

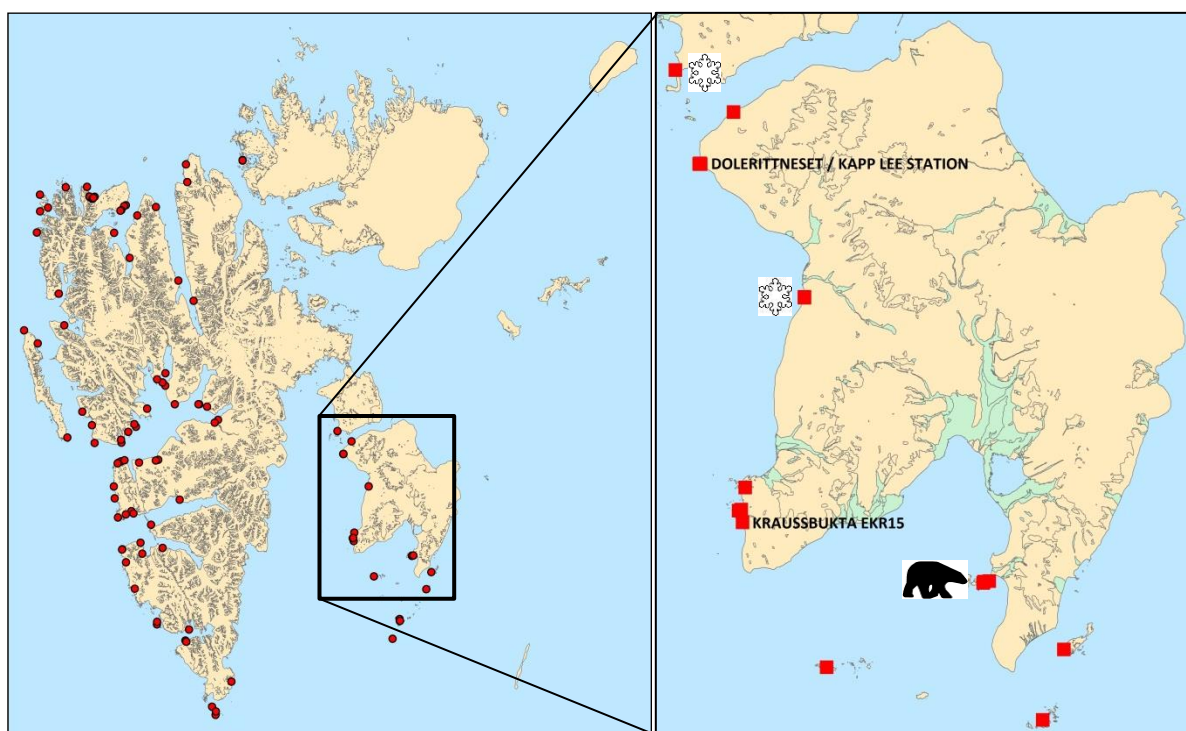


Frigga Kruse, Sarah Dresscher, and Marthe Koeweiden

Pomor archaeology on Edgeøya, Svalbard (RiS ID 10194)

August 19 – 28, 2015

Interim Fieldwork Report



Unless otherwise stated, photographs by Frigga Kruse.

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NON-TECHNICAL SUMMARY

From August 19 – 28, 2015, two historical archaeologists and an archaeology student from the Arctic Centre of the University of Groningen were on board the Netherlands Scientific Expedition Edgeøya Svalbard (sees.nl). The team investigated as many Pomor sites as possible under the constraints of route, time, weather, ice, and polar bears.

The Pomors were Russian hunters from the White Sea region, who came to Svalbard in the 18th and 19th centuries to hunt primarily for walrus but also to exploit other living resources. Their huts have been studied extensively but not enough is known about their interaction with the environment. The research questions underlying the fieldwork were therefore: *1) to what extent did the Arctic landscape dictate the location of the Pomor sites? and 2) what was the lasting impact of the Pomor activities on the environment of Edgeøya?*

Ultimately, the team was able to conduct archaeological surveys at two sites on Edgeøya: Dolerittneset (Kapp Leestasjon) and Kraussbukta. A third site that was visited was Gnålodden in Hornsund on Spitsbergen.

This interim report outlines the methodology used and the results obtained during this unusual undertaking. The discussion, conclusions, and recommendations for future work will be treated in the final fieldwork report.

The SEES expedition was made possible by NWO (Netherlands Organisation for Scientific Research), Oceanwide Expeditions, and the Arctic Centre of the University of Groningen.

KEYWORDS

SEES, Edgeøya, Pomors, archaeology, phosphate survey

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INTRODUCTION

From August 19 – 28, 2015, a team of two historical archaeologists and an archaeology student from the Arctic Centre of the University of Groningen were on board the Netherlands Scientific Expedition Edgeøya Svalbard, hereafter referred to as the SEES expedition or simply SEES. Frigga Kruse (post-doc researcher), Sarah Dresscher (PhD researcher), and Marthe Koeweiden (BA student) took this opportunity to investigate as many Pomor sites as possible under the constraints of route, time, weather, ice, and polar bears.

The Pomors were Russian hunters from the White Sea region, who came to Svalbard in the 18th and 19th centuries to hunt primarily for walrus but also to exploit other living resources. Their huts have been studied extensively but not enough is known about their interaction with the environment. The research questions underlying the fieldwork were therefore: **1) to what extent did the Arctic landscape dictate the location of the Pomor sites? and 2) what was the lasting impact of the Pomor activities on the environment of Edgeøya?**

Ultimately, the team was able to conduct archaeological surveys at only two sites on Edgeøya: Dolerittneset (Kapp Leestasjon) and Kraussbukta. A third site that was visited but that had not been prepared for was Gnålodden in Hornsund on Spitsbergen. This interim report outlines the methodology employed during this unusual undertaking. Besides ‘traditional’ archaeological methods, the team keenly sought interdisciplinary research collaborations and encouraged the ‘community’, i.e. other scientists and tourists on board the *MV Ortelius* to actively take part in our fieldwork. Furthermore, the report presents the initial results of the site walkover, the vegetation survey, and the bone survey. Soil samples were collected at Dolerittneset and at Kraussbukta to enable phosphate analysis. At the time of writing, funding for the analysis had been secured from the Svalbard Environmental Protection Fund (project number 15/73). The analysis had preliminarily been scheduled for January 2016.

The archaeological fieldwork has been registered in the Research in Svalbard Database as ‘Pomor Archaeology on Edgeøya’ (RiS ID 10194). The project is linked to RiS ID 4520: ‘Netherlands Scientific Expedition Edgeøya Svalbard SEES.NL’. Its results feed into Kruse’s post-doc project called ‘Ecological Consequences of 400 Years Natural-Resource Exploitation in Svalbard’ (RiS ID 6917) and Dresscher’s PhD project ‘Surviving Off the Land and Sea’ (RiS ID 10071). Furthermore, the community archaeology aspect will be used in conjunction with ‘Science and Tourism – an Integrated Approach to Arctic Fieldwork’ (RiS ID 10014).

The SEES expedition, in which 55 scientists from different fields participated and whom were joined by 35 tourists, would not have been possible without the enthusiasm and contributions of NWO (Netherlands Organisation of Scientific Research), Oceanwide Expeditions, and the Arctic Centre of the University of Groningen. ‘Team Archaeology’ would like to extend their thanks to the SEES scientific director Maarten Loonen, to the expedition leader Jan Belgers, to the expedition guides, and to the captain of the *Ortelius* and his crew, all of whom tried

their utmost to accommodate our science. A special mention to Michael and Katrin: that warm meal on the table at 11pm will not be forgotten.

We would also like to thank the Governor of Svalbard for granting us permission to do our fieldwork and the staff of the Svalbard Museum for their great interest in our work and their even greater hospitality. We are equally grateful to all the representatives of the media on board, in Longyearbyen, and back in the Netherlands for the very positive picture you have painted of us.

Last but not least we are indebted to the ‘community’ who signed up for hours of soil sampling in the cold: Liesbeth Noor, Monique de Vries, Karen Mulders, Kim van Dam, Miriam Vermeij, Paul Marcel, Arjen Dorst, Nienke Beintema, Judith Klostermann, Stientje van Veldhoven, and Hilde de Laat. We are sorry we could not make everyone’s dream to be an archaeologist for a day come true, but you have installed in us the confidence that ‘community archaeology’ on Svalbard is an exercise worth repeating.

AIMS AND OBJECTIVES

The archaeological fieldwork aimed to investigate 1) *to what extent the Arctic landscape of Edgeøya dictated the location of the Pomor sites* and 2) *what the lasting impacts of the Pomor activities on the environment of the island were*.

At every site, the archaeologists planned to firstly carry out a thorough assessment of the site approach and a team walkover that would inform a comprehensive study of the local landscape and the environment. A second emphasis lay on systematic soil sampling for later phosphate analysis that would help to identify different areas of former activities. Metal detecting across the sampling grids would complement the findings of the phosphate survey. The visual inspection and mapping of vegetation and animal bone would add important information to the emerging picture of past habitation and exploitation.

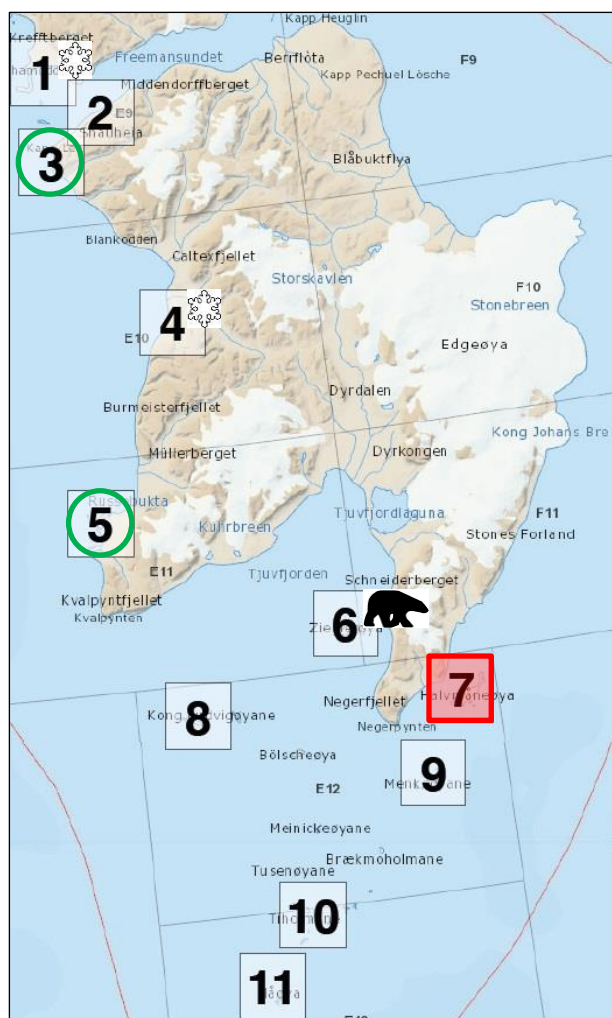
SITE SETTINGS

The archaeological team was one of several scientific teams on board the *Ortelius*. Due to the challenging logistics during the expedition, the success of our fieldwork depended on how well our objectives could be combined with other scientific remits. In addition, the daily plan was subject to the barely predictable constraints of weather, ice, and polar bears. Since it was not possible to know beforehand where landings could be made, Marthe Koeweiden was charged with the formidable task of preparing for **all** Pomor sites on Edgeøya as well as a selected few along the outbound route and the return trip.

