and ordinary skins had a relatively low value and were also available closer to Europe. Consequently, they would have constituted a fragile link to European trade.

The written sources make it apparent that the export commodities which constituted a lifeline for the Greenlanders maintaining trading links with Europe instead were Arctic commodities such as walrus ivory, walrus skin, polar bear skin and an occasional live polar bear, and probably also white falcons (*Falco rusticolus*) and narwhal horns (*Dipl. Norv.* 1 [71]; Jónsson 1920: 71–72; *Reg. Norv.* IV [522]).<sup>5</sup> Tithe payments reveal that the Greenlanders could offer large quantities of these attractive trade items (Seaver 1996: 79–80). A large-scale ‘cash hunt’ of a commercial character can consequently be assumed to have been an essential aspect of life in Norse Greenland.

Walrus (*Odobenus rosmarus*) and polar bear (*Ursus* or *Thalarctos maritimus*) lived north of the settlement areas, yet it is possible that there

<sup>4</sup> The purpose of this article is not to give a close account of the written and archaeological sources that bear witness to the Norðrsetur voyages nor to give a detailed description of the hunting voyages. For a study of these, see especially McGovern (1985).

<sup>5</sup> This must be weighed in relation to the fact that in the beginning of the 19<sup>th</sup> century seldom more than 150 walrus were caught in an average year along the entire west coast of Greenland (McGhee 1984: 21). Even if the tithe payments were likely to be the result of several years’ catch we must, on the other hand, remember that it is improbable that the whole catch went to Rome.

was a small number of them – primarily during the winter – outside the settlements during the beginning of the Norse period, but never in such numbers that they could have been important export commodities or left the quantity of osteological material that has been found in excavations of Norse farmsteads (McGovern 1985: 288, 297–302). Information about hunting voyages to the far north is primarily found in *Grænlands Annál* (c. 1523), a transcript of a now lost part of *Hauksbók* from the 14<sup>th</sup> century that tells of the Greenlanders ‘hljóta jafnan siglingar að hafa norður að óbyggðum’ (always needing to sail north to the wastelands) in order to hunt.<sup>6</sup> Every summer, hunting expeditions were said to have been organised to the remote region in the far north known as Norðrsetur (Halldórsson 1978: 49–50).

Guided by the sailing descriptions in *Grænlands Annál*, accounts of the supplies of driftwood and knowledge of the concentrations of the walrus populations found today, there cannot be much doubt that Norðrsetur was located far north of the Western Settlement in the vicinity of Disko Bay on the central west coast of Greenland (between 68–71° N). For example, Bjarney in Norðrsetur, said to take twelve days to row around, must be Disko Island at 70° N, because there is simply no other island of that size in the whole region. Furthermore, places even further north – Eisunes and Æðanes – are mentioned in *Grænlands Annál* (Halldórsson 1978: 39).

The archaeological material that bears witness to Norse activities in Norðrsetur – apart from stray objects found in connection with the Inuit – is very limited. The two finds that have been made are, however, of such a character that they give a splendid testimony to the nature of the Norðrsetur voyages. A Norse stone ruin, known as ‘The Bear Trap’ (*Björnefelden*), has been found on the Nuugssuaq Peninsula, just north of Disko Bay (see Figure 1). The name comes from the incorrect assumption by several scholars, among them Helge Ingstad (1985: 418–422), that the building was a kind of trap for catching polar bears. The building has been well surveyed by Jørgen Meldgaard (1995: 206–207), but never archaeologically excavated. Nevertheless, according to Meldgaard the building can be identified as a storage building, perhaps intended for walrus ivory. The ruin is quadratic, with external measurements of 4.39×4.37 metres and thus of the same size as the storage buildings (*skemmur*) of the larger Norse farms (McGovern 1985: 295).

<sup>6</sup> The translations from Old Norse throughout the article are those of the author.

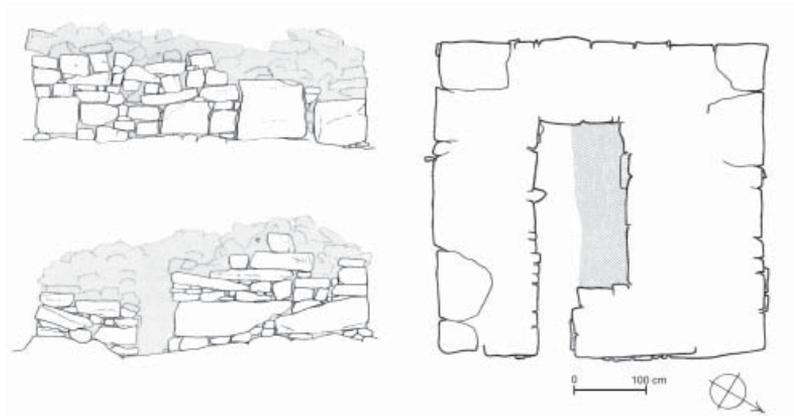


Figure 1: 'The Bear Trap' (*Bjørnefælden*) at the Nuugssuaq Peninsula just north of Disko Bay. The ruin is quadratic and similar to larger Norse storage facilities (*skemmur*) in the settlements and was perhaps intended for walrus ivory. Survey drawing by Jørgen Meldgaard from 1953. Source: Meldgaard (1995: 207), reproduced by kind permission of the National Museum, Copenhagen.

The second significant Norse find in the Norðrsetur region is a small rune stone, measuring a mere 10×3 cm, found at the site of three presumably Norse cairns at the top of the island of Kingigtorsuaq, near Upernavik, at 72° 55' N. The rune stone is, both in terms of runic writing and linguistics, dated to A.D. 1250–1300, with cryptic runes at the end. The apparently insignificant little inscription reads as follows (Olsen 1949: 52):

**ellikr · sikuaps · sōn̄ : r · ok · baannē : tortarson̄ : | ok : enripi · osson̄ :  
lāukardak · in̄ : fyrir · gakndag | hlopu · uārdate · okrydu : ??????**

Erlingr Sighvats sonr ok Bjarni Þórðar sonr ok Eindriði Odds sonr laugardagin fyrir gagn dag hlóðu varða þe[ssa] ok [...]

Erlingr Sighvatr's son and Bjarni Þórðr's son and Eindriði Oddr's son constructed these cairns the Saturday before minor Rogation Day, and [...].

According to our Gregorian calendar, the Saturday before the minor Rogation Day (*gangdagr*) is May 2<sup>nd</sup>. This is long before the pack-ice has broken up this far north. Thus, the three men must have spent the long and harsh Arctic winter in this northern part of Norðrsetur. It is interest-

ing to note that May 2<sup>nd</sup> is the first day with the midnight sun at 72° 55' N (Meldgaard 1995: 210). The date on the inscription is, therefore, hardly a mere coincidence. The Kingigtorsuaq rune stone must be regarded as strong proof that Norse Greenlanders – voluntarily or otherwise – spent the winter in Norðrsetur.

Since it was Norðrsetur that provided the Greenlanders with the valuable export commodities they were dependent on, the region must have had a very significant importance to Norse Greenlandic society, just as Arneborg (1998, 2003) asserts. The significance of Norðrsetur is illustrated by the special definition of its legal status. In connection with Greenland surrendering its sovereignty to the Norwegian crown in 1261, the Greenlanders, according to Sturla Þórðarson's almost contemporary *Hákonar saga Hákonarsonar*, were to have secured:

svá at öll manndráp skyldi bæta við konunginn, hvárt er drepnir væri Noranir eða Grænlenzkir; ok svá hvárt sem þeir væri drepnir í bygð eðr Norðr-setu. Svá ok, þó þeir sæti allt norðr undir Stjörnuna, þá skyldi konungr eigi at síðr tala þegn-gildi eptir þá (Vigfússon 1887: 321).

so that fines for all manslaughter should be paid to the king, regardless of whether the slain were Norse or Greenlander, and regardless of whether they were killed in the settlements or in Norðrsetur. Even if they were far north under the Polar Star, the king would claim fines for their manslaughter.<sup>7</sup>

Such legislation would scarcely have been necessary – as Greenland's other outlying regions were not explicitly specified – unless Norðrsetur were an integral part of Norse Greenlandic society. In the legislation, Norðrsetur was treated in the same manner as the settlements. The occurrence of more regular visits to Norðrsetur is indicated by the fact that hunters, according to *Grænlands Annál*, had bases both at Karlbúðir in the southern part of Norðrsetur and at places further north called Króksfjarðaheiðr and Greipr (Halldórsson 1978: 39, 49–50, 55). The exploitation of the Norðrsetur resources took place by way of either summer hunting expeditions or more professional hunting, which involved spending the winter. The written sources only support the former; the Kingigtorsuaq rune stone does not explain whether the men who had spent the winter there and made the inscription had done this voluntarily or had been in distress. McGovern (1979: 192–193, 197–198;

<sup>7</sup> The author would like to express his gratitude to Rune Palm for help with the translation of this somewhat difficult passage.

1985: 302) has suggested that those hunters who spent the whole year in Norðrsetur could have been outlaws (*skóggangsmenn*).

Whereas the Norse Greenlanders – at least until the end of the Norse period – were alone in the settlement areas, this had not been the case in Norðrsetur since the 13<sup>th</sup> century. It was populated by the *skrælings*, the Old Norse name for Inuit as well as Amerindians (Baitsholts 2003; McAleese 2003; Odess, Loring and Fitzhugh 2000; Sutherland 2000b). Unquestionably, the Norse hunters encountered Inuit people in Norðrsetur, even if we have only a very limited knowledge of the nature of these encounters (*cf.* Arneborg 1991 *passim*; see also Storm 1880: 76). Robert McGhee (1984: 20–23) estimates, on the basis of archaeological material, that it is reasonable to suggest that Norse–Inuit contacts, both with Late Dorset Palaeo-Eskimos and the Thule people, ‘occurred more frequently than recorded’ in the written sources. He thinks it likely that the Norse artefacts found in excavations of medieval Inuit dwellings came into the hands of the Inuit through extended but sporadic contact with Norse Greenlanders.<sup>8</sup> Up until now, approximately 170 Norse artefacts have been found across the eastern Canadian High Arctic and northern Greenland at medieval Inuit sites.<sup>9</sup> Less than 1% of the presumed total number of Late Dorset Palaeo-Eskimo sites have currently been excavated, and the percentage is scarcely much higher for medieval Thule Inuit sites (Sutherland 2000a: 164). Since the few excavated sites have yielded at least 170 Norse artefacts, it seems most likely that altogether the sites contain up to some 12,000 Norse artefacts, thus indicating frequent Norse–Inuit contact.

The finds are of different types, ranging from pieces of cloth, ship rivets, metal and wooden objects, a carpenter’s plane and a bronze balance with folding arms (see Figure 2). Several medieval Inuit woodcarvings depicting Norsemen have also been found in the eastern Canadian High Arctic as well as in northern Greenland (see Figure 3 and Map 1). A handful of Inuit artefacts have also been found in Norse farms (Arneborg 2003: 178). It is likely that the Norse–Inuit contacts in the Norðrsetur region provided the Norse with trading opportunities (Schledermann

<sup>8</sup> Since McGhee wrote this article, several new discoveries have been made supporting his assumption. See, for example, Schledermann and McCullough (2003: 199) and Sutherland (2000a *passim*).