In the document *Pomor sites on and around Edgeøya*, Koeweiden (2015) gives an overview of all sites on Edgeøya that are categorized as *Fangstlokalitet* (*russisk*) (hunting locality, Russian) in Norway’s *Askeladden* database available at <https://askeladden.ra.no>. Askeladden’s geospatial data was plotted on a Topo-Svalbard base map available at <http://toposvalbard.npolar.no>. Site descriptions were added manually. Aerial photographs and 3D maps provided by TopoSvalbard further aided the visualisation of the sites. The distances between prominent topographic

features such as the coast, rivers, and lakes were measured in Askeladden. Additional environmental information was taken from the map 'Landscape ecology of Edgeøya, Svalbard' (1977).

Every site was given a SEES-specific reference code, consisting of a single letter indicating the location, two letters indicating the site name, the number 15 for the year of the SEES expedition in 2015 and the final two digits of the Askeladden locality ID, followed by the Askeladden feature number for the sites, where multiple features were separately registered. For example, **EHA15-60-1** denoted **Edgeøya**, **HA**benichtbukta, **2015**, **92860-1**. The locations prepared for were E – Edgeøya, H – Halvmåneøya, T – Tusenøyane, and S – Sørkappøya.



The Pomor sites within potential reach of the SEES expedition were:

1. Barkhamodden on Barentsøya [Askeladden locality ID 92751]
2. Skrukkefjellet [131110]
3. **Dolerittneset / Kapp Leestasjon [92729]**
4. Vingla in Diskobukta [92891]
5. Ekrollhamna [92878]
Habenichtbukta [92860, 128778]
Krausbukta [92829]
6. Delitschøya [92724]
Andreetangen [92728]
7. Halvmåneøya [92804]
8. Kong Ludvigøya [92780]
9. Menkeøya [92785]
10. Tilholmane [92761, 92767, 92769, 92778]
11. Kulstadholmane [92774]

Of these, Habenichtbukta, Delitschøya, and Halmåneøya are nature reserves and were out of bounds.

Barkhamodden and Diskobukta could not be reached due to ice, and there was at least one polar bear at Andreetangen.

Ultimately, the archaeological team was able to land at **Dolerittneset on August 21 and 22, 2015** and at **Krausbukta on August 25, 2015**. These two sites will be treated in some detail in this section, while an overview of **Gnålodden** in Hornsund on Spitsbergen, which was visited on the return journey on **August 27, 2015**, will also be provided.

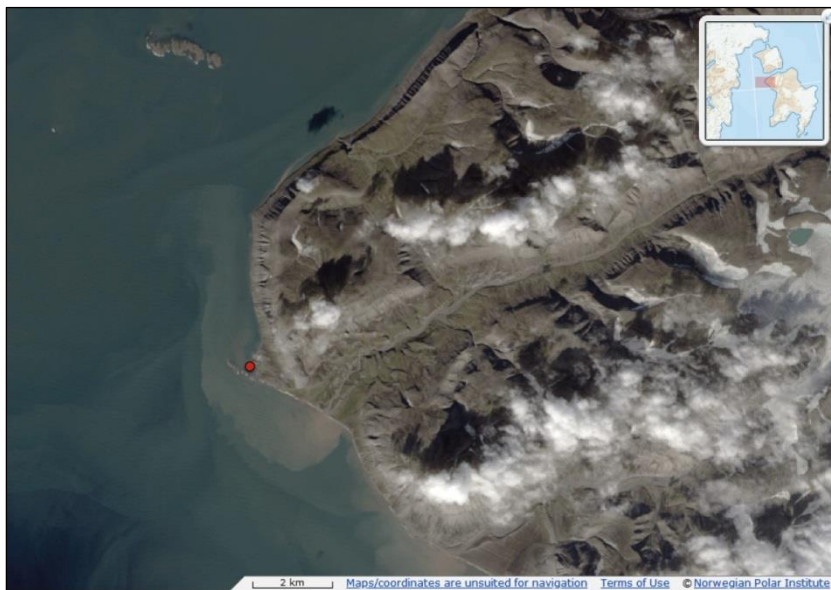
Dolerittneset (78° 04.8'N 20° 49.0'E)

Place names (2003) describes Dolerittneset as a point south of Kapp Lee, on the southern side of Stretehamna on the north-western part of Edgeøya. It was first named by Neilson in 1968 after the rock called dolerite which outcrops here.



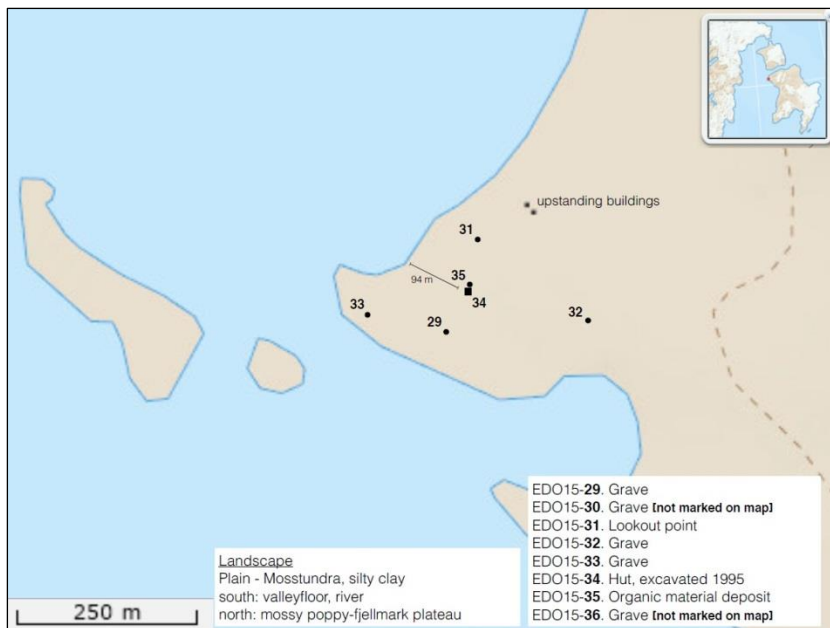
The topographical map shows the location of Dolerittneset, which is also known as Kapp Leestasjonen after the Dutch research station which was built here in 1968 (*Place names* 2003). Prior to the station being built, the whole area was simply referred to as Kapp Lee, although the actual cape can clearly be

seen to lie about 4km to the north. Two features of note are the steep cliffs that line the coast to the north of Dolerittneset and the large Rosenbergdalen to its southeast.



In this aerial photograph, the steepness of the cliffs to the north are emphasised as are the greenness of Rosenbergdalen to the south-east but also of Åmotsdalen beyond Kapp Lee. One question that arises is whether these valleys did support reindeer and other living resources at the time of the Pomors. When the

picture was taken, the river in Rosenbergdalen carried much sediment which the currents took in a northerly direction past Dolerittneset. Do these sediments make it a better or a worse place for marine organisms to feed? What is the effect on walrus that haul out at Dolerittneset? Does the current influence navigation?



At this scale, the topographic map offers little detail. There are a couple of small islands to the west of the archaeological site and a small bay immediately to the south. A contour hints at the cliffs to the east. There is no obvious sources of fresh water.

Two upstanding buildings are shown to the north when there

should in fact be three: an octagonal hut from 1904 (not shown) and two exploratory huts from the late 1960s. The former Dutch research station, a Nissen hut, has since been removed. The Pomor site comprises a Pomor hut (EDO15-34) indicated to have been excavated in 1995 and an associated organic material deposit (EDO15-35). To the north of the hut is a lookout (EDO15-31) and scattered around are five graves, two of which are lacking geospatial data and could not be plotted.

The site is set on silty clay in a moss tundra. As mentioned above, Rosenbergdalen to the southeast is a large valley comprising a river, and a mossy poppy-fjellmark plateau landscape can be found to the north.

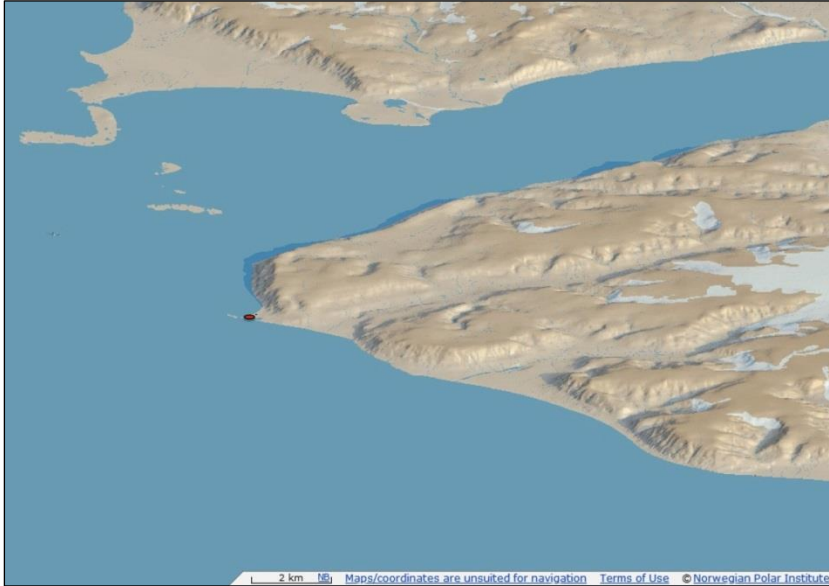


In this aerial photograph, the two islands to the west of the site are shown in greater detail as are a large number of submerged rocks, suggesting that the little bay to the south of the site is practically inaccessible to vessels with the exception perhaps of small boats at high tide. But why would they go

here? Between the islands, the current pushes plumes of sediment from Rosenbergdalen northwards.

On land, a rocky ridge (a sill) of dolerite can be discerned at height to the east of the site from which meltwater channels leave in a westerly direction onto the low-lying area, which comprises much green, and eventually into the sea. The three

upstanding buildings can be seen, enhanced by their shadows, and at this scale, it is obvious that the Pomor lookout is situated on top of a dolerite outcrop which separates the upstanding buildings from the Pomor hut. All buildings have easy access to the beach, in front of which no submerged obstacles can be made out. To the north of the upstanding buildings, walrus are hauled out onto the beach. This raises the question if there was a walrus haul-out at this location in Pomor times.



The 3D image of the site stresses its location on a low-lying area immediately to the northwest of the very large and accessible Rosenbergdalen. Yet, if the valley had been of primary importance, perhaps the Pomors would have placed a hut directly at its mouth or even a short distance into the valley. Having

said that, just because a hut has not been found here does not mean there never was one. Another valley, Visdalen, can be seen further south. Although the toponym hints at fish at this location, it is actually named after Visdalen in Jotunheimen in Norway (*Place names* 2003).



In this oblique aerial photograph, the dolerite which gives Dolerittneset its name, finds expression as a horizontal sill in the cliffs above the site as well as a series of ridges on the low-lying area and the rocky islands in the front of the picture. Due

to characteristics of the dolerite, the islands give an impression of Giant's Causeway in Ireland. Dolerite is a fairly hard rock, and the outcrop pattern at this location probably meant that softer rocks and unconsolidated overburden have not been eroded away. Geologically speaking, this location is not as changeable as many other Arctic landscape types.

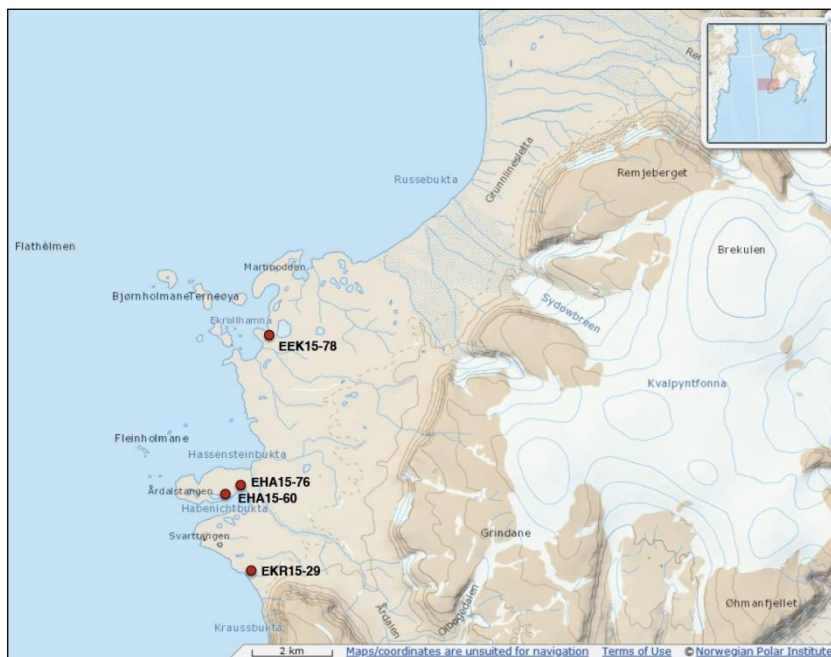
On the low-lying area, the sequence of features for orientation purposes from left to right is: long beach – rocky ridge with lookout – short beach and plateau with

Pomor hut – low rocky ridge – small bay. There are some features on the long beach which appear to be too big for driftwood or walrus; they could be zodiacs. Where the long beach meets the rocky ridge, the three upstanding buildings are just visible. The Pomor lookout is not large enough to be seen. The Pomor hut is situated above the short stretch of beach on a plateau (for want of a better word) between the two rocky ridges. No archaeology has been found on the low ridge.

The surface of the sea water again provides an indication of the currents that sweep through and past the islands in a northerly direction. It appears to be high tide, and the small bay may now be reachable by boat though one would probably have to have a pressing reason to try it.

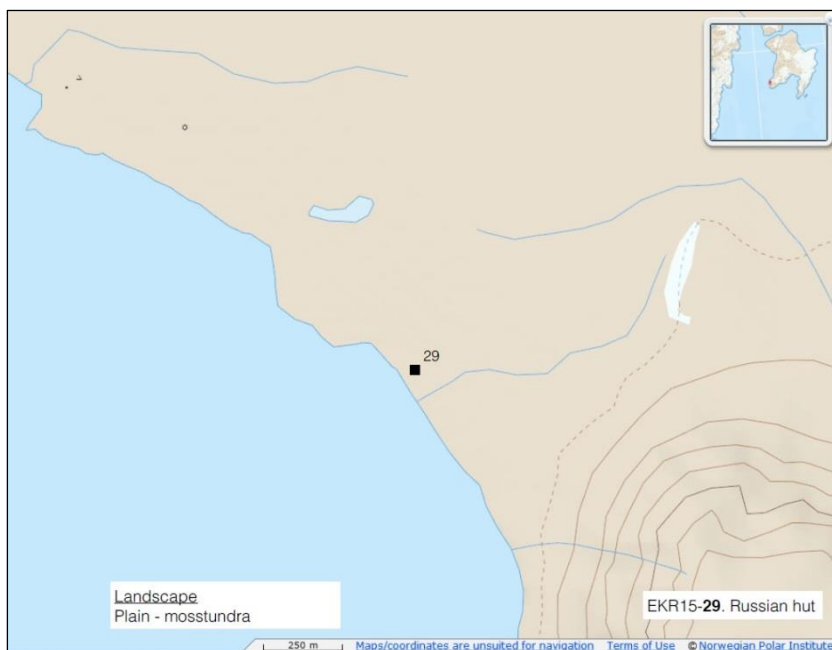
Kraussbukta (77° 30'N 20°30'E)

According to *Place names* (2003), Kraussbukta is an “open bay on the southwest side of Edgeøya. After Professor Dr Ferdinand von Krauss, 1812-90, managing director of the Kgl. Württembergische Naturalienkabinett in Stuttgart, Germany. But Gregor Krauss, 1841-1915, professor and managing director of the botanical garden at Erlangen, later of Halle and Würzburg [*sic*] may also have been meant. He worked up material on the expedition of Heuglin.”



This topographic map shows the location of the Pomor site in Kraussbukta, coded EKR15-29, to lie to the south of the Pomor sites in Habenichtbukta (EHA 15-60 and EHA15-76) and Ekerhamna (EEK 15-78). The sites are situated along the coast of a large unnamed flat between Grunnlinesletta in Russebukta to the north and Årdalen to the south. There are sev-

eral rivers and small lakes. Grunnlinesletta is indicated to be swampy and therefore probably a bad place for landing a boat or for building a hut.



At this scale, the remains of a Russian hut are shown to lie in a moss tundra immediately north of a short stream. To the south of that stream, the coastal strip begins to narrow, and just off the bottom edge of the map, the steep slopes of Årdalsnuten directly meet the sea. There is no beach to speak over the 9km down to the point of Kvalpynten and for

another 9km beyond the point to the east. A small lake is indicated about 500m to the north of the Pomor site. At a distance of approximately 1.5km, the ruin of a later expedition hut and a navigational modern beacon can be found.

It is noteworthy that the coast should not be one evenly curved line but that there are 'bits sticking out' just to the north of the Pomor hut. There is no river meeting the sea here and therefore no river delta. Such bits may indicate rock outcrops that do not erode away as quickly as softer rocks or overburden around them. They may also offer shelter or cause the creation of beaches. The latter may in turn be useful as haul-out or landing beaches.

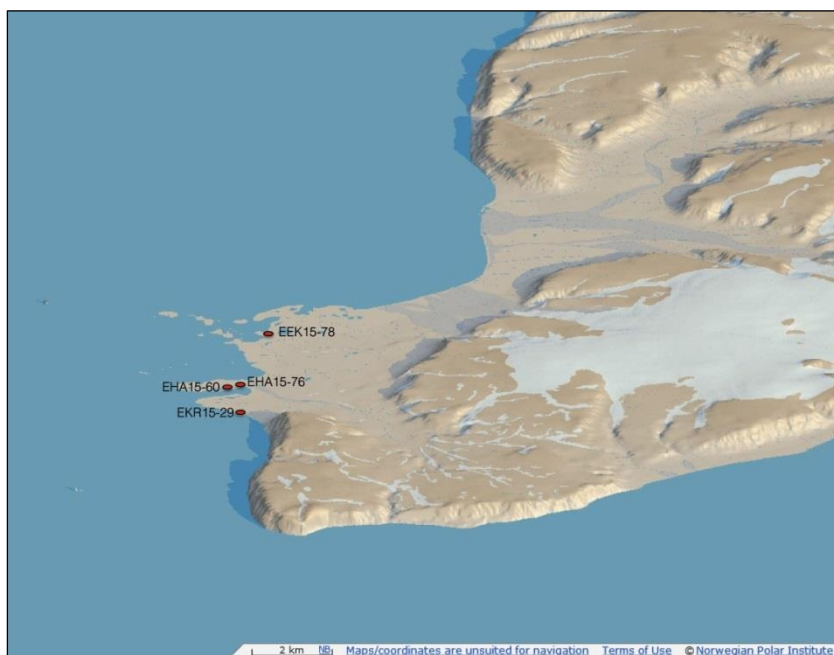


In this aerial photograph, there are a range of interesting geological and geomorphological features. As such, the 'bit sticking out' with the

Giant's-Causeway appearance (aka columnar jointing) is a dolerite sill. There is a larger knoll against which the waves are breaking, and immediately to the east and inland of it is a smaller outcrop which

will find mention in the results. To the east of the dolerite sill, the moss tundra exhibits permafrost-induced patterned ground. The stream mentioned above drains this area of water. The depth of the stream channel is emphasised by snow that has

accumulated in it and has not yet melted. This depth stands in contrast to the small amount of water that flows in the stream. The stream water does not reach the sea; it disappears into the beach deposits. This is probably the usual state of affairs as there is no build-up of sediments, no delta to speak of and the seawater in the 'delta' area is seemingly unaffected by any incoming fresh water. This photograph further highlights two features of the snow melt: where the snow drifts are thickest, they melt the latest; and the melting of the snow drifts is further delayed where the southern sun cannot reach them. The beach is wide and probably gravelly. Some driftwood can be recognised from this height, lying high on the beach. A high concentration of sediment can be seen in the seawater along the beach front where it is perhaps being reworked continually by wave action; this suspended sediment disperses somewhat where the current meets the dolerite outcrop. With increasing water depth, there are sharp gradients to medium sediment density at shallow depth and low sediment density in deeper water. Obstacles in the water that may hinder landing are not immediately obvious.



This 3D image substantiates the impression that the Pomor sites share the low-lying area between Russebukta to the north and the mountains around Kvalpynten to the south. Although there is generally much water in this area, only Grunnlinesletta is indicated to be swampy. If the Pomors had an inland focus besides their primary marine focus, the area

to the south of Grunnlinesletta may have sufficed. To utilise the large Plurdalen in the top right of the image, the Pomors would probably have needed to erect a camp in the very north of Russebukta under Zigel'fjellet, thereby avoiding any overland travel through swampy areas. No such camp has as yet been found.

Gnålodden (77° 00' N 15° 40' E)

Gnålodden is a point below Gnålberget, itself a steep rock face (759m) of Sofiekammen in southernmost Wedel Jarlsberg Land on the northern shore of Hornsund. The rock face is inhabited by a Kittiwake colony. (*Place names* 2003). Hornsund had not featured prominently in the SEES plans, and the landing site was chosen mostly for the dramatic scenery and not its scientific potential. It was a

coincidence that this site should comprise Pomor archaeology. As such, the archaeological team had not prepared for this location.