<sup>9</sup> Jette Arneborg of the National Museum in Copenhagen has kindly informed the author in a letter dated 26 October 2005 that no significant amount of Norse artefacts has been discovered lately, except for some artefacts found on Baffin Island by Patricia D. Sutherland from the Canadian Museum of Civilization in the on-going *Helluland Archaeology Project*.

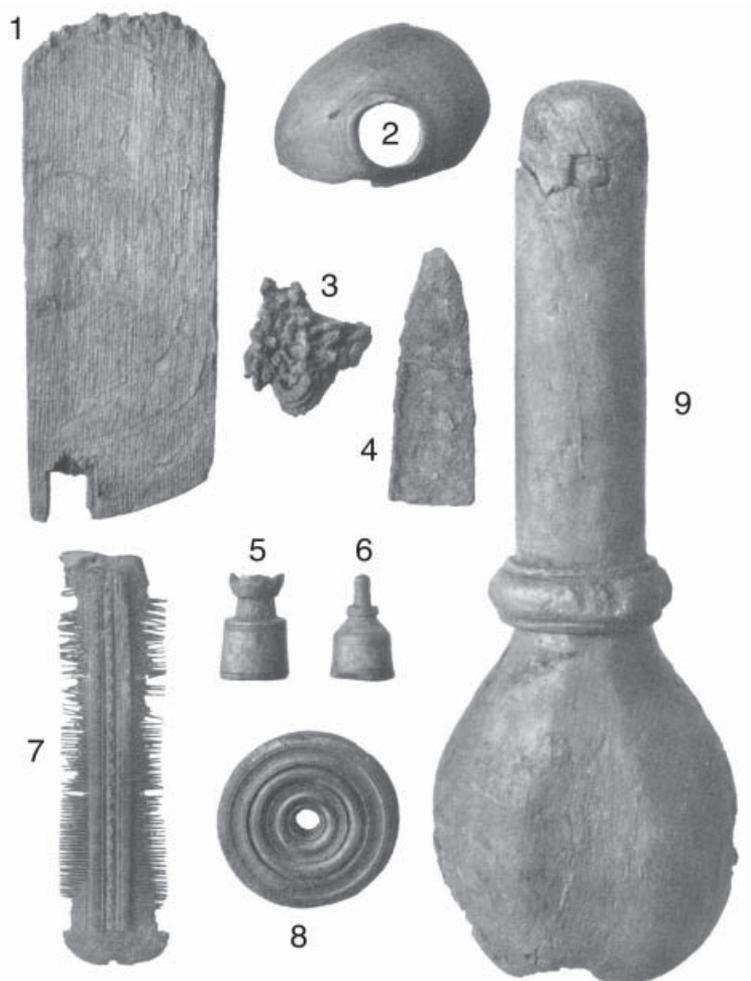


Figure 2: Some of the objects of Norse origin found in excavations of 13<sup>th</sup> and 14<sup>th</sup> century Thule Inuit settlements in the Thule District of northwest Greenland. 1. Part of a tub bottom of oak with incised concentric double circles. 2. Piece of a rounded funnel of wood. 3. Rusty conglomeration of flat interlinked iron rings. 4. Broken piece of an iron spearhead. 5. Chess piece (rook) of bone. 6. Chess piece (pawn) of walrus ivory. 7. Comb of bone with fine teeth on both sides. 8. Draughtsman of bone. 9. Spoon-shaped box carved out of one piece of wood. (Scale: 1:2.) Source: Holtved (1944), Plate 44, reproduced by kind permission of Dansk Polarcenter, publisher of *Meddelelser om Grønland*.

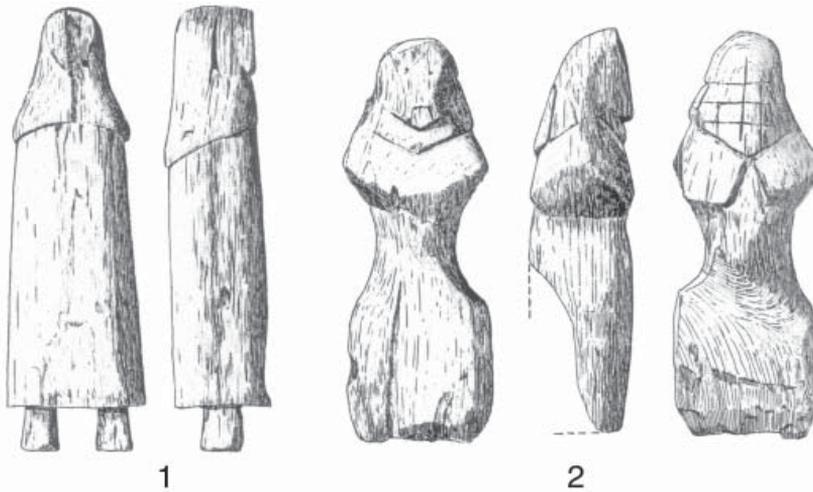


Figure 3: Drawings by Hans Christian Gulløv of 13<sup>th</sup> or 14<sup>th</sup> century Thule Inuit woodcarvings. 1. Figure depicting Norse male found in the Egedesminde District. 2. Figure depicting a Norse female, found at 73° N. This find is of particular interest as it may indicate that a woman was observed far north of the settlement areas and thus that women sometimes participated in the *Norðrsetur* voyages, as they did in the early 11<sup>th</sup> century *Vinland* voyages. (Scale: 1:1.) Source: Meldgaard (1995: 208), reproduced by kind permission of Gulløv.

and McCullough 2003: 198). There is, however, no evidence of contact between the Norse and the Inuit having been so well developed that it could have constituted an acceptable alternative to their own hunting. While it is possible that the hunters' profit could have increased through trade, they were more dependent on their own hunting. A few scholars have, however, stressed the economic significance of Norse–Inuit trade. Jørgen Meldgaard (1995: 207) in particular has championed this view, arguing that the Inuit could have provided the Norse with considerable quantities of walrus ivory to bring back to the settlements. However, neither Meldgaard nor other scholars who share his view on this matter have been able to present any evidence supporting his theory.

McGovern (1985: 299) has drawn attention to the fact that the osteological material from the walrus found in the excavations in Norse Greenland principally derive from the maxilla. Therefore, he draws the conclusion that the whole walrus carcass was left behind in *Norðrsetur*, whereas only the valuable tusks were brought back home. McGovern

(1979: 186–188; 1985, 301–302) believes that on the basis of the osteological material we can conclude that the slaughter in Norðrsetur was ‘hurried and incomplete’, and that in the case of the walrus meat and fat being brought back to the settlements, they were stripped of bones.<sup>10</sup> As we shall see below, there are good reasons to assume that the Norðrsetur hunt was a race against time. Another reason for leaving most of the catch in Norðrsetur could have been that the hunters lacked access to a sufficient number of vessels with an adequate cargo capacity. As McGovern (1979: 156–157) stresses, the most common type of vessels in Norse Greenland were probably six-oared boats (*sexæringar*), well suited for long voyages but only in short stages and not suitable for long distances over open sea (McGovern 1979: 156–157). Cautiously estimated, they had a very limited cargo capacity, as shown in Table 2, which the author has further developed from a table published by McGovern (1985: 305). That such six-oared boats were used for the Norðrsetur voyages is stated in several places in the *Grænlands Annál* (Halldórsson 1978: 39, 54). In addition, the distances between different locations are given, using the unit a ‘day’s row’. However, ships with considerably larger cargo capacity must also have been used to enable a rational exploitation of the Norðrsetur resources, something that will be returned to later on. Moreover, *Grænlands Annál* actually describes the elite farmers (*stórbændr*) as also building and using larger ships for their Norðrsetur hunting voyages (Halldórsson 1978: 55).

The race against time that McGovern (1985: 306–307) has stressed that the Norðrsetur hunt faced is understandable because the hunt, as shown in Table 1, took place during the season when the demand for agricultural manpower was at its greatest in the settlements. The optimum period for the hay harvest was in mid-August and lasted only a few weeks. To be able to bring in a maximum amount of fodder for the long sub-arctic winter it was necessary to have the maximum workforce available. If the hunters could not be back from the Norðrsetur hunt in time to participate in the hay harvest, this would have seriously disadvantaged the farms the hunters came from.

McGovern (1985: 306) has calculated that if we assume that the hunters left the settlements in mid-June and returned in late August, they would have had eleven weeks at their disposal. According to *Grænlands Annál* (Halldórsson 1978: 39), it took 15 days with a six-oared boat to reach

<sup>10</sup> In the Western Settlement, some osteological material has been found, indicating that some walrus meat was consumed, unlike in the Eastern Settlement.

Table 2: The hypothetical cargo capacity in tonnes for Norse Greenlandic six-oared boats and ocean-going sailing vessels. The table expands upon the one by McGovern (1985) Fig. [12]: 4. The weights as well as the cargo capacity of a six-oared boat (1.2 tonnes) for all measures (except timber and driftwood) are taken from McGovern, while the cargo capacity of an ocean-going sailing vessel (20 tonnes) is the author’s own calculation. For information concerning the density of a cubic metre of timber and driftwood the author would like to express his gratitude to Charlie Butler at the Department of Natural Resources, Government of Newfoundland and Labrador.

Item	Weight (kg)	Number trans- portable with 1.2 tonnes cargo capacity	Number trans- portable with 20 tonnes cargo capacity
Adult walrus meat and fat	730	1.6	27
Large walrus tusk and maxilla	7.5	160	2,667
Walrus hide (large)	45	27	444
Polar bear meat and fat	220	5	91
Polar bear hide (large)	15	80	1,333
Adult harp seal meat and fat	73	16	274
Adult harp seal fat only	40	30	500
Fresh timber (per m <sup>3</sup> ) <sup>a</sup>	900	1.3	22.2
Driftwood and charcoal (per m <sup>3</sup> ) <sup>b</sup>	450	2.6	44.4

<sup>a</sup>The specific gravity of Labrador black spruce timber is slightly higher than the average value for black spruce timber so the value given in the table for a cubic metre of timber should perhaps be adjusted upwards somewhat.

<sup>b</sup>The weight of driftwood varies somewhat depending on the wood species.

Disko Bay from the Western Settlement (a 30 day roundtrip), while hunters from the Eastern Settlement would have needed an additional twelve days in each direction (a 54 day roundtrip).<sup>11</sup> As McGovern (1985: 306) points out, on this premise, hunters from the Western Settlement would have had seven weeks at their disposal in the Norðrsetur hunting ground, while hunters from the Eastern Settlement would only have had three weeks. If this calculation is correct, it undoubtedly confirms the assumption by Kirsten A. Seaver (1996: 108, 248) that the Western Settlement was the ‘engine’ of Norse Greenland’s ‘cash economy’. However, sailing vessels which considerably reduced the time required for the voyage must also have been used – at least to some extent. The larger cargo capacity and much higher speed of such vessels would practically have been necessary prerequisites to enable the inhabitants in the Eastern Settlement to realistically exploit Norðrsetur.

<sup>11</sup> Compare the author’s distance table (Table 3) with that of Morchen (1964).