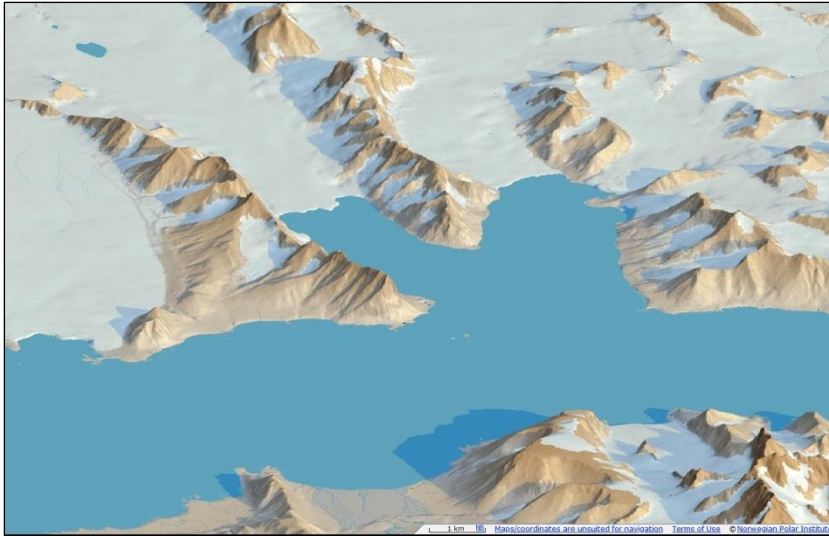
From the topographic map below, it is clear that Gnålodden is literally a point with barely a flat area or an obvious landing beach around it. The slopes of Gnålberget rise steeply.



The aerial photograph emphasises Gnålodden's location as well as some green colour at the foot of the bird cliff and the geomorphological processes at work around it. Sediment is carried off the land at various locations, the colour being subject to the underlying bedrock. The sediment dispersal in the

seawater indicates the currents. The bergy bits in Burgerbukta originate from Paierbreen and Mühlbacherbreen just off the top edge of the photograph. At this

scale, it is difficult to see the waves on the water that indicate a south-westerly breeze at the time the image was taken.



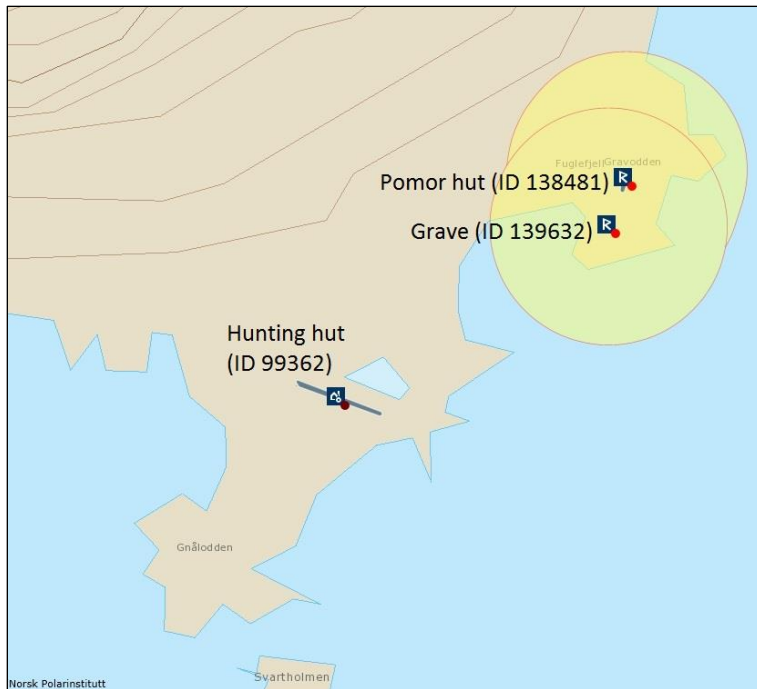
This 3D image and the oblique aerial photograph below help to visualise the relative isolation and inaccessibility of Gnålodden – at least in the summer months. It prompts the viewer to think again in historical terms of the Pomors' focus on the sea, the land, or both. What could have been

the resources at this location at different times of year? Was there a walrus haul-out nearby? Did the Pomors utilise the eggs and the birds of the cliff in summer? Was this area perhaps a thoroughfare for polar bears and Arctic foxes in winter? These are questions that can be easily be raised by looking at the maps but that must be answered by the combination of archival research and fieldwork.



A consultation of the Askeladden database reveals the Pomor site to be a hut and an associated stone cairn (ID 138481). As seen in the map below, it is not situated directly at Gnålodden but at another small headland called Gravodden. The name originates from the single undated grave (ID 139632) here. Furthermore, there is a

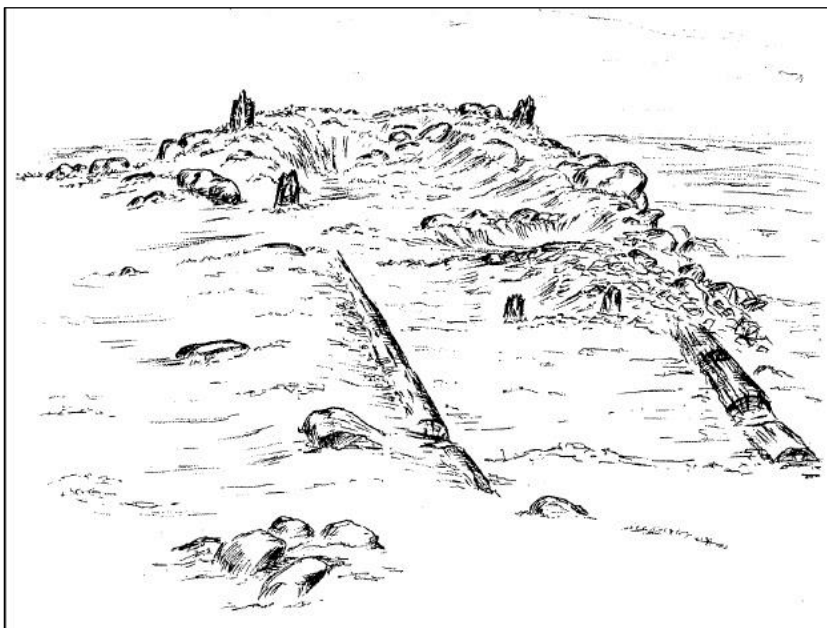
Norwegian hunters' hut and an associated winch (ID 99362). In light of so much past activity, the pros of game in this area must have outweighed the cons of the location.



PREVIOUS WORK

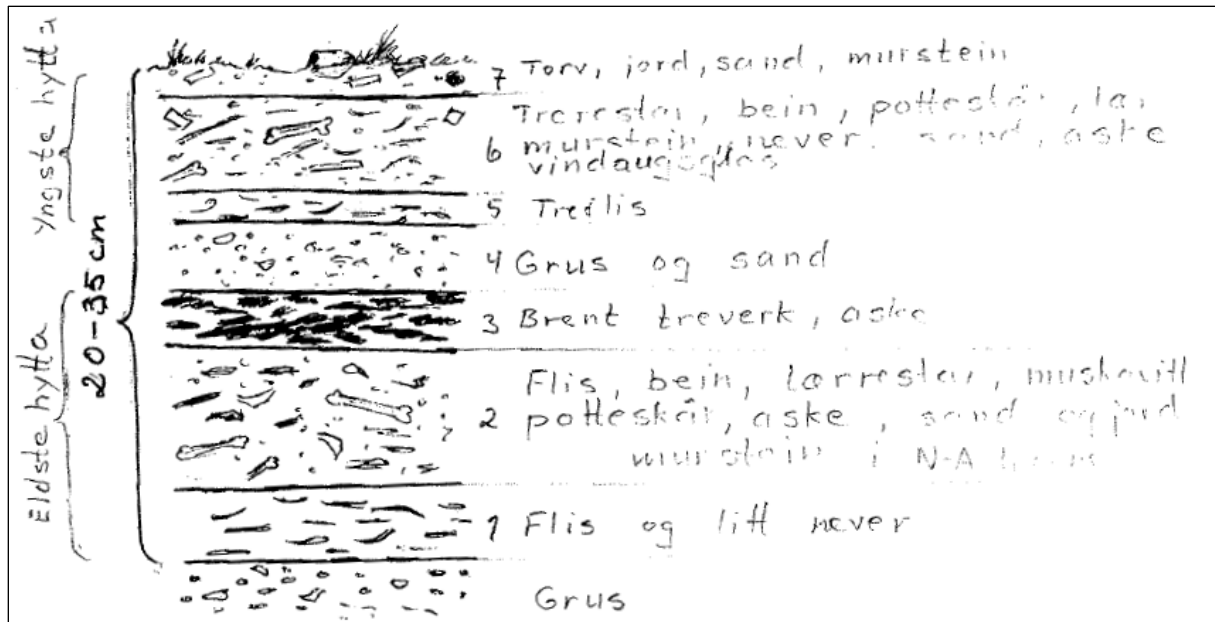
Dolerittneset (78° 04.8'N 20° 49.0'E)

The Pomor hut at Dolerittneset was first excavated by the Norwegian amateur archaeologist Arne Dalland during a private expedition in 1968. Dalland's documentation is available from the archives of the Governor of Svalbard. It comprises a hand-written report of 22 pages as well as sketches and photographs.

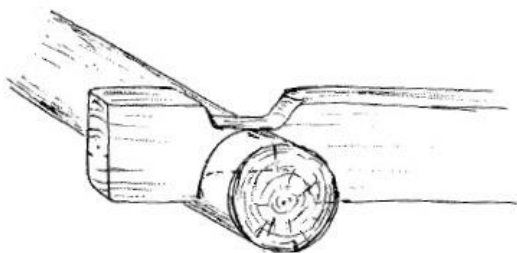


Pre-excitation sketch of the Pomor hut at Dolerittneset, looking north (Dalland 1968).

In view of the hut having been excavated again in 1995 (see below) and our focus not being the hut but the surrounding area of the hut, the information contained within Dalland's report is not repeated in any detail here. We do, however, choose to include a pre-excitation sketch of the hut, a sketch of the contexts Dalland encountered, and a sketch of the construction technique used.

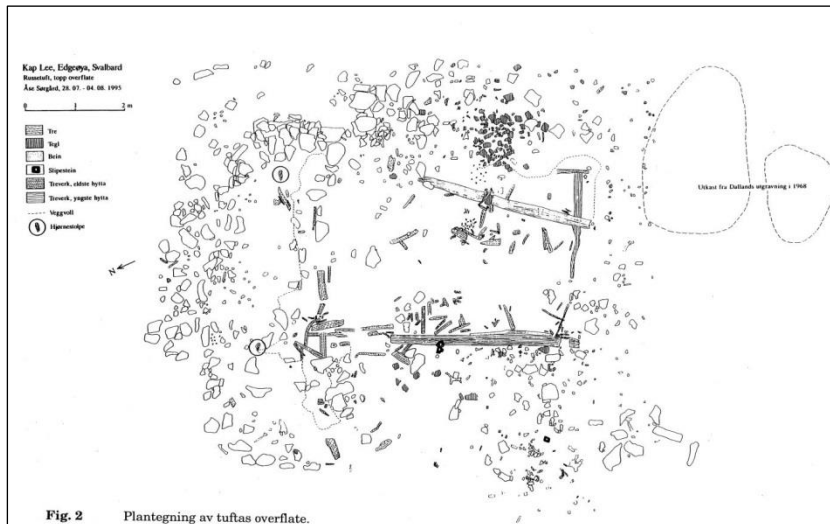


Sketch of contexts encountered during the excavation of the Pomor hut at Dolerittneset (Dalland 1968). Dalland distinguishes between an older hut at the bottom, a burn layer, and a younger hut at the top. At least two layers are shown to contain much bone among other artefacts.



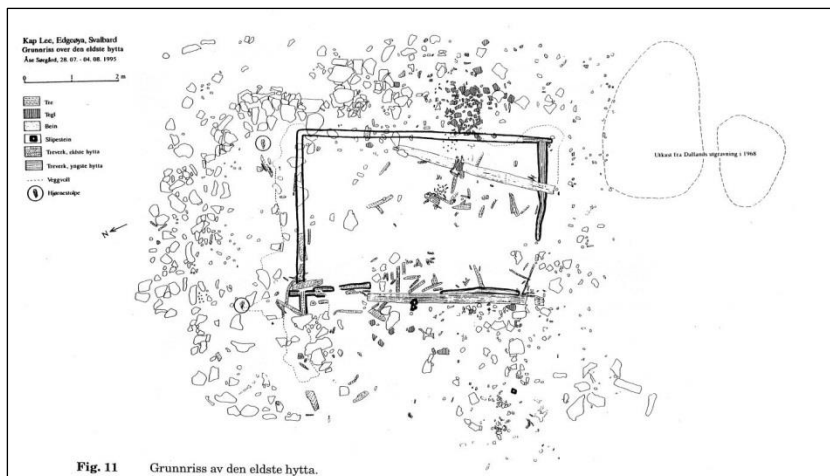
In this sketch, Dalland (1968) records the construction technique. It shows a full-round log which is fully round on the inside of the hut as well as out (as opposed to Swedish cope logs that are also round inside and out but with a half-moon shaped groove at the bottom). It also shows a square timber which is flat inside and out, in this case without any grooves (as opposed to a D-shaped timber that is round on the outside and flat on the inside). According to Wikipedia ("log house"), the corner notch is typical for mediaeval Norwegian buildings.

Between July 21 and August 16, 1995, four Norwegian archaeologists under the leadership of Roger Jørgensen again excavated the Pomor hut at Dolerittneset. Jørgensen's 17-page report (1995) and additional documentation are also available from the archives of the Governor of Svalbard.



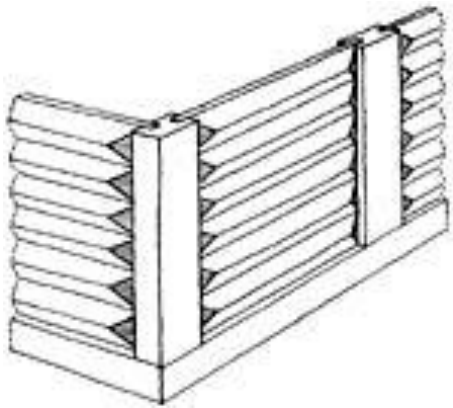
A pre-excavation plan view of the Pomor huts at Dolerittneset (Jørgensen 1995). Note the spoil heaps of the Dalland excavation in 1968 in the top left corner.

Jørgensen (1995) summarises that two huts stood at Dolerittneset, the younger one built on the burnt remains of the older one. Around them, a substantial scatter of woodchips and animal bones was found. Because of the amount of woodchips, Jørgensen (1995) argues that at least one of the huts was built on site as opposed to being a prefabricated construction.



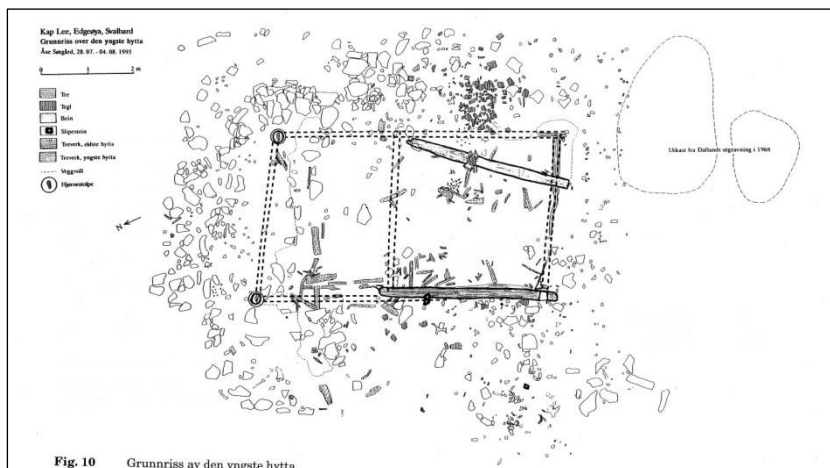
The older hut was roughly aligned north-south and measured 5m by 3.4m. It was a log construction of which only the bottom strakes were partially preserved. The short walls were made of round logs [wood that had not been processed] while the long walls were

made of timber [American: lumber; wood that had been processed into beams and planks] (see Dalland's sketch above). An oven had stood in the north-east corner of the hut on a foundation of timber. The oven remains comprised red bricks; the timber foundation was 1.25m wide. The door may have been in the west wall in the north-west corner. There are no obvious signs that the hut had more than one room, but this cannot be rejected fully because evidence may survive under the northern embankment which was constructed by *sleppveggkonstruksjon* ('drop-wall construction').



An example of 'drop-wall construction'. According to Wikipedia, this is also called corner post construction: the logs or timbers have tenons (projections of wood) made for insertion into mortises (grooves) in the posts. It is part timber framing, part log building.

The younger hut was built on the founding logs of the older one. It comprised two rooms, one of notch construction and the other of drop-wall construction. The notch-constructed room was made of round logs. It was shorter than the older hut, measuring only 3.1m in the north-south direction, but it had the same width of 3.4m. These were probably the living quarters of the hut since there had also been an oven in the north-east corner.

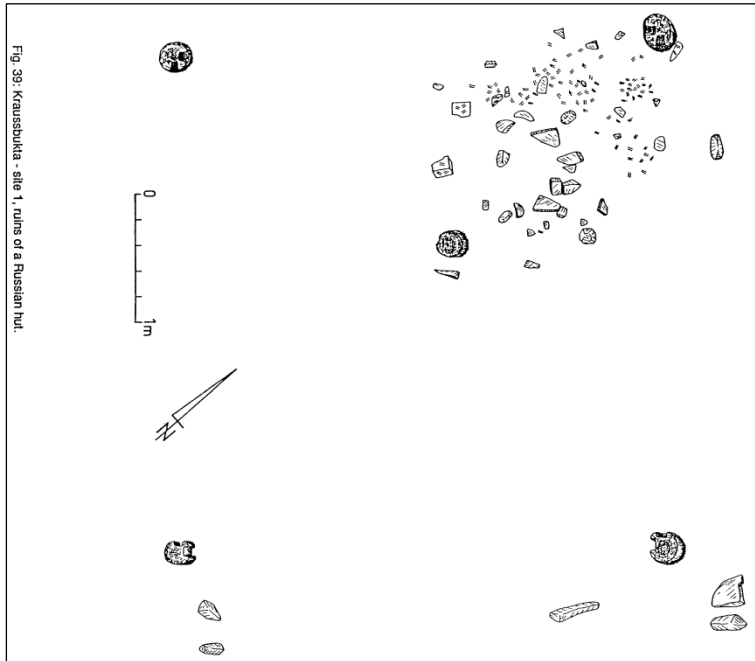


The drop-wall constructed room to the north measured 3m in the north-south direction, giving a total length of the younger hut of 6.1m, and was again 3.4m wide. There had been an embankment of turf and rocks around the outside of the hut, which was most substantial along the outer north wall. The door appears to have been in the same spot in the west wall as before. The position of an internal door between the rooms is not known.

The huts at Dolerittneset have not been dated absolutely. Jørgensen (1995) found evidence in the foundation of the younger hut of V. F. Starkov of the Russian Academy of Sciences having taken a sample of a log for dendrochronological testing. The sample was dated to 1746 (Chernyk 1987 in Jørgensen 1995). Dalland (1968) further found a coin of the year 1771 in the younger hut. The ceramics he discovered broadly date to the 18th century.

Kraussbukta (77° 30'N 20°30'E)

In 1988, a team of five Norwegian and Polish archaeologists carried out surveys on Edgeøya (Chochorowski and Jasinski 1990). This included Kraussbukta. The following is a direct quote from their report / publication:

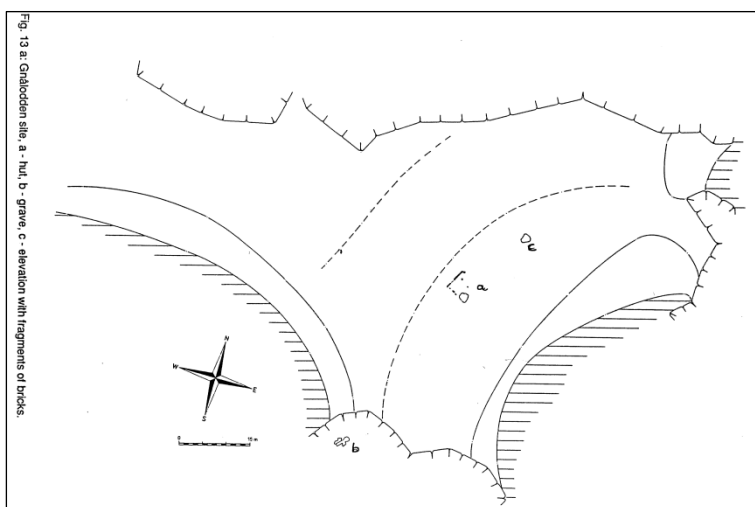


“Remains of a hut constructed of dovetailed beams set in vertical corner posts were located on the upper terrace several meters above the level of the present storm berm (Fig. 39). Not far from the hut, a seasonal water course has its mouth. The remains of the hut are thickly overgrown with tundra. In one of the corners a stone and brick oven can just be discerned, framed with a construction set on wooden posts. Two large whale ribs

[sic] with cuts made as if for construction purposes lie close to the ruins (Foto 70 [omitted]). The nature of the object, and especially the type of construction, suggest that it was a seasonal station.”