The time aspect of the Norðrsetur hunt could explain why the Western Settlement, which was by far the most marginal, was settled immediately after the Norse arrived in Greenland. Osteological material from walrus constitutes an insignificant percentage of the total osteological material, but the percentage is notably larger in the Western Settlement (1.78%) than in the Eastern Settlement (0.43%) (McGovern 1985: 299–300, 302). This indicates better access to walrus in the Western Settlement, which should be explained by its closer proximity to Norðrsetur. The chieftain farm Sandnes (V 51) in the Western Settlement was once a Greenland bishop's seat, if we are to believe the information in the episcopal steward Ívarr Bárðarson's description of Greenland from the mid-14<sup>th</sup> century (Jónsson 1930: 29).<sup>12</sup> The choice of episcopal see is surprising, considering the small size and marginal conditions of the Western Settlement in relation to the Eastern Settlement, unless the valuable Arctic resources from Norðrsetur are taken into consideration.

Furthermore, this time aspect hardly makes it reasonable to assume that northern regions very far up would have been exploited on a regular basis. The abundance of walrus in the Smith Sound (77–79°N) took such a long time to reach, as shown in Table 3, that it could hardly have been exploited regularly.<sup>13</sup> With a six-oared boat, it would have taken a minimum of roughly 35 days in each direction. Presumably it would have taken even longer in reality due to difficult ice conditions, changeable winds and other factors. The aforementioned calculation is nothing more than the product of 'armchair work', intended to establish reasonable minimum times. The many Norse artefacts that have been found in connection with the Inuit in the Smith Sound region can probably be explained as a result of trade.

Some scholars have also wanted to include the eastern Canadian High Arctic in the Norðrsetur region (*e.g.* Seaver 1996: 29). A considerable number of Norse artefacts in Inuit context have also been discovered there. Finding evidence in the scant written sources of these areas having belonged to Norðrsetur is not possible. On the other hand, there is nothing in the sources that contradicts the theory that they also were resource regions for Norse Greenland. However, there are reasons to

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<sup>12</sup> Sandnes (V 51) seems to have been something of an entrepôt for the Norðrsetur voyages, judging from the osteological material. Fully 6.93% of the osteological material found originated from walrus, while the average for the Western Settlement is 1.78% (McGovern 1985: 300).

<sup>13</sup> Hunting voyages to the very far north were likely stimulated by the search for the rare narwhal (*Monodon monoceros*), seldom found south of 70°N, with its very valuable horn.

Table 3: Distance table to locations referred to in *dægr* (days) with the Western Settlement as the starting point. The known distances from the Western Settlement are taken from *Grænlands Annál*. For the distances calculated the author has assumed, in accordance with Morchen (1964), that 1 *dægr's* row = 67 kilometres ( $\pm 5\%$ ), 4 *dægrs'* row = 1 *dægr's* sailing = 267 kilometres ( $\pm 5\%$ ). The distances in kilometres are rounded up and are measured with the help of Geographic Information Systems (GIS) data from the GIS Data Depot. Unless a land mass is in the way, distances are measured as the crow flies. The actual sailing distances would therefore probably have been considerably longer. In all probability the Norse followed the ocean currents, at least to some extent, which would have made the voyage especially to Markland (Labrador) much more time-consuming. The figures in the table should for that reason only be interpreted as absolute minimums and be used for comparing the relative amount of time needed to travel to different locations.

#### Known distances from the Western Settlement (64° N)

Location	<i>Dægrs'</i> row	<i>Dægrs'</i> sailing
Bjarney (Disko Island, 70° N)	15	4
Karlbúðir	12	3
Eastern Settlement (61° N)	12	3

#### Calculated distances from the Western Settlement (64° N)

Location	<i>Dægrs'</i> row	<i>Dægrs'</i> sailing	Kilometres (rounded up)
Cape Aston (70° N)	18	5	925
Cape Chidley (61° N)	16	4	800
Cape Dyer (66° N)	11	3	525
Devon Island (75° N)	32	8	1,600
Kaipokok Bay (56° N)	22	6	1,125
Nuugssuaq Peninsula (71° N)	18	5	900
Napartok Bay (58° N)	19	5	950
Smith Sound (77° N)	35	9	1,750
Upernavik (73° N)	21	5	1,025

doubt that these areas ever played a significant economic role for the Greenlanders.

The strongest incentive for exploiting Baffin Island – and the other Canadian Arctic islands west of Greenland – must have been that under certain climatic conditions the majority of the walrus population, normally located around Disko Bay, could move across Davis Strait to the east coast of Baffin Island (McGovern 1979: 245). As shown in Table 3, the distance itself would not have posed any problems for Norse hunters following the walrus population to Baffin Island, even if six-oared boats were not suitable for crossing the open sea. The exploitation of resour-

ces along the coasts of Baffin Island would therefore, in principle, have required ocean-going sailing vessels (*hafskip*).

The ice conditions would, on the other hand, have been a serious obstacle. While Disko Bay is normally ice-free by mid-June, the many modern Canadian Ice Service (CIS) charts and ice patrol rapports studied in detail by the author show that the pack-ice usually covers between 80–90% of the sea in the second half of July in the western part of Baffin Bay (see Map 1). To enter this belt of pack-ice before August with thin-hulled clinker-built ships during most years would have been sheer suicide. The ice conditions along the coast of Baffin Island first became satisfactory in late August. By that time the brief Arctic summer would have been almost over, and it would be time for the hay harvest in the settlements at home. Even if they had sailed during the hay harvest season, the hunting season would have been extremely short before the autumn storms and the cold set in. This hardly suggests that the hunt along the coasts of Baffin Island would have been a voluntary choice as long as there were alternatives.<sup>14</sup>

## Hunting Voyages to the East Coast of Greenland

To the residents in the Eastern Settlement, the east coast of Greenland was a much closer resource region than Norðrsetur that offered, although in less abundance, much of the same resources. It has been suggested, mainly by Helge Ingstad (1960: 179–180) and more cautiously by Fridtjof Nansen (1911: 226), that the residents of at least the southern part of the Eastern Settlement exploited the resources along the east coast of Greenland more frequently than the Norðrsetur resources. A hunting station, Finnsbúðir, was located ‘fyrir austan jökla á Grænalandi’ (east of the glaciers of Greenland) (Halldórsson 1978: 263; Jónsson 1930: 21).

It is also reported in Ívarr Bárðarson’s description of Greenland that there was an island off the southeast coast of Greenland, Krossey, probably situated north of Finnsbúðir, and belonging to the bishop and known for its abundance of polar bears, which were hunted there with his permission (Jónsson 1930: 21–22). In *Grænlandinga þáttur* (Sveinsson and Þórðarson 1935: 276), an *Íslendingasaga* about the 1120s, we are told that the Greenlander Sigurðr Njálsson, accompanied by approxi-

<sup>14</sup> An increasing number of Norse artefacts from the east coast of Baffin Island suggest contact between the Norse and the Inuit of a closer nature than has previously been considered (Sutherland 2000a *passim*).

mately fifteen men, ‘fór opt á haustum til fangs í óbyggðir’ (went up to the wastelands during the autumn to hunt). The saga informs us that the *óbygðum* referred to was Greenland’s east coast and that they sailed to Hvítserkr, the southernmost *jökull* (glacier) along the east coast of Greenland, according to Fridtjof Nansen (1911: 221) – presumably Sikuivjtip Apusiia at 62° 12’ N.

The account of Sigurðr and his men hunting there during the autumn is very interesting. Normally, the Norse avoided navigation during the autumn due to frequent storms and other hazards. Moreover, the men who went on hunting expeditions during that season could not participate in the vital hay harvest, which would have meant a serious handicap for the farms they came from. Despite this, the fact that it was during the autumn that Sigurðr and his men went hunting is confirmation of the extremely difficult ice conditions along the east coast of Greenland. The belt of pack-ice that drifts south from the High Arctic with the East Greenland Current had not melted sufficiently to allow reasonably safe navigation until the end of the brief summer.

*Konungs skuggsjá* has a vivid description of the ice conditions along the southeast coast of Greenland, as medieval Norsemen experienced them (Jónsson 1920: 68–69; Nansen 1911: 215). The description of terrible ice conditions and of ships trapped and broken among the ice masses in the middle of the summer makes it easy to understand why Norse hunters preferred to make the long voyage up to Norðrsetur instead of putting their lives at risk among the pack-ice on the east coast of Greenland. Only in certain years, with better ice conditions, would hunting along the east coast of Greenland have been a realistic alternative for the inhabitants of the Eastern Settlement, whereas Norðrsetur always could be reached even if the voyages were long and difficult. The increasingly deteriorating climate throughout the Middle Ages must have made access to Greenland’s east coast more and more difficult even during the best years. The ice conditions, favourable at the beginning of the Norse period in Greenland, became gradually more severe, resulting in the ‘Little Ice Age’, when the east coast of Greenland became blocked by ice the whole year around.

Primarily the information contained in Ívarr Bárðarson’s description of Greenland, as well as the fact that Finnsbúðir seems to have been a hunting station, indicates that at least the southernmost part of the east coast of Greenland could have played some role as a resource region for the Eastern Settlement. Further north, along that coast, the ice conditions

were even more severe than those mentioned above. There is, however, evidence that somehow Norse hunters daringly managed to penetrate this pack-ice. In *The Farm Beneath the Sand* (*Gården under sandet*, GUS), an extremely well-preserved Norse farm site in the Western Settlement, covered with metre-thick gravel and with the culture layers beneath locked in permafrost when it was discovered, archaeologists have found fibres from a pelt of musk-ox (*Ovibos moschatus*) (Berglund 2000). These animals could either be hunted in remote parts of the Canadian Arctic as well as in the very northern part of Greenland – thus absolutely inaccessible for the Norse – or along the less remote east coast of Greenland. The southernmost region along the east coast where the Norse could have found these animals would have been Scoresby Sound (70°N), which is very far up on that coast (Ingstad 1985: 56). In the medieval geographical description *Gripla*, we are told about animals, which could hardly have been anything else but musk-oxen, that were said to be living on the east coast of Greenland. Trophies from those animals, in the form of heads, were said to have been displayed in several Norwegian churches (Halldórsson 1978: 37, 233). If it had not been for the mentioning of the whole heads, one might also be able to conclude that the musk-ox fibres found at *The Farm Beneath the Sand* originated from Norse–Inuit trade. The information concerning whole heads of musk-oxen, however, may suggest that Norse hunters at least occasionally ventured very far up along the east coast of Greenland.

## Social Aspects of the High Arctic Hunting Voyages

In hierarchical societies, resource exploitation is often carried out through communal and well co-ordinated activities conducted by the elite (McGovern 1979: 165). This seems to be true for Norse Greenland as well, considering that, according to research primarily by Thomas H. McGovern, the caribou and seal hunts on the periphery of the settlement areas seem to have been both communal and well-co-ordinated activities. That the expeditions to *Norðrsetur* also fit this description is obvious from *Grænlands Annál* (Halldórsson 1978: 55). There it is reported that ‘[a]llir stórbændur í Grænlandi höfðu skip stór og skútur byggðar til að senda í *Norðrsetu* eftir afla með allra handa veiðiskap og telgdum viðum, og stundum fóru þeir sjálfir með’ (all the wealthy farmers in Greenland had large ships and boats built to send to hunt in *Norðrsetur*, supplied with all

kinds of equipment and pieces of rough-hewn wood, and sometimes they accompanied the expeditions themselves). This statement makes it clear that it was Greenland's secular elite that built and equipped the ships that brought the hunters to Norðrsetur. This way they controlled the exploitation of the High Arctic resources.