Gnålodden (77° 00' N 15° 40' E)

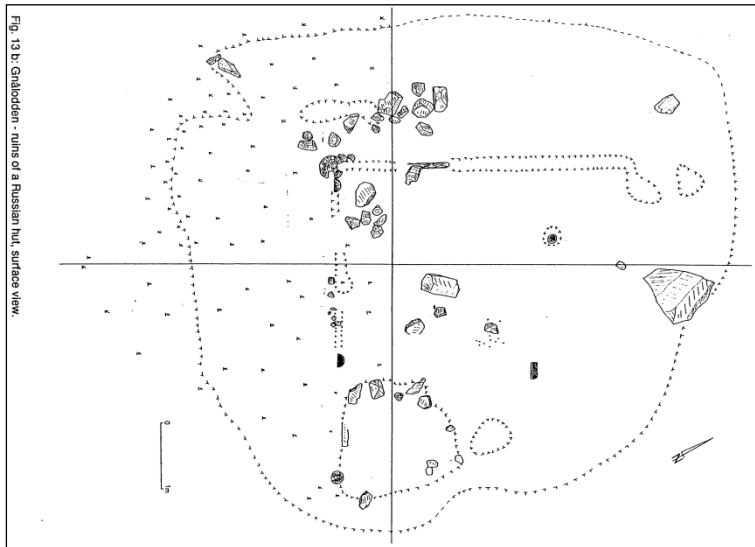
In 1988, the same team of Norwegian and Polish archaeologists carried out surveys in Hornsund (Chochorowski and Jasinski 1990). This included Gnålodden. The following is another direct quote from their report / publication:



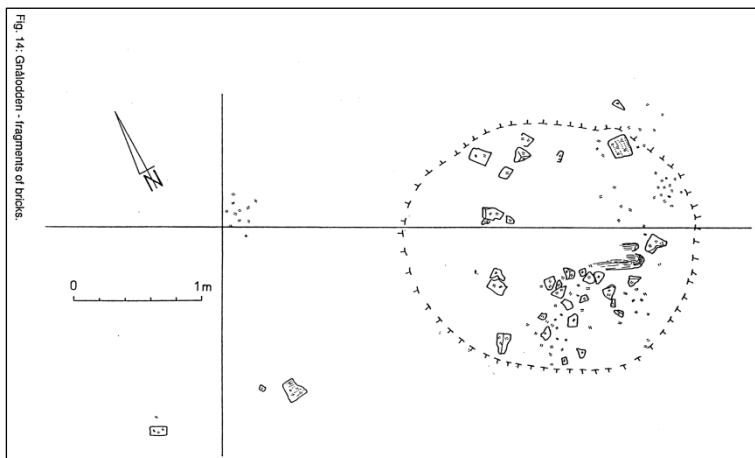
“The Gnålodden site is located in the east section of the promontory (Gravodden), on a small flat between the slopes of Gnålberget and the rocks verging on the sea. The main archaeological objects on the site are remnants of a Pomor hut, built of dovetailed beams set in vertical corner posts, situated next to the present storm berm in a quite

wet place (Fig. 13 a, b; Foto 13 [photo omitted]). The ruins are barely visible on the surface due to the rich tundra growth in the area. Here also the ruins suggest that the

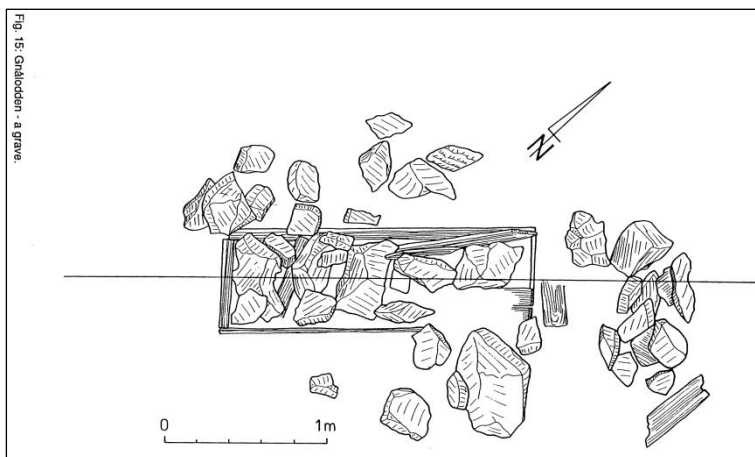
construction was not strong (thin walls), and was probably used as a seasonal station. As in the case of other Pomor objects, chopped walrus bones were found around the hut.



Chochorowski and Jasinski 1990: Fig. 13b showing a plan view of the Pomor hut at Gravodden / Gnålodden.



“Fragments of bricks typical of Pomor objects were found on the surface of a small elevation in the vicinity of the Gnålodden hut. It cannot be ruled out that this very rubble had been identified by Hoffer (1880: 31 ff.) as the ruins of an oil melting furnace (Fig. 14).



“Not far from the hut on a rocky elevation is a grave. Judging by its orientation (SW-NE) and by the regular wooden box-shaped coffin hidden under the flagstones, the grave should rather be associated with western European whalers (Fig. 15; Foto 14 [photo omitted]).”

In July and August 1989, a team of four archaeologists from Norway and Poland undertook excavations at Gnålodden and two other sites in Hornsund. “The aim was to carry out a regional-scale study of Russian hunting activity on Svalbard.” (Chochorowski and Jasinski in Jasinski 1993). The following are quotes from their report / publication:

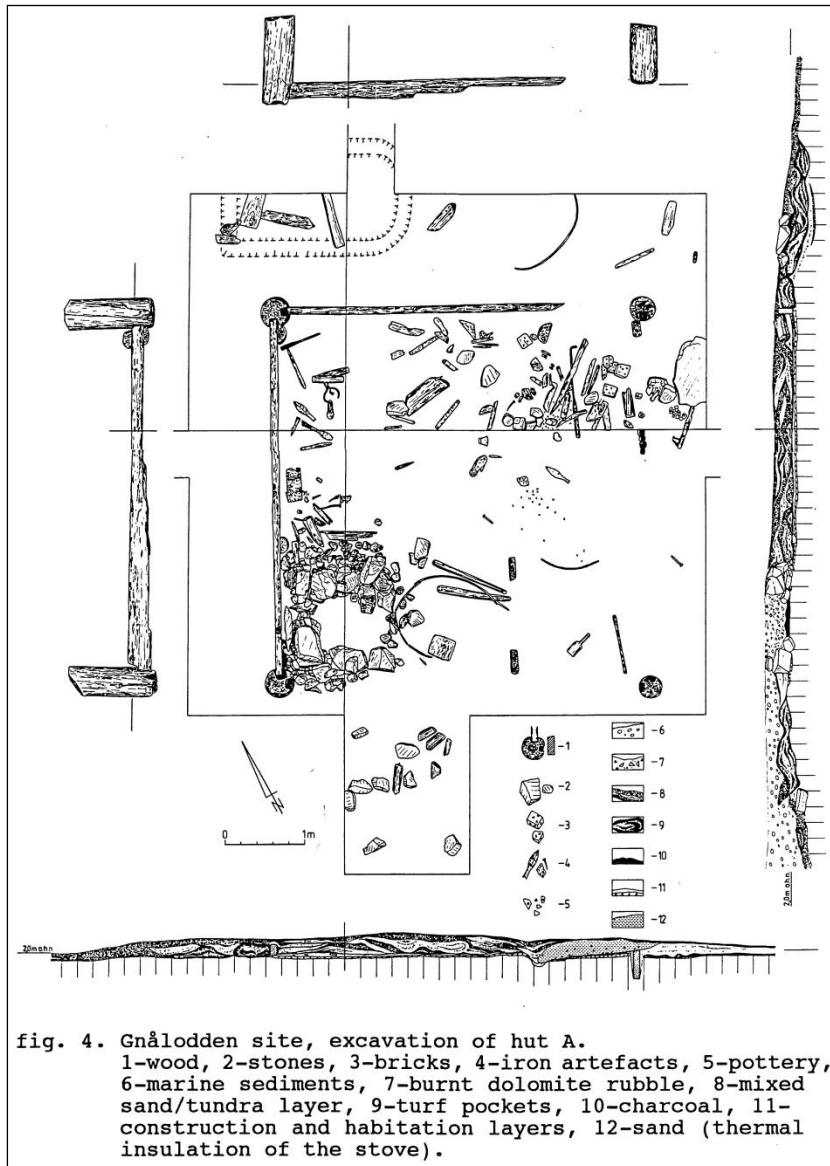


fig. 4. Gnålodden site, excavation of hut A.
1-wood, 2-stones, 3-bricks, 4-iron artefacts, 5-pottery, 6-marine sediments, 7-burnt dolomite rubble, 8-mixed sand/tundra layer, 9-turf pockets, 10-charcoal, 11-construction and habitation layers, 12-sand (thermal insulation of the stove).

“Object A (hut). State of preservation. A few structural elements just visible on the surface enabled this structure to be recognised as a hut. These were posts at the south-east and south-west corners, two smaller posts on the south wall and another in the northern part, and a small piece of plank visible in the west wall. [...]

“The rich assemblage of finds discovered in the ruins of the hut confirms its Russian origin. A few finds of West European kaolin pipes make it possible to estimate the chronology of the hut to the beginning of the second half of the 18th century [figure omitted].

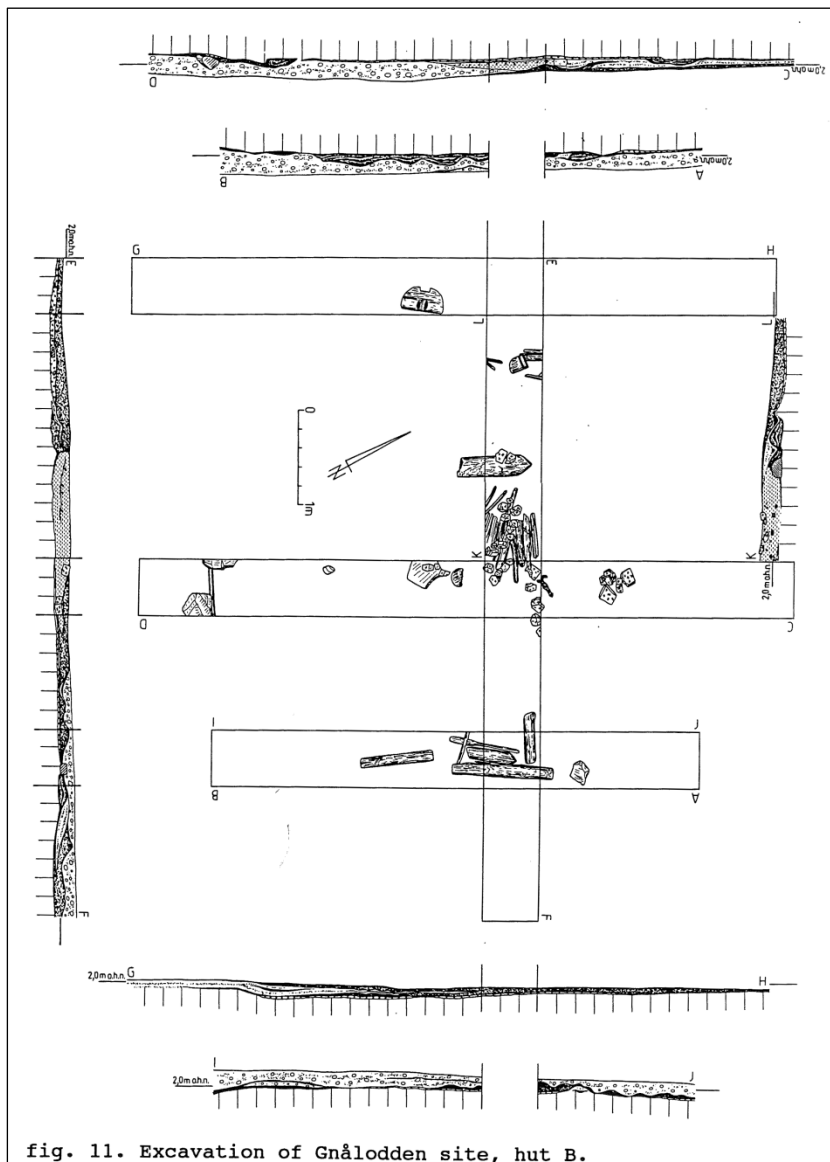
It should be noted that

the inventory contains typical hunting equipment [...], as well as a fairly rich set of household appliances [...]. Also discovered were bone pegs with one end sharpened – the by-products of the use of a bow lathe, wooden last for shoe manufacturing, and four chess pieces [figures omitted].

[...]

“Excavations revealed a considerable amount of zoological material – mainly animal bones and skin (of walrus, reindeer and polar fox), and particularly bird bones, which affirm that the bird colony at Gnålodden was an important food resource for the hunters occupying Gnålodden hunting stations.

“Unfortunately, only the fragments of kaolin pipes can be used to determine the chronology of the hut. Typology of Pomor pottery and iron tools shows that the majority of forms occurring on Svalbard (and also at the Gnålodden site) had been in use in northern Russia for some centuries in the post Medieval period and that this type of material generally cannot be used for detailed chronological definition of Russian hunting stations on the archipelago.”



“Object B (hut). State of preservation. On the surface of the ground, dwelling B occurred as a small mound of brick rubble (ca 2 m in diameter), centred around two small beams sticking out aslant [...]. After uncovering, the beams proved to be only a part of a larger concentration of similar elements lying approximately parallel to each other. The layer of sand covering the beams contained no artefacts. On the surface of the sand layer and around it there were both small and large fragments of bricks as well as fragments of thin sandstone slabs. The sand layer could easily be differentiated from

the neighbouring layers. Beyond doubt, the mound contained ruins of a brick stove, typically constructed on a beam socle and isolated from the walls of the hut by a layer of sand.

“The condition of the stove remnants uncovered in a trial excavation did not promise an easy reconstruction of the architectural structure of the dwelling. Two more pilot trenches [...] did not bring any important revelations either. Therefore, conclusions about the size and the nature of the structure are based mainly on stratigraphical data (fig. 11).”

“A few finds obtained from the trial excavation show that the hut belonged to Russian hunters; these include typical pottery fragments of iron nails, leather, window glass, bird and mammal bones. Although scarce, the fragments of West European kaolin pipes found in the hut allow dating of the hut to approximately the middle of the 18th century.

[...]

“The Gnålodden stations. The precise dating of huts A and B and the definition of their chronological relationship seem to be quite difficult. This is also true of the functional structure of the whole site. Hut A is probably representative of stations which were used periodically as summer stations [...]. Hut B seems to have been a dwelling fit for whole year habitation, including the polar winter. It is therefore quite improbable that two such lodges should have existed and functioned side by side in the same period of time. We should rather consider here the possibility of chronological differences between the two huts. Both of them are dated by kaolin pipes to the middle of the 18th century. We have to stress here, however, that in the hunting stations (not permanent settlements) – even a chronological difference of one hunting season can signify a lack of continuity of habitation.

“The state of preservation of the two huts suggests that hut B functioned first. After abandonment (caused, for example, by decreasing hunting results), the timber could have been used in constructing hut A.”

METHODOLOGY

Archaeological survey

The archaeological team had discussed the most flexible methodology for the archaeological survey well in advance of the SEES expedition taking place. It was committed to paper in Kruse (2015) *Pomor archaeology on Edgeøya, Svalbard (RiS ID 10194), August 19 – 28, 2015. Site manual*. Copies of the site manual were made available to each team member, in the RiS database, to the SEES scientific director, and to anyone who had an interest in our plans. The following is an abridged methodology.

Regarding site management, the team kept a site file which comprised: Kruse's (2015) *Site manual*; Koeweiden's (2015) *Pomor sites on and around Edgeøya*; Dresscher's (2015) *Background information Pomor sites, SEES expedition*; the research application; the Governor's fieldwork permission; and any relevant recording sheets. There was an equipment list (included in Appendix 1), a daily site record, a drawing index, a photographic index, a feature recording sheet, and a feature index. We had discussed the expedition-specific site codes (see above) as well as any expedition-specific feature codes, should new archaeological features be found. For the use of GPS devices, we had made a list of abbreviations for the most likely artefacts and ecofacts to be encountered.

Whilst the background information came in very handy throughout the SEES expedition, we mostly did not use any of the recording sheets in the short time available on the sites. Armed with a notebook, a pencil, and a digital camera, we

could pretty much carry out all the recording we needed during the common approach and team walkover. The digital camera, in particular, became an unmissable tool.

Common approach and team walkover. We emphasised polar bear safety at the start of every landing! We then recorded seascape and approach, accessibility and landing, and landscape and context of the site. We preliminarily identified ALL known archaeological features, not just the ones of immediate interest to us, as well as many modern features. Unfortunately, the practise of only noting what is of immediate interest is too common in Svalbard archaeology. Next, we identified potential areas of past activities which in turn gave rise to our surveying activities.

Phosphate survey. This was not to be carried out in or directly on top of known archaeological features but between and around them. We had identified potentially suitable areas on the maps prior to the landings, but the reality was usually very different. On sites, around the huts, we identified likely areas of past activities anew and decided on the site-specific grids and sampling strategy. The grids were mapped using a GPS device. Due to time constraints, the sampling interval would always be 1m, no variations. The soil samples were to be less than an egg-cup full of soil sampled with a teaspoon from a suitable depth. Each was put in a small zip-locked plastic bag and logically and consecutively labelled. Despite the pre-arranged site codes, we simply labelled the grids I, II, and III (we only did three grids in total). Then we used a row number starting with 00, 01, 02, etc. followed by a sample number starting with 000, 001, 002, etc. It was found to be sufficient and rapid.

Metal detecting. This was not to be carried out in or directly on top of known archaeological features but between and around them, preferably in the same grids as the phosphate survey to add another layer of information. Detections could not be dug up (no permission!) but would be marked temporarily with flags. The flag locations were to be recorded using GPS. The purpose was not to identify the objects but to investigate the distribution pattern of metal-related activities. However, due to metal in the underlying bedrock (dolerite) and the sensitivity of walruses to the beeping noise, the metal detector could not be used.

Visual inspection and mapping. The team member(s) carrying out this task addressed vegetation cover, animal bone surface assemblages, driftwood, and beach litter. Kruse's (2015) *Site manual* refers to the possible collection of vegetation samples; this was not done. Animal bones were only collected in the form of reindeer lower jaws (3 from Dolerittneset; 1 from Kraussbukta). The dGPS was to be used to map linear topographic features (high-water marks, cliffs, other coastal features, streams, dry stream beds, lakes, dry lake beds, patches of peat or ice, suitable contours around the site, contours at height, or others suitable). Such features would delineate the archaeological site and refine the existing topographic basemap. The dGPS should also record existing benchmarks and the most obvious known archaeological feature on the sites to use as anchor points on which to base all subsequent manual or digital mapping. However, due to a software fault, the dGPS could not be used effectively.

Digital photography. This was our most important 'survey' tool on the sites. Each team member had a camera as did those scientists and tourists who came to assist us. Everyone was briefed to take all-encompassing photographs of seascape and approach, accessibility and landing, landscape and context of the site, conditions of known features, especially if at risk, details of any new features (or feature previously thought unimportant) as well as research-related artefacts and especially ecofacts. There were photographic considerations regarding mining history and built heritage, but those did not come to pass. No historical photographs of the Pomor sites were known that would lend themselves to repeat photography. The fully indexed photographic record is included in Appendix 2.

Sketching and drawing. Sketching sufficed.

Building and structure recording. None was undertaken.

Publicity and outreach. The SEES expedition was in the public eye, and it is in any case good scientific practise to engage in education and outreach. Thought was therefore given to appropriate and representative clothing during SEES (blue expeditions jackets could be purchased from NWO at a reduced cost) and especially while on site, as any team member may appear on photographs or film at any time. Team members were also encouraged to take 'snapshots' besides regular scientific photography in order to document expedition life which would be useful for later public presentations and popular publications. The team did not take videos themselves.

Multi- and interdisciplinary research

There were a range of tasks which the archaeological team could do themselves. These included traditional archaeological survey; soil sampling; metal detecting; the visual inspection and recording of vegetation cover; and the visual inspection and recording of animal bone assemblages at the surface.

Furthermore, we were very happy to be of use to other researchers. Thus, we were willing to collect reindeer jaws from our sites, take water samples, collect insects; record driftwood and modern beach litter; and sample driftwood for dendrochronology (not done).

Where we lacked the necessary expertise, much could be gained archaeologically in working together with other scientists. We made a considerable effort prior to the SEES expedition to contact several scientists whom we thought may have something to offer to our research questions (see Appendix 5). However, it was difficult to really connect across research borders until we met them in person. Then they were usually very enthusiastic about the possibilities, all depending on the available time and the necessary funding, of course.

Hence, we asked the sea mammal specialists to collect sea mammal bone samples for us (for later DNA analysis) and requested to be kept informed about the outcomes of the DNA analysis of the reindeer jaws we and others collected. DNA analysis over time may show us the effects of intensive hunting on former game animals such as bowhead whale, walrus, polar bear, Arctic fox, and Svalbard reindeer. We imagine the genetic material will have passed through a bottleneck as

animals faced near extinction and will have diversified again from there. It would be interesting to pinpoint when that bottleneck occurred and what it has done to genetic diversity.

There were also several scientists who wanted to take sediment cores and peat cores either for palaeoclimatic and palaeoenvironmental studies or to find evidence for oil exploration in the 1970s – we convinced them to take their samples in such a way as to include the human timescale in Svalbard, that is to say the last 400 years. We encouraged them to look for any signs of human activity during their analysis and interpretation. These could be direct signs such as layers containing coal or ash from burning wood and fossil fuels where there are no coal seams, or indirect signs such nutrient-enrichment (phosphates, types of diatoms) by the processing of animals in lakes or the sudden growth of bird colonies nearby (the latter is based on a hypothesis that the depletion of plankton-eating whales caused a food web shift and may have benefitted plankton-eating birds, for example). There is a similar range of possibilities from peat cores. Sediment cores and peat cores were, in fact, taken, but because the archaeological team has nothing to do with their analysis, we will have to wait for the results.

Community archaeology

The SEES expedition received much publicity in the Netherlands, and from the beginning, the archaeological team wanted to involve the public in their work as much as possible. We firstly generated the following elevator pitch to make sure that we could bring our point across in a few sentences only:

We perceive the Arctic as a pristine wilderness, but is this still the case for Spitsbergen? Humans arrived on Spitsbergen in the 16th century. What was their impact on Edgeøya? Archaeologists can reconstruct the human impact on Edgeøya using material remains as well as written sources. We want to move away from investigating individual archaeological sites such as hunting stations to studying the Arctic landscape they are situated in. We intend to conduct a pilot study using phosphate survey under Arctic conditions to distinguish areas of different past activities, for example, the processing of animals.

During a first meeting of all scientists and ‘research assistants’ prior to the SEES expedition taking place, it was already clear that many hoped to go out into the field with us for at least a day. We could now lobby for more field assistants, but we decided that there was already so much SEES information going around that we would keep our request for more ‘community archaeologists’ until we were on board of the *Ortelius*.