The presence of the well-built storage building, 'The Bear Trap', and the hunting stations that are mentioned in *Grænlands Annál* also suggest that the Norðrsetur voyages were well-organised enterprises, preceded by considerable investment in infrastructure in order to make the resource exploitation easier and more effective. In *Eiríks saga rauða* and *Grænlendinga saga*, both describing the early Vínland voyages, similar bases were considered private property for those who had them built (Sveinsson and Þórðarson 1935). The owner of such a base could decide how others should be allowed to make use of it. Through stressing the ownership of bases in remote resource regions the control of the resource exploitation in those areas could be secured (Wallace 2003: 225–226, 232).<sup>15</sup>

McGovern (1985: 297–302) has shown that osteological material from walruses and polar bears has been found on the majority of Norse farmsteads excavated in Greenland – in other words, animals were hunted in Norðrsetur. Even though most of this material is found on the larger farms, it is also located in the middens of the marginal inland farms. As McGovern (1985: 299, 302, 308) points out, there were no economic incentives for distributing the elite's catch from Norðrsetur to the smallholders on scattered farmsteads. Therefore we may, as McGovern (1985: 302) does, conclude from the osteological material that men from the smaller farms also participated in the long hunting voyages north of the settlements. However, this does not in any way mean that the hunters from the small farms were not dependent on the elite to participate in the hunting. The smallholders were not likely to have been in possession of ocean-going vessels. Therefore, it is likely that they had to share a part of their catch with those who furnished them with ships, organised the hunting voyages and owned the hunting stations in Norðrsetur.

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<sup>15</sup> A well-organised base for resource exploitation has been archaeologically excavated in North America. The remains at L'Anse aux Meadows on the very northern tip of Newfoundland – the only pre-Columbian European settlement so far discovered in North America – reveal a large and very well-organised base with buildings of large storage capacity, facilities for boat repair and a complex for iron production. The base was used the whole year round for a short period in the beginning of the 11<sup>th</sup> century for exploiting the resources of the Vínland region further south in the Gulf of St. Lawrence. The social and hierarchical stratifications of the base are obvious from the archaeological remains and the layout of the complex (cf. Wallace 2003).

The risks involved in the Norðrsetur voyages must have been considerable. The coast north of the Western Settlement was filled with countless skerries and often dense fog. Drift-ice and frequent storms did not help to make those waters safer to navigate (McGovern 1979: 184). That the voyages were considered dangerous is confirmed in the fragmented *Norðursétrdrápa* and in *Skáld-Helga Rimur*, where the dangerous hunt in the far north is glorified (Rafn and Magnusen 1845: 234–239). Risky activities conferred honour and in Old Norse society honour equalled position in society. In Iceland (and Greenland), where no ordinary military conflicts took place, the feud enabled men to gain glory as on the continent (Byock 2001). It is likely that the Norðrsetur voyages, besides riches, also offered an honour (*virðing*) equal to that gained by the sword. The Norðrsetur hunt also offered an opportunity to demonstrate male courage (*drengskapr*) and a chance to prove that one could fulfil an expected role in society.

Losing men to the ice in the far north would have put a severe strain on the small Greenlandic society, especially in the smaller and more marginal Western Settlement. Considering the great economic significance of the Norðrsetur hunt, and the risks involved, it is conceivable that this remote hunt played an important role in Norse Greenlandic society. Despite the fact that the sources do not give us any clear evidence for this assumption, McGovern (1985: 308–309), with some support from a few archaeological artefacts, has speculatively suggested that participating in the Norðrsetur hunt may well have been considered a male rite of passage and the hunt itself could have been associated with both status and magic. This is, for example, suggested by a ritual burial of walrus skulls at the episcopal see and cathedral at Garðar (Ø 47). A similar ritual burial (possibly of Norse origin) of walrus skulls has been discovered on southern Baffin Island (Seaver 1996: 30–31; 2000, 275).

The social perspectives of the organised northern hunting voyages should not be neglected, because they would very likely have contributed to creating the differences in the social structures of Iceland and Greenland. As Jesse L. Byock (2001: 13) has emphasised in a study concerning social organisation in Free State Iceland (c. A.D. 930–1262), there existed no kind of communal activity (such as large construction work or a military organisation) that would have secured the elite's role as leaders. In Greenland, on the other hand, the Norðrsetur hunting voyages could have constituted communal activity such as Iceland was lacking. Through co-ordinating and organising the hunting voyages the

elite was able to play a leading role they could not play in Iceland.

Controlling the supply of valuable items of export must, in the long run, have led to far-reaching consequences for society, as the elite could thereby control imports. In Old Norse society, ties of loyalty and economically and politically important alliances could be created through valuable gifts. The elite's power position was, furthermore, strengthened through demonstrating power and wealth by way of large feasts where exotic drinks like wine were served (Byock 2001: 67–68, 74).

Archaeozoological investigations have, with the reservation that the material may not be representative, indicated a tendency of the percentage of osteological material from walrus to decrease during the latter part of the Norse period in Greenland (McGovern 1985: 299, 302). A reduced percentage of walrus in the osteological material indicates either reduced access to walrus or a substantially reduced value, with the result that the *Norðrsetur* voyages no longer would have been profitable. The latter theory has been supported by several scholars arguing that better access to African elephant ivory reduced the demand for Greenlandic walrus ivory (*cf.* Roesdahl 1995: 30), but Seaver (personal communication, 5 January 2006) has recently questioned this theory on the basis of documentary sources.

Jette Arneborg (2003: 170–172, 177), pointing out the great economic significance of walrus ivory and skin, has emphasised that a reduced supply of this valuable export commodity would have had far-reaching consequences for the social structure, if the elite farmers could no longer import and distribute foreign commodities. When the most important item of export could no longer safeguard regular import, the elite's position must soon have been threatened. The supplies of foreign commodities, legitimising power and status, were reduced. In such a situation the ownership of land, which allowed pastoral farming, must have been the only remaining significant power factor for maintaining the social hierarchy.

## Markland – A Resource Region for Timber Exploitation?

Greenland did not have any timber of sufficient quality for building ocean-going ships. The lack of such timber was a very serious handicap, which had deprived the inhabitants of the other North Atlantic islands of

ocean-going vessels: an impossible fate for the Norse Greenlanders who were dependent on the long voyages to Norðrsetur (Ingstad 1985: 19–25; Pilgrim 2004: 7). Timber of an acceptable quality for shipbuilding was, therefore, necessary to come by at all costs. For other purposes, however, Greenland could offer sufficient amounts of wood, albeit of poor quality (Seaver 1996: 21, 49–51). Sheltered valleys were covered in willow scrub, and in the beginning of the settlement period there were also areas of birch forest, thus both provided fuel for domestic needs (Fredskild 1973). For house construction and other timber needs there was driftwood to be fetched along the shores. According to *Konungs skuggsjá*, the Greenlanders still needed to import construction timber, presumably from Norway:

En a Grœnalannde er spa sœm þu matt þano ner pita at alt þat sœm þangat kœmr af aðrum lonndum þa er þar dyrt þpi at þat land liggr spa ifiarska pið annur lonnd at þangat fara sialldan mœnn. En hværtþætna þat sœm þeir skolo lanndino mæð hialpa þa þærða þeir þat allt at kaupa af aðrum lonndum. bæðe iarn oc spa pið allan þænn sœm þeir skolo hus af gera (Jónsson 1920: 71–72).

But in Greenland it is this way, as you may well know, that whatever comes from other lands is high in price, for the land is so distant from other lands that men seldom visit it. And everything that is needed to improve the land must be purchased abroad, both iron and all that [*i.e.* timber] used in building houses.

Whereas new research may indicate that the statement is correct regarding the Greenlanders' iron import (*e.g.* Buchwald 2001), there are good reasons to doubt the existence of a significant timber import. There exists concrete archaeological evidence that the timber used in house construction was not imported, but instead driftwood that originated in Siberia.<sup>16</sup> The Icelanders are known to have imported timber from Norway, but Iceland was much closer to Norway than Greenland was (Kjærheim 1974: 587–588). The Greenlanders, on the other hand, seem to have been required to provide themselves with staples necessary for their subsistence due to the limited and irregular nature of the Greenlandic trade and the high prices caused by the distance and dan-

<sup>16</sup> Analyses of wood found in archaeological excavations of Norse farmsteads in Greenland have not, according to Jette Arneborg in a letter to the author dated 26 October 2005, yielded any firm evidence of imported wood, either from Europe or Markland. Joel Berglund (2000: 297) has, however, remarked that some of the construction timber from The Farm Beneath the Sand is not characterised by the sea-wormholes usually found in driftwood and therefore could be interpreted as imported timber.

gers involved. The Greenlandic trade seems to have been restricted to low-bulk, high-value items (Gad 1967: 151–155; McGovern 1985: 277, 281–282).

According to *Grænlands Annál*, voyages to Norðrsetur to collect driftwood were important to the Greenlanders when the driftwood washed ashore near the settlements was insufficient to satisfy their need for timber (Halldórsson 1978: 49). It is plausible that a significant quantity of the driftwood was used in the production of charcoal. Huge amounts of charcoal were required to forge edges on the scythes used during the hay harvest upon which animal husbandry depended (Eysteinnsson and Blöndal 2003: 413–414). The collection of driftwood in Norðrsetur could have been combined with the important hunt. The supplies of driftwood that Norðrsetur could provide should be regarded as additional evidence for the great significance this resource region had for the Greenlanders.

Although driftwood is an acceptable substitute for fresh wood in use as construction timber and charcoal production, it is not suitable for shipbuilding. Driftwood is stiff, in-flexible – often full of wormholes and splits – and almost impossible to shape into curves in the way needed for shipbuilding (Pilgrim 2004: 39; Seaver 1996: 28). The Norse shipbuilding techniques depended on wood from curved trees for certain ship parts to acquire the right shape and to be strong enough. The shipbuilder, therefore, needed to choose his timber himself (Ingstad 1985: 23–24; Pilgrim 2004: 90).<sup>17</sup> It is difficult but yet possible to construct smaller, non ocean-going vessels out of driftwood if there is no alternative, but driftwood is hardly suitable for well-built ocean-going ships (Pilgrim 2004: 3; Nansen 1911: 232–233).<sup>18</sup> That the Greenlanders owned larger ships that could reach both North America and Iceland is known from the *Icelandic Annals* (Storm 1888: 129, 144, 213, 353, 403). *Grænlands Annál* also states that such ships were built for the Norse elite in Greenland for the Norðrsetur voyages (Halldórsson 1978: 55). There is, however, no information on what timber they used for these ships.

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<sup>17</sup> Bill Meades from the Canadian Forestry Association has kindly informed the author in a letter dated 8 July 2005 that on trips along the coast of Labrador he has observed an abundant occurrence of J-shaped stunted trees – in Labrador locally referred to as ‘crooks’ – in the stands of scrubby krummholz along the exposed outer coast, which would have been suitable for constructing the ship’s ribs. According to Meades, the local population still values these trees for this purpose.

<sup>18</sup> In regards to this matter, the author received the same information from a shipbuilder during a conversation in the summer of 2005.

McGovern (1985: 304) has stressed that one of the main problems faced by the Norse during the Norðrsetur hunting voyages would have been the very limited cargo capacity of six-oared boats. As shown clearly in Table 2, even small ocean-going sailing vessels could carry a cargo almost twenty times larger than a six-oared boat (see Figures 4 and 5). To enable the Norðrsetur hunters to bring home more than just walrus ivory and skin, and not be forced to leave all the meat and fat behind, access to vessels larger than the six-oared boats, the latter with a cargo capacity of about 1.2 tonnes, would have been a necessity. The driftwood from Norðrsetur, which according to *Grænlands Annál* was of great significance to the Greenlanders, would hardly have been possible to exploit at all with only six-oared boats. Even if the whole cargo space were filled only with driftwood, as shown in Table 2, about 2.6 m<sup>3</sup> could be brought back to the settlements. This should be regarded as at least circumstantial evidence that the Norse participants in the Norðrsetur voyages also had access to larger vessels. Moreover, Table 3 shows that access to ocean-going sailing vessels would have made the voyages considerably less time-consuming and, therefore, made exploitation of more remote resource regions possible. Hence, more time could be spent on hunting and less on the voyage itself.

This shows that the Greenlanders had huge economic incentives to obtain ocean-going vessels, and it indicates that the Greenlanders would have been willing to make enormous efforts to gain access to sufficient amounts of shipbuilding timber. It would have been a huge sacrifice to import all the timber needed for shipbuilding all the way from Norway in exchange for valuable items of export, which could be traded for so many other items of interest. A shipbuilder, specialising in constructing replicas of Viking ships, has claimed to the author that it almost ‘was out of the question’ to build ships out of timber imported from far away because of the density of fresh lumber and the limited cargo capacity of medieval ships. Importing entire ships from Norway would also have been very expensive and it proved in the long run impossible to supply Iceland, situated so much closer to Norway than Greenland, with ships in that way. Medieval vessels, with thin wooden hulls, needed to be replaced about every twenty years; this, to some degree, depended on which sort of wood had been used. The Icelanders, therefore, later on practically lacked ocean-going vessels (McGovern 1979: 183).<sup>19</sup> Neither

<sup>19</sup> Importing entire ships would have required the traders going to Greenland with two ships, selling one and sailing home with their goods on the other.

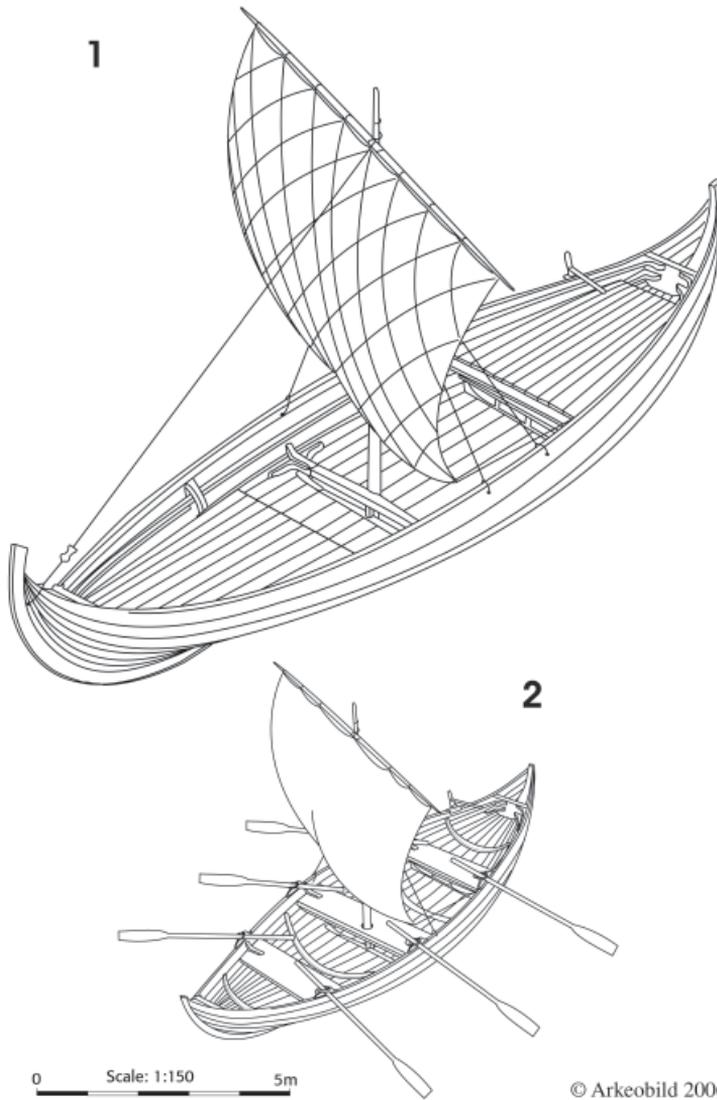


Figure 4: Reconstruction of (1) an ocean-going Greenlandic sailing vessel (*hafskip*) and (2) a Greenlandic six-oared boat (*sexæringr*). The drawings, made by Arkeobild in collaboration with the author, are based on archaeological material. Note the relatively small size of the Greenlandic sailing vessel; it is, as stated in the *Icelandic Annals*, smaller than the smallest Norwegian ocean-going trading vessels. No previous attempt has ever been made to reconstruct a Greenlandic six-oared boat, a somewhat difficult task due to the limited archaeological remains.

importing timber nor whole ships would have been a reasonable option, if the Greenlanders had other possible alternatives for obtaining ship-building timber.

Such an alternative existed: during the Vínland expeditions in the first decades of the 11<sup>th</sup> century, a large part of the east coast of North America was explored.<sup>20</sup> Even though the expeditions did not result in any permanent settlements west of Greenland, the inhabitants of the virtually treeless Greenland must, as Helge Ingstad (1985: 22, 266) among others has stressed, have remembered the huge boreal forests of Labrador, which they called Markland ('Forest Land'). There were unlimited amounts of timber to be exploited, at less than a third of the distance to Norway. Many scholars have, therefore, also taken it for granted that the Greenlanders more or less regularly undertook voyages to Markland to cut the timber they needed. Firm evidence for this reasonable assumption is lacking but, as we shall see below, circumstantial evidence supports it, *i.e.* a Greenlandic voyage to Markland, often cited in the literature, was mentioned in the Icelandic *Skálholt Annal* for the year 1347:

Voru aðr fyrir .xj. apr reka skip. þa kom ok skip af Grænlandi minna at vexti enn sma Islandz fôr. þat kom i Straum fiórð inn ytra. þat var akkeris laust. þar voru á .xvij. menn ok höfðu farit til Marklandz enn síðan vordit hingat hafreka (Storm 1888: 213).

There were six other shipwrecks. Then also came a ship from Greenland, smaller in size than the small vessels that trade with Iceland. It came to Outer Straumfjörðr; it was without an anchor. There were seventeen men on board, and they had sailed to Markland, but afterwards were driven hither.

It hardly seems to have been the ship's original destination, namely Markland, which caused the annalist to note the incident, but rather the accident and the ship drifting over the ocean all the way to Iceland. That the ship had gone to Markland is only mentioned in passing, which indicates that this was not regarded as anything extraordinary.<sup>21</sup> It is not likely that the voyage was an isolated event; in that case, it would be a highly unlikely coincidence that this particular ship was driven off course so that the voyage could be recorded. Nothing in the annal gives any kind

<sup>20</sup> The secondary literature concerning the Vínland voyages is very extensive. For a detailed bibliography, see Bengersen (1997).

<sup>21</sup> Something that supports this interpretation is that *Gottskalks Annal*, which refers to the incident, recounts only that the ship was from Greenland (Storm 1888: 353).

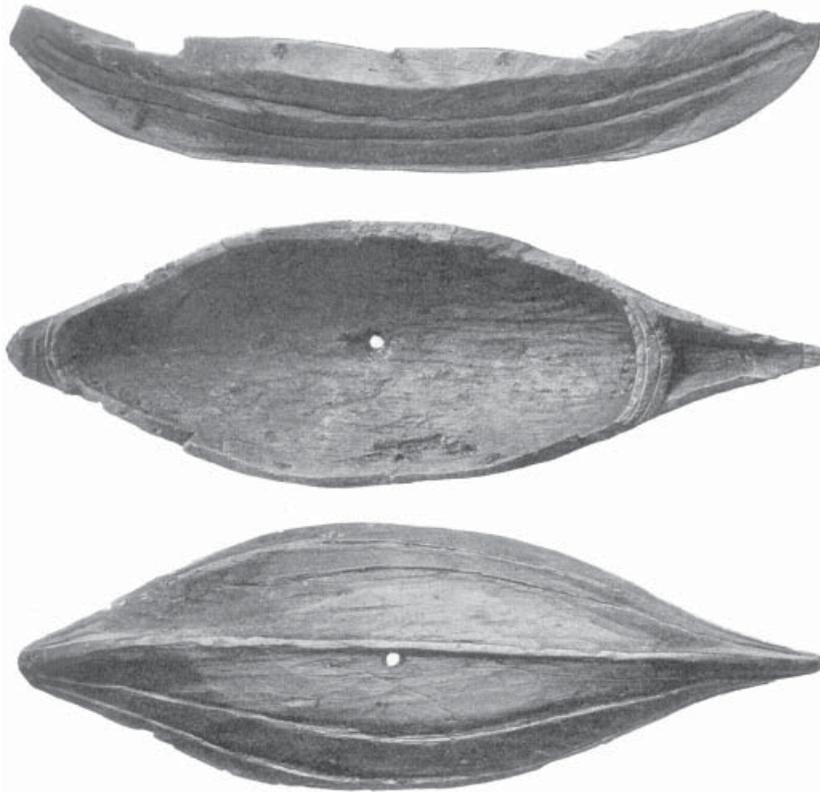


Figure 5: Ship model of a four-oared boat, found in Umîviarsuk (V 52a) in the Western Settlement, measuring 22.2×7.3×4.5 cm. (Scale: 1:2.) This kind of four-oared vessel, outfitted with a small mast, was presumably similar to the six-oared boats employed for the Norðrsetur voyages. Source: Roussell (1936: 97), reproduced by kind permission of Dansk Polarcenter, publisher of *Meddelelser om Grønland*.

of indication that the ship's original destination was considered as particularly remarkable.<sup>22</sup>

The analysis of wood from parts of ten Norse Greenlandic ships has shown that six specimens were larch (*Larix*), two were spruce (*Picea*) and two were either spruce or larch. The conclusion drawn from this study was that the ships were made of driftwood (Andersen and Malmros 1993: 118–122). As Kirsten A. Seaver (1996: 28) has pointed out, this interpretation is unlikely due to the difficulty of making larger vessels out

<sup>22</sup> This view has been expressed by Pilgrim (2004) and Seaver (1996) among others.

of driftwood. If we therefore exclude that possibility, we must conclude that the Norse Greenlanders fetched (at least some of) their ship building timber from North America, because larch did not grow in Scandinavia at all. Moreover, spruce would not have been used as shipbuilding timber in Norway or have been imported from there for that purpose, because it has a much shorter lifespan than tree species such as pine (*Pinus*) or oak (*Quercus*), and is, therefore, less suitable for shipbuilding. Instead, the use of larch and spruce must be interpreted as an adaptation to more locally accessible resources (Pilgrim 2004: 31).

Another piece of evidence that the Greenlanders built their own vessels of material they had procured themselves can be found in *Regii Annal* (Storm 1888: 129, 144), which describes a crew of fourteen on its way to Norway arriving in Iceland, in 1189, on board a Greenlandic ‘skipi er seymt var trésávmi einvm nér þat. ok bvnndit sini’ (ship that was joined together with tree nails and bound with sinews). In archaeological excavations in the Western Settlement remains of ships joined together in this way have been found (Roussell 1936: 101, 169–170). Ships from Norway would certainly not have been built in this primitive manner. Nor is it likely that ships built of imported Norwegian timber would have been built in such a manner, considering the enormous cost of such a bulky item as timber – if one were able to import the timber, one could also pay for comparatively cheap iron ship rivets. This should be regarded as additional evidence that the ships were not built of timber imported from Europe. If, on the other hand, the ships were built in Markland, or with timber fetched from there, it would indeed have been difficult to obtain ship rivets.

According to Seaver (1996: 29–32), Markland was not merely a source of fresh lumber, but also ‘very likely’ of bog iron extraction. On the basis of circumstantial archaeological evidence, Seaver argues that the Norse exploited the iron bogs in Markland. However, in the present article this subject will not be treated, chiefly owing to the author’s firm belief that although iron bog resources might have been exploited from time to time, iron should nevertheless be considered as a secondary resource of Markland, in comparison with fresh lumber. To put it another way: iron was a low-bulk, high-value item, possible to import from Norway and then of a superior quality to that which the iron bogs of Labrador could possibly supply, whereas timber was a high-bulk item – needed in large quantities – and thus beyond the economically viable limit for regular import from Norway.

A voyage to Markland would in itself scarcely have been an insurmountable obstacle. Such a voyage would, however, have required access to ocean-going ships. To undertake a voyage to Markland in a six-oared boat would hardly have been feasible. It would, as shown in Table 2, have been all too time-consuming and it is doubtful whether such a small vessel could have managed such a long voyage across the open sea. By which route the Norse chose to sail to Markland is a disputed question. Most scholars, including Helge Ingstad (1985), have assumed that they first followed the ocean currents north along Greenland's west coast up to Norðrsetur and crossed Davis Strait at its narrowest point at 66–67°N or even further north. Then they could have followed the ocean currents south along the coasts of southern Baffin Island and northern Labrador. The advocates of this route stress that the Norse hardly ever would have needed to cross the open sea and would have been able to follow the ocean currents all the way along the coasts.

Mats G. Larsson (2003: 392–393), however, has pointed out the unlikelihood of this northern route. The advantage of being able to follow the ocean currents and avoid long distances across the open sea is negated if one considers the highly dangerous ice conditions outside the east coast of Baffin Island and, to a lesser extent, the considerably longer sailing distance. After having closely studied the ice conditions along this route, the author has drawn the conclusion that during most years it would not have been possible to use this route until the second half of August. In the calculations presented in Table 3, it has been assumed that the Norse instead crossed the open ocean to the southwest (as the crow flies) from the settlements in Greenland to Labrador. It is likely that they, skilled sailors as they were, made some use of the ocean currents, but not to the extent that they risked getting trapped in the belt of pack-ice outside Baffin Island. Such a route would presumably have made the voyages to Markland a little more time-consuming than those described in Table 3. Regardless of the route chosen, it would have been out of the question to exploit Markland's resources with a six-oared boat. For that reason, it is not too bold an assumption that it was only the elite, already in possession of ocean-going vessels, who could exploit the timber resources of Markland and thus consequently control access to ocean-going sailing vessels.

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Nowhere else in the Northern Hemisphere do Arctic conditions reach as far south as on the Labrador peninsula, where the ice-filled Labrador Current sweeps down the coast. The Arctic tree limit runs at about 58° N, but still further south forests in coastal areas are only to be found in sheltered inlets. Even taking into consideration the effects of the 'Little Ice Age' and the fact that the forests near the coast have been ruthlessly exploited for centuries, the tree limit during the Middle Ages cannot have been dramatically different to that of today (Elliott-Fisk 1983; Lamb 1985).<sup>23</sup> The tree species that would have been of interest to the Norse searching for shipbuilding timber in Labrador would have been black spruce (*Picea mariana*), white spruce (*Picea glauca*), balsam fir (*Abies balsamea*) and larch (*Larix laricina*). The northernmost place where the Norse could have found forests of any significance would have been at the south shore of Napartok Bay at 58° N. Being that close to the tree limit, however, the trees were too slender to be suitable for shipbuilding. Further south, however, there are numerous inlets sustaining forests with trees suitable for shipbuilding. It is evident that the timber resources along the coast of Labrador are suitable for shipbuilding given the fact that a shipyard was built in 1974 in the village of Postville in Kaipokok Bay (55° N), where fishing vessels more than 15 metres long have been constructed from locally felled black and white spruce (Pilgrim 2004: 79, 115).

Valeri A. Pilgrim, a native of the coast of Labrador and familiar with the conditions and natural resources there, has in her Norwegian Master's thesis (2004) made an inventory of practically all the sources and circumstantial evidence concerning the Norse exploitation of Markland. She has drawn the conclusion that the timber resources in Markland were essential for Greenlanders as a result of their dependence on ships. Pilgrim considers the summer drift-ice between Greenland and Labrador as the greatest obstacle to Norse resource exploitation in Markland and stresses too that it was likely that the Greenlanders used those years when there was less drift-ice to fetch timber from Labrador (Pilgrim 2004: 21). She comes to the conclusion that the voyages to Markland were 'probably less than occasional since the dangerous risk of sailing southwest in open boats was very high', but that the Greenlanders took that risk 'on a sporadic basis' (Pilgrim 2004: 11, 92, 114).

These 'timber hunting expeditions', according to Pilgrim (2004: 33),

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<sup>23</sup> The author would especially like to express his gratitude to Dave Lemkay and Bill Meades from the Canadian Forestry Association for sharing their knowledge, based on personal observations, of forest conditions along the coast of Labrador in a letter dated 8 July 2005.

most likely consisted of several ships with crews of about six men each. Because lumber for shipbuilding purposes improves in quality if it is felled during the winter, Pilgrim (2004: 33, 84 *et passim*) does not exclude the possibility that those on the expeditions, which were combined with hunting, spent the winter in Markland and built new ships in the spring, using the lumber they had cut during the winter, before sailing home in early summer. If we exclude the overwintering option (the reasons for this will be given later on), the Greenlanders had two alternatives for exploiting the timber resources of Markland. They could either spend a whole summer there and build ships near the logging site or could fell and cut up the timber they needed during a brief stay and transport it home.

The latter strategy would have minimized the time required for a voyage to Markland since the necessary quantity of timber needed to build a ship could be felled and cut up within just a day if necessary. Pilgrim (2004: 26) emphasises that the timber could be cut up into the right length and width at the logging site so that it required minimal cargo capacity. To dry up timber for shipbuilding takes about one month and a competent crew could build a ship in the course of one summer (Ingstad 1985: 24).

That it was this strategy that was most commonly used is indicated by the fact that the Greenlandic vessels were small (Storm 1888: 213). It does not need to be interpreted as there having been an actual scarcity of timber, as for example, Nansen (1911: 232–233) has asserted, but could just as well be the result of the ships being built from timber transported to Greenland from the logging site. If the Norse did not build their ships in Markland, but with timber fetched from there, the very limited cargo capacity of the ships carrying the timber home to Greenland would have made it impossible to build ships of larger dimensions. As a result, ships built in Greenland, with timber fetched from Markland, would have been considerably smaller than ships built for example in Norway of timber felled near the construction site. Moreover, it is likely that the timber the Greenlanders fetched originated from the northern parts of Labrador, considering the relatively short distance from there to Greenland. As a rule, these trees are rather small and slender. The dimensions of ships built from such timber consequently were quite modest. Pilgrim (2004: 26) assumed, when she calculated the cargo capacity of the Greenlandic ships, that they had about the same cargo capacity as normal Norwegian ships (*i.e.* 50–75 tonnes). The smallest ocean-going

Norwegian vessels had a cargo capacity of 25 tonnes. On the basis of statements in the *Icelandic Annals* that a ship from Greenland was smaller than the smallest Norwegian trading vessels, the author has estimated, as shown in Table 2, that a Greenlandic ship could carry a cargo of only about 20 tonnes.

In the event that the timber was felled in Markland only for transportation home, it is a plausible scenario, considering the limited work force, that voyages in search of timber occurred in connection with the hunting voyages to Norðrsetur. In summers with favourable ice conditions the hunting season in Disko Bay could have begun earlier. The hunters could then have crossed Davis Strait later in the summer and followed the border of the pack-ice south along Baffin Island until they reached the forested parts of the coast of Labrador. After having swiftly felled timber they could have sailed home in late summer with their cargo, when the ocean was almost free of drift-ice along that stretch. Such a hypothetical model has been advocated by Seaver (1996: 28–29).

To spend a summer in Markland in order to build a new ship near the logging site would, however, have obvious advantages. One such advantage would have been that after dividing the crew, it would have been possible to sail back to Greenland with two ships, both, of course, carrying a full cargo of timber to build additional, although smaller, vessels. Moreover, ships of larger dimensions could have been built if they had been constructed at the logging site, because the cargo capacity of the ships importing timber was a limiting factor for the size of the vessels built of imported timber.

Another advantage of longer stays in Markland, if we disregard the lost hunting opportunity in Norðrsetur, would have been the chance to hunt, for example, black bear (*Ursus americanus*). It is plausible that the Greenlanders made use of this opportunity when they were in Markland. Finds from a 14<sup>th</sup> century layer from The Farm Beneath the Sand may suggest this. There, archaeologists have found fibres from the fur of either black or brown bear as well as bison pelt fibres (Arneborg 2003: 171; Rogers 1998: 72). Because fur imports to Greenland seem highly unlikely, since fur was one of Greenland's main items of export, it is a much more plausible explanation that the bear fur originated in North America. Because bison did not live in areas likely to have been visited by the Norse, the find is a good indication of Norse–Amerindian trade. In the same way as it seems highly unlikely that the Markland voyage in 1347, recorded in the *Icelandic Annals*, would have been an

isolated event, it seems equally unlikely that The Farm Beneath the Sand would have been the only Norse farm in Greenland in possession of North American furs. That we only have evidence of this from The Farm Beneath the Sand is most likely a result of the fact that no other Norse farm found to date is in anywhere near the same state of preservation that such fur fibres can be identified. Exploiting the comparably small walrus populations along the northern part of the coast of Labrador could possibly also have increased the profit of Norse logging expeditions to Markland. However, the archaeological material does not have the potential to yield any evidence in support of this assumption; the osteological material cannot inform us whether the walrus was killed in Markland, Norðrsetur or in some other place.

Above all, what makes the idea of longer regular stays in Markland unlikely is that the archaeological excavations have not yielded any kind of evidence of regular contact between the Amerindians of Labrador and the Norse Greenlanders. The total absence of Norse artefacts in the few and ill preserved medieval Amerindian settlements so far excavated on the coast of Labrador indicates that we may not expect further excavations to yield any significant evidence indicating close contact between the two peoples. This must be placed in relation to the over 170 Norse artefacts that have been excavated from medieval Inuit settlements in the High Arctic, both from Late Dorset Palaeo-Eskimos and Thule people, and the fact that new finds are made regularly.

The obvious disadvantages of the strategy of spending the summer season in Markland in order to build a new ship suggest it may not have been commonly employed. First and foremost, it would have meant that valuable manpower was tied up in Markland during the most intensive part of the Norse seasonal round, as shown in Table 1. Were the Greenlanders able to afford this? The disadvantages, from a wider economic perspective, would quite likely have outweighed the advantages of being able to build a ship at the logging site. Overwintering would, as Pilgrim (2004: 33) suggested, have occasioned an even greater strain on society. Firstly, it would have meant that the men who spent the winter in Markland would have forsaken the important autumn caribou hunt and, secondly, the spring pack-ice outside the coast of Labrador would have made it impossible to return home in time for the vital spring seal hunt. A small society like Norse Greenland – with a comparatively low degree of specialisation – could simply not have afforded to spend the winter in Markland, especially if it were not necessary. The voyages to Markland

would, therefore, normally – in the same way as the hunting voyages to Norðrsetur – have been a seasonal activity.

Thirdly, longer stays in Markland would have considerably increased the risk of native attacks. How important this factor was for the Norse choice of strategy would depend on how hostile contact normally was with the *skrælings*. We do not know much about this. The Norse experience of contact with the *skrælings* was characterised by violence in the early 11<sup>th</sup> century Vínland voyages. However, we know hardly anything about the nature of the contact between Norse and Amerindians after the time described in the narrations in *Eiríks saga rauða* and *Grœnlendinga saga* (Sveinsson and Þórðarson 1935: 228–233, 256–263). As several scholars – for instance, Helge Ingstad (1985), Robert McGhee (1984) and Kirsten A. Seaver (1996) – have stressed, voyages to Markland would have involved trespassing on areas inhabited by Amerindians. What we do know is that the Amerindian groups in the Markland region consisted of small and scattered sub-arctic hunters; in total, they probably numbered less than one thousand.

The Amerindian people living along the coast of Labrador between A.D. 1000–1500 are archaeologically known as Point Revenge. Very little is known of their culture because Labrador's acidic sub-arctic soil destroys organic material (McGhee 1984: 7–8; Pilgrim 2004: 58, 115). That the Amerindians were few in number and lived in small, dispersed family groups does not mean that they could not constitute a serious threat to Norse logging parties. This is obvious from the experience of what could happen to 16<sup>th</sup> century European expeditions (see for example Morison 1971: 596).

The only archaeological evidence of Norse contact with Amerindians from the Markland region actually indicates encounters of a hostile nature. It consists of two arrow projectile points of presumably the type used by Labrador or Newfoundland Amerindians (Seaver 2000: 275) (see Figure 6). Because one of the projectile points was found in a churchyard (Roussell 1936: 106), it is hardly too far-fetched to assume that the voyages to Markland were fraught with considerable danger. Therefore, it is reasonable to suggest that the Norse, always being greatly outnumbered in the foreign land, did their best to avoid contact with the Amerindian population.

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Figure 6: Point Revenge or ancestral Beothuck Amerindian arrow projectile point found at a 1930 excavation in the churchyard at Sandnes (V 51) in the Western Settlement. (Scale: 1:1.) Source: Rousell (1936: 106), reproduced by kind permission of Dansk Polarcenter, publisher of *Meddelelser om Grønland*.



While research on Norse Greenland has regarded as somewhat controversial the question of whether Markland should be considered as a resource region for Norse Greenland, there has been no controversy that Norðrsetur should be regarded as such. Several scholars have, however, argued that Markland was also a resource region, not least Valeri A. Pilgrim (2004) and Kirsten A. Seaver (1996). However, no one has previously taken the economic labour aspect into consideration concerning the Markland voyages and interpreted the sources from that perspective. The present article does not claim to present any definitive answers concerning Norse resource exploitation in Markland: it is not yet possible to do so. Neither the archaeological nor the documentary evidence gives us more than fragmented insights into Norse Greenland, which hint at contact with Markland. There exist only isolated, disconnected pieces of a puzzle that tempt us to make qualified guesses based on knowledge of other aspects of Norse Greenland in order to bring at least some of the puzzle together.

The pieces of the puzzle indicate that Markland was a resource region for Norse Greenland, despite the opinion of some scholars, but they also indicate that, for example, Seaver may have overestimated the significance of this resource region. Finally, it may not be out of place to stress that *Hákonar saga Hákonarsonar* does not expressly define Markland's legal status, as it does with Norðrsetur. This should be understood to mean that Markland's resources were not as regularly and widely exploited as those of Norðrsetur.

Whereas new archaeological evidence from the Norðrsetur voyages would only to a limited extent furnish us with new insights into Norðrsetur's social and economic significance for Norse Greenland, archaeological evidence originating from the Markland voyages would offer valuable sources of information. Such finds are needed to verify the economic and social system outlined in this article more closely. Above

all, a systematic investigation of all ship parts found in Greenland is needed to enable their comparison with wood used for other purposes, as well as analysing and comparing wood with finds from other parts of the medieval Scandinavian world and with Arctic driftwood and timber from Labrador.

## Interaction Between Resource Exploitation in Norðrsetur and Markland

Agricultural societies in medieval Europe were – to various degrees – dependent on natural resources beyond the settlement areas. The marginal conditions for agricultural subsistence in Greenland made that requirement unusually large for the settlements there. Norse Greenland depended on trade with Europe in order to maintain its cultural identity and a European way of life. The agricultural surplus from the settlements was not valuable enough to offer the Greenlanders any precious and highly coveted items of export. Frequent long-range hunting voyages to High Arctic resource regions, with substantial walrus populations, were therefore essential. McGovern (1979: 182), among other scholars, has suggested that economic organisation in Norse Greenland was, to a considerable extent, a result of the Greenlanders' need to obtain valuable items of export, mainly walrus ivory and skin.

This seems a reasonable hypothesis. A combination of favourable summer ice conditions and a relatively short sailing distance made Norðrsetur, in the vicinity of what is today known as Disko Bay, the most important region for Arctic resources. This article puts forward the view that the Norðrsetur hunting voyages were well co-ordinated yearly activities, controlled by the elite. Access to and proprietorship of hunting stations in Norðrsetur made it likely that the Norse elite controlled the walrus hunting grounds and decided how these should be exploited. Ownership of vessels that made those remote hunting voyages possible seems to have been restricted to the elite. If this assumption is correct, it means that they had total control over the Norðrsetur resources. Since it was these resources that constituted Greenland's items of export, this meant control over import and its distribution. With the transatlantic trade in their hands, the elite's position of power and dominance could be safely secured. Much suggests that the leading role that the male elite

were able to assume as organisers of the hunting voyages may well have contributed to the preservation of their position in society.

In the same way as Iceland, Greenland lacked native timber suitable for shipbuilding and, as has been argued in this article, it seems highly unlikely that this need could have been satisfied through imports from Norway or any other part of Europe. Some timber import from Europe cannot be ruled out, but – due to the high-bulk nature of timber and the irregular character of the Greenland trade – it seems highly unlikely that it was ever significant enough to satisfy the Greenlanders' needs. Circumstantial evidence suggests that shipbuilding timber instead was obtained from Markland. Whereas even common smallholders very likely could have owned small vessels, possible to make out of driftwood, only the elite would have had access to larger ocean-going vessels. As previously stressed in this article, *Norðrsetur's* resources could not have been effectively exploited unless men had access to larger vessels, due to the limited cargo capacity of a six-oared boat or a similar smaller vessel. Therefore, those who had access to larger, ocean-going vessels could exploit the Arctic resources much more effectively, and as a result practically control the transatlantic trade. The Markland voyages should, therefore, be regarded as necessary investments for a rational and profitable exploitation of the valuable resources in *Norðrsetur* and other High Arctic regions by the elite in Norse Greenland. It is possible that these investments in Markland timber could often be combined with exploitation of the wild mammals of mainland North America, but this was hardly the main reason for the voyages.

From an economic viewpoint, these timber exploitation voyages were a necessity but, at the same time, they put a strain on society. We must keep in mind that Norse Greenland, even at its peak, was a very small society and that the marginal agriculture was dependent on the whole available work force. The route to Markland, due to drift-ice, was only reasonably safe in late summer, when the vital and work-intensive hay harvest took place in the settlements. Sending men to Markland meant that they could neither participate in the hay harvest nor the *Norðrsetur* hunt. These are strong arguments for doubting that voyages to Markland were undertaken more often than absolutely necessary to maintain a fleet of ocean-going ships in Greenland. Apart from the dangers associated with such voyages, they meant a reduced work force in the season when agricultural activities were most work-intensive.

As shown in Figure 7, we can conclude that more or less different

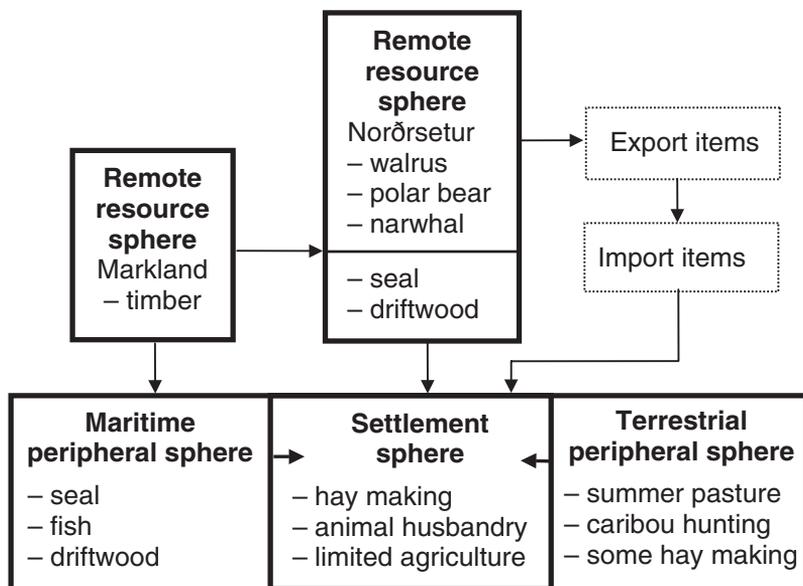


Figure 7: A theoretical model of the domestic and 'cash' economic system of Norse Greenland constructed by the author, summarising the main points in the article.

peripheral areas co-operated with each other in offering the Greenlanders resources. To put it simply, we can identify three different resource spheres. Firstly, the '*settlement sphere*', secondly the adjacent '*outlying or peripheral region sphere*', providing resources for domestic subsistence, and lastly the '*remote resource sphere*'. This last one provided the Greenlanders with items of export and – for Markland's part – the ship-building timber necessary for the rational exploitation of the High Arctic resources desirable for European merchants.

## Works cited

- Arneborg, Jette, 1991, 'Kulturmøtet mellem nordboer og eskimoer – En kritisk analyse af kilderne til belysning af kulturmødet mellem nordboere og eskimoer i Grønland: Vurderet i norrønt perspektiv', Unpublished PhD dissertation, Institut for Forhistorisk og Klassisk arkæologi, University of Copenhagen.
- , 1992, 'Grønland, udgangspunktet for sejladerne til Nordamerika', in *Vikingerne sejlads til Nordamerika* (Roskilde: The Viking Ship Museum): 13–21.

- , 1998, 'The High Arctic 'Utmark' of the Norse Greenlanders', in Hans Andersson, Lars Ersgård and Eva Svensson (eds.), *Outland Use In Preindustrial Europe*, (Lund: Lund Studies in Medieval Archaeology 20): 156–166.
- , 2003, 'Norse Greenland: Reflections on Settlement and Depopulation', in James H. Barrett (ed.), *Contact, Continuity, and Collapse: The Norse Colonization of the North Atlantic* (Turnhout: Brepols): 163–181.
- , et al., 1999, 'Change of Diet of the Greenland Viking Determined From Stable Carbon Isotope Analysis and <sup>14</sup>C Dating of Their Bones', *Radiocarbon* 41: 157–168.
- Baitsholts, Kenneth, 2003, 'Humour, Irony, and Insight: The First European Accounts of Native North Americans', in Shannon Lewis-Simpson (ed.), *Vinland Revisited: The Norse World at the Turn of the First Millennium* (St. John's: Historic Sites Association of Newfoundland and Labrador): 365–375.
- Berglund, Joel, 2000, 'The Farm Beneath the Sand', in William W. Fitzhugh and Elisabeth I. Ward (eds.), *Vikings: The North Atlantic Saga* (Washington and London: Smithsonian Institution Press): 295–303.
- Brink, Stefan, 1991, 'Den norröna bosättningen på Grönland: En kortfattad forskningsöversikt jämte några nya forskningsbidrag', *Scripta Islandica* 42: 3–33.
- Buchwald, Vagn Fabritius, 2001, *Iron and Slags in Ancient Greenland*, Meddelelser om Grønland, Man and Society 26 (Copenhagen: Kommissionen for videnskabelige Undersøgelser i Grønland).
- Christensen, Karen Marie Bojsen, 1990, 'Aspects of the Norse Economy in the Western Settlement in Greenland', *Acta Archaeologica* 61: 158–165.
- Deborah L., Elliott-Fisk, 1983, 'The Stability of the Northern Canadian Tree Limit', *Annals of the Association of American Geographers* 73: 560–576.
- Diplomatarium Norvegicum*, vols. 1–21 (Oslo 1849–1970).
- Enghoff, Inge Bødker, 2003, *Hunting, Fishing and Animal Husbandry at The Farm Beneath The Sand, Western Greenland. An Archaeozoological Analysis of a Norse Farm in the Western Settlement*, Meddelelser om Grønland, Man and Society 28 (Copenhagen: Kommissionen for videnskabelige Undersøgelser i Grønland).
- Fredskild, Bent, 1973, *Studies in the Vegetational History of Greenland*, Meddelelser om Grønland (Copenhagen: Kommissionen for videnskabelige Undersøgelser i Grønland).
- Fyllingsnes, Frode, 1990, *Udergongen til dei norrøne bygdene på Grønland i seinmellomalderen. Eit forskingshistorisk oversyn* (Oslo: Middelalderforum).
- Gad, Finn, 1967, *Grønlands Historie. I Indtil 1700* (Copenhagen: Nyt nordisk forlag Arnold Busck).
- Halldórsson, Ólafur, 1978, *Grænland í miðaldaritum* (Reykjavík: Sögufélag).
- Hansen, Birger Ulf, 1991, 'Using Climate and Vegetation Studies in Southern Greenland to Estimate the Natural Resources During the Norse Period', *Acta Borealia* 8: 40–54.

- Holtved, Erik, 1944, *Archaeological Investigations in the Thule District*, Meddelelser om Grønland (Copenhagen: C. A. Reitzels forlag).
- Ingstad, Helge, 1960, *Landet under Leidarstjernen: En ferd til Grønlands norrøne bygder* (Oslo: Gyldendal).
- , 1985, *The Norse Discovery of America*, vol. II, Norwegian University Press (Oslo–Bergen–Stavanger–Tromsø).
- Jónsson, Finnur (ed.), 1920, *Konungs skuggsia. Speculum regale* (Copenhagen: Gyldendal).
- Keller, Christian, 1989, ‘The Eastern Settlement Reconsidered. Some Analyses of Norse Medieval Greenland’, Unpublished PhD dissertation, University of Oslo.
- Kjørheim, Steinar, 1974, ‘Trelasthandel’, *Kulturhistoriskt lexikon för nordisk medeltid* 18 (Malmö: Allhems förlag).
- Lamb, H.F., 1985, ‘Palynological Evidence for Postglacial Change in the Position of Tree Limit in Labrador’, *Ecological Monographs* 55: 241–258.
- Larsson, Mats G., 2003, ‘The Vínland sagas and the actual characteristics of Eastern Canada – some comparisons with special attention to the account of the later explorers’, in Shannon Lewis-Simpson (ed.), *Vínland Revisited: The Norse World at the Turn of the First Millennium* (St. John’s: Historic Sites Association of Newfoundland and Labrador): 391–398.
- McAleese, Kevin, 2003, ‘Skrælingar abroad – skrælingar at home?’, in Shannon Lewis-Simpson (ed.), *Vínland Revisited: The Norse World at the Turn of the First Millennium* (St. John’s: Historic Sites Association of Newfoundland and Labrador): 353–364.
- McGhee, Robert, 1984, ‘Contact between Native North Americans and the Medieval Norse: A Review of the Evidence’, *American Antiquity* 49: 4–26.
- McGovern, Thomas Howatt, 1979, ‘The Paleoeconomy of Norse Greenland: Adaption and Extinction in a Tightly Bounded Ecosystem’, Unpublished PhD dissertation, Columbia University.
- , 1985, ‘The Arctic Frontier of Norse Greenland’, in Stanton W. Green and Stephen M. Perlman (eds.), *The Archaeology of Frontiers and Boundaries* (Orlando: Academic Press, Inc.): 275–323.
- Meldgaard, Jørgen, 1995, ‘Eskimoer og Nordboer i Det yderste Nord’, *Nationalmuseets arbejdsmark 1995*: 199–214.
- Morchen, Roald, 1964, ‘Den nautiske mil gjennom tusen år: Sagatidens distansetabeller fra vestkysten av Grønland til Hvite havet’, *Bergens sjøfartsmuseums årshfte* 1964: 5–32.
- Morison, Samuel Eliot, 1971, *The European Discovery of America: The Northern Voyages A.D. 500–1600* (New York: Oxford University Press).
- Odess, Daniel, Loring, Stephen and Fitzhugh, William W., 2000, ‘Skræling: First peoples of Helluland, Markland, and Vinland’, in William W. Fitzhugh and Elisabeth I. Ward (eds.), *Vikings: The North Atlantic Saga* (Washington and London: Smithsonian Institution Press): 193–205.

- Olsen, Magnus, 1949, 'Sproget i de grønlandske runeinnskrifter', in Magnus Olsen, *Fra norrøn filologi* (Oslo: Forlagt av H. Aschehoug & Co): 51–71.
- Pilgrim, Valeri A., 2004, 'The Greenland Norse: The Hunt For Wood in Labrador. A Cross-Cultural Perspective', Unpublished Master's thesis, The Centre for Nordic, Viking and Medieval Studies, University of Oslo.
- Rafn, C[arl] C. and Magnussen, Finn (eds.), 1833–1845, *Grønlands Historiske Mindesmerker I–III* (Copenhagen: De Kongelige Nordiske Oldstids-Selskab).
- Regesta Norvegica*, 1889–1979 (Oslo: Norsk Historisk Kjeldekriftfond).
- Roesdahl, Else, 1995, *Hvalrostand, elfenben og nordboerne i Grønland*, C. C. Rafn forelæsning nr. 10 (Odense).
- Rogers, Penelope Walton, 1998, in Jette Arneborg and Hans Christian Gulløv (eds.), *Man, Culture and Environment in Ancient Greenland. Report on a Research Programme* (Copenhagen: The Danish National Museum & Danish Polar Center): 66–73.
- Roussell, Aage, 1936, *Sandnes and the Neighbouring Farms*, Meddelelser om Grønland 88(2) (Copenhagen: C. A. Reitzels forlag).
- Schledermann, Peter, 2000, 'Ellesmere: Vikings In The Far North', in William W. Fitzhugh and Elisabeth I. Ward (eds.), *Vikings: The North Atlantic Saga* (Washington and London: Smithsonian Institution Press): 248–256.
- Schledermann, P[eter] and McCullough, K[aren] M., 2003, 'Inuit–Norse Contact in the Smith Sound Region', in James H. Barrett (ed.), *Contact, Continuity, and Collapse: The Norse Colonization of the North Atlantic* (Turnhout: Brepols): 183–205.
- Seaver, Kirsten A., 1996, *The Frozen Echo: Greenland and the Exploration of North America, ca. A.D. 1000–1500* (Stanford: Stanford University Press).
- , 2000, 'Unanswered Questions', in William W. Fitzhugh and Elisabeth I. Ward (eds.), *Vikings: The North Atlantic Saga* (Washington and London: Smithsonian Institution Press): 270–279.
- Storm, Gustav (ed.), 1880, *Monumenta Historica Norvegiæ. Latinske kildeskrifter til Norges historie i middelalderen* (Kristiania: A. W. Brøgger).
- , 1888, *Islandske Annaler indtil 1578* (Christiania: Norsk Historisk Kjeldekrifts-Institut).
- Sutherland, Patricia D., 2000a, 'Strands of Culture Contact: Dorset–Norse Interactions in the Canadian Eastern Arctic', in Martin Appelt, Joel Berglund and Hans Christian Gulløv (eds.), *Identities and Cultural Contacts in the Arctic* (Copenhagen: The Danish National Museum & Danish Polar Center): 59–69.
- , 2000b, 'The Norse and Native North Americans', in William W. Fitzhugh and Elisabeth I. Ward (eds.), *Vikings: The North Atlantic Saga* (Washington and London: Smithsonian Institution Press): 238–247.
- Sveinsson, Einar Ól. and Þórðarson, Matthías (eds.), 1935, *Eyrbyggja saga, Brands þátr orva, Eiríks saga rauða, Grænlandinga saga, Grænlandinga þátr*, Íslenzk fornrit 4, (Reykjavík: Hið íslenska fornritafélag).

- Vebæk, C[hristen] L[eif], 1991, 'Hunting on Land and at Sea and Fishing in Medieval Norse Greenland', *Acta Borealia* 8: 5–14.
- Vésteinsson, Orri, McGovern, Thomas H. and Keller, Christian, 2002, 'Enduring Impacts: Social and Environmental Aspects of Viking Age Settlement in Iceland and Greenland', *Archaeologia Islandica* 2: 98–136.
- Vigfússon, Guðbrandur (ed.), 1887, *Icelandic Sagas, and Other Historical Documents Relating to the Settlement and Descents of the Northmen on the British Isles. 1–2: Hakonar saga, and a Fragment of Magnus saga, with Appendices: Rerum Britannicarum medii aevi scriptores 88.2.* (London: The Master of the Rolls).
- Wallace, Birgitta Linderöth, 'L'Anse aux Meadows and Vinland: An Abandoned Experiment', in James H. Barrett (ed.), *Contact, Continuity, and Collapse: The Norse Colonization of the North Atlantic* (Turnhout: Brepols): 207–238.