On board, we had envisaged that we could perhaps arrange a meeting in the lecture room to introduce our project, get people to sign up, and induct them at the same time, but this was not so. Instead, we communicated (very effectively) via the notice board in the reception and hung up a list (see Appendix 6). At first, the list was

divided into different days and expected locations, but due to the extremely changeable nature of the daily plans, we had to increase our flexibility even more. There was the added complication that other scientists could come into the field with us without further ado, but the tourists were not insured to have an archaeologist (Kruse) as 'weapon's bearer' as opposed to an official Oceanwide guide. To some degree, this could be circumvented by signing a disclaimer. In any case, the consequent list was simply divided into scientists and tourists, and once the archaeological team knew what the plan would be, we chose names from the list. This might happen at breakfast, with the chosen ones needing to get ready for a whole day in the field asap.

We were lucky with the weather. The inductions could occur on site. On one occasion, we could not land because of a polar bear. So those who had wanted to help us received an impromptu Pomor lecture in the zodiac with an explanation as to what would have happened on site. The field assistants on this occasion comprised social scientists and representatives of the media wanting to study us. They very much appreciated being given the insight despite the failed landing.

Reporting, archiving, and dissemination

A written account underpins all other elements of a full record by providing detailed locational information together with context, description, analysis, and interpretation not readily communicable by other means. Thus, every team member was encouraged to keep a diary of her tasks and activities to be scanned and archived after the expedition.

In fact, all information committed to paper during SEES was scanned and digitally archived. The digital archive is available on request from Kruse or from the Arctic Centre of the University of Groningen.

Following the fieldwork, the archaeological team endeavoured to produce as complete a fieldwork report as possible, using modern technology readily available and not cutting corners. Despite the production of a large number of pages, the final report will not be perfect. We hope to be setting an example for future archaeologists nonetheless. Svalbard archaeology has much to gain from better, comprehensive reporting, archiving, and dissemination.

The team welcomes the opportunity through the RiS database to disseminate our grey literature to our peers. Although some hardcopies will be printed, colour pdf copies will be sent directly to the Governor of Svalbard, to the Svalbard Museum, and to the Norwegian Directorate of Cultural Heritage. Great care will be taken to also include UNIS in a move to promote the social sciences and humanities at the university centre. Furthermore, we will distribute copies among other SEES members (scientists and tourists) and use our social network, which extends to Svalbard, to make the public aware of our products.

During and after the SEES expedition, the archaeological team has been trying to engage the media. The picture which has been painted of our project is very positive. A selection has been included in Appendix 7.

RESULTS

Dolerittneset (78° 04.8'N 20° 49.0'E)

Site narrative

The first day of fieldwork at Dolerittneset was August 21, 2015. In the morning, there was still some cloud, but there was little to no wind, the sea was calm, and very little ice floated at the anchorage out at sea. The weather improved throughout the day, and the sky was clear in the afternoon with a temperature of 14°C. Conditions were extremely favourable, and the visibility was great. The science shuttle began at 09:30, i.e. different scientific teams boarded the zodiacs and were landed at Dolerittneset, the archaeological team being among the first. The tourists followed once all scientists were on shore.



Overview of the long landing beach from the Pomor lookout at Dolerittneset. The conditions were favourable. Some walrus can be seen just below the ridge. The roofs of the three upstanding huts can also be seen at centre right. Looking N. (Photo: F. Kruse.)



Overview of the short beach from the Pomor lookout at Dolerittneset. Walruses are hauled out on the beach. The low dolerite island can be seen at the medium distance. Looking S. (Photo: F. Kruse.)



Overview of the small cove at high tide from the dolerite ridge comprising an Arctic fox den. Looking SE in the direction of Rosenbergdalen. (Photo: F. Kruse.)

Initially, Kruse, Dresscher, and Koeweiden were joined by Kim van Dam (University of Groningen), Liesbeth Noor (Netherlands Organisation for Scientific Research), and Monique de Vries (Netherlands Polar Commission). We reached the Pomor site

at 11:00 and carried out the team walkover until 11:45. At 12:00, we were also joined by Karen Mulders (University of Groningen), Miriam Vermeij (tourist), and Marcel Paul (tourist) in addition to Oceanwide guide Arjen Dorst. After setting out the grids, the extents of which were limited by the proximity to walruses at the beach as well as available time, we divided the tasks: Noor and Vermeij took soil samples in Grid I; de Vries and Paul took soil samples in Grid II; van Dam and Mulders tested the metal detector; Kruse made a photographic record of the site and the fieldwork; Dresscher and Koeweiden began to map the animal bone scatter using the dGPS.



The remains of the Pomor hut were central to the fieldwork but were excluded from any sampling and mapping. The photo shows different team members engaged in their various tasks. Looking NE. (Photo: F. Kruse.)

Lunch was from 12:30 until 13:15. During this time, we were visited by other scientists and tourists, and the film team. A tea break at 15:00 was followed by a short walk to keep warm,

even on a day like this. At 17:25, a group of tourists arrived back from a hike. This group included the sediment and pollen experts Wim Hoek, Tom van Hoef, and Keechy Akkermann. At 17:45, we observed them taking a peat core for us near the Pomor site (N 78° 04.866 E 20° 48.803). Kruse took the last photograph at the end of the fieldwork at 18:42, after which the whole team was shuttled back to the *Ortelius*.



Wim Hoek and Tom van Hoef extracting a peat core near the Pomor site. (Photo: F. Kruse.)

Seascape and approach. On arrival at Dolerittneset in the early morning, the sun stood above but behind the hills, highlighting the silhouette but making it difficult to discern details along the shore. There were no navigational marks, but the sea was so calm that the low-lying islands and any submerged obstacles could easily be seen from the zodiacs and avoided.

Accessibility and landing. Both sandy beaches (the long one beneath the Norwegian hunting hut and the short one beneath the Pomor site) were easily accessible in this weather and with the present currents, but there were walrus hauls out on both. A landing site towards the northern end of the long beach was thus chosen in order not to disturb the animals. The tide was falling. Some ice floes were stranded in the surf zone, but the zodiacs could easily avoid them.

Landscape and context of site. The landscape was very much as has been outlined in the site settings above. The backshore comprised well-rounded gravel and cobbles. An erosive edge marked the raised beach, but patchy vegetation masked any obvious change from the former beach deposits to the colluvium of the hill slope. No extra effort was made to look for it. There were signs of recent mudslides through the meltwater channels but no streams. Some patches of ground were very marshy. It could not be discerned if the few logs of driftwood that lay on and below the raised beach were recent additions (storms) or in fact as old as the raised beach. This was not further investigated. In the beach sand, day-old polar bear tracks and fresh reindeer tracks were discovered. A polar bear was, in fact, observed in Rosenbergdalen, and two or three reindeer were still roaming around Dolerittneset. Kittiwakes were resting on the ice floes in the shallows. A flock of pink-footed geese flew overhead. Other sightings included purple sandpiper, the eggs of a whelk, cotton-grass, and yellowing polar willow, but this is by no means an exhaustive list. It mostly includes species that can be recognised and photographed easily. Our site of choice was the Pomor hut and its immediate surrounds. As suggested by the site settings, this hut lay between the two dolerite ridges on a local high point, a watershed. The first impression was that there was almost no vegetation to the

south-east of this watershed while it appeared greener to the north-west. There also seemed to be more of a bone scatter to the north-west with hardly any bone to the south-east. We did investigate this further.

Identification of features and site formation processes. Along the track to the site, we passed the Norwegian hunting hut from 1904 and the two upstanding exploratory huts from the late 1960s. Sawn-off wooden posts clearly demarcated the former location of the Dutch Nissen hut erected in 1968. On site, we easily identified the previously excavated Pomor hut and the lookout. We found one of the graves (Askeladden ID 92729-29) but decided not to waste time searching for the other four. The grave lay at the foot of an edge on the dolerite outcrop and was covered by thick, green grass. Among the loose rocks of this particular outcrop was a substantial Arctic fox den. No archaeology pre-dating the Pomors is registered in Askeladden. After the Pomors, the site was frequented by Norwegian hunters and overwintering scientists. It is becoming an increasingly popular destination for tourists today. All of these groups will have influenced the site formation, i.e. by moving artefacts and ecofacts around over substantial distances, and this change is still ongoing. The fox den serves as a reminder that not all site formation processes are human-induced.

Anchor points. The four corner posts of the Pomor huts acted as our anchor points on which to base our subsequent surveys.

Identification of research-specific features. Besides the hut, there were no archaeological structures that attracted our research-specific attention. Around the Pomor hut at a radius of perhaps 100m or more, which reached all the way down to the beach and the present walrus haul-out, however, lay an unevenly distributed scatter of animal bones, and the vegetation in this area was not homogenous but patchy. We investigated these patterns further and had hoped to include the Arctic fox den in our investigation as bone was also found here. Time-permitting, we would have liked to survey the walrus kill site above the long beach on the other side of the lookout ridge.

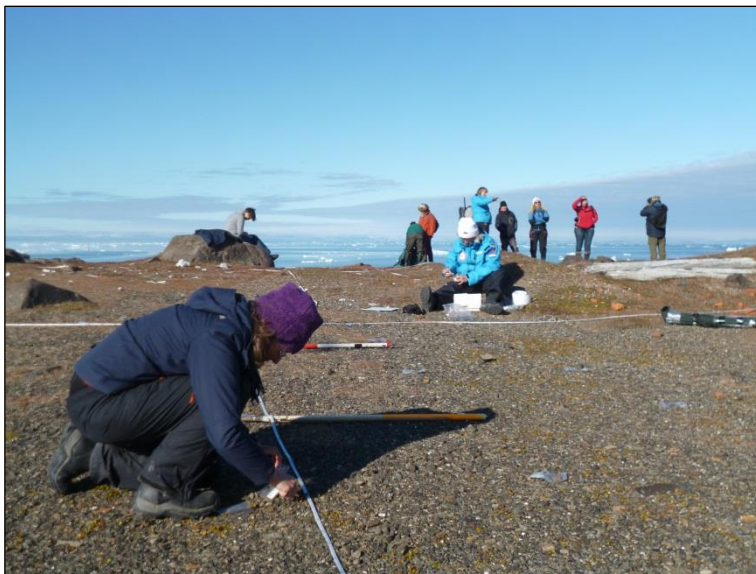
Potential areas of past activity. Our first impression gave rise to the notion of a 'front of the hut' to the north-west and a 'back of the hut' to the south-east. These notions were substantiated by a door having been found in the west wall of the hut in previous excavations. We imagined but cannot be sure without testing that past activities were probably confined to the front; we attempted to be unbiased and all-inclusive.

Survey commenced all around the hut but excluded the interior of the hut (Appendix 3). The interior had in any case been disturbed at least twice by previous excavations and soil sampling would be useless. Grid I lay to the 'front' side of the watershed and hugged the western wall. Grid II lay to the 'back' side of the watershed and hugged the eastern wall. Soil sampling progressed without great difficulty besides the fact that there was hardly any soil to speak of. Samples were taken directly at the surface, and while avoiding gravel and occasional cobbles, it was often tricky to extract even a teaspoonful. Metal detecting immediately ran into problems. Once switched on, the metal detector, which had worked under Arctic circumstances before, gave off signals uncontrollably. This instantly upset the walrus.

After testing out of earshot, it transpired that the metal-rich dolerite rendered the method futile at this location. Van Dam and Mulders consequently turned their attention to mapping the vegetation cover within the phosphate survey grids. Next, a software fault meant that the dGPS could only be used in demo mode, i.e. only a very limited number of readings could be taken, which made it useless for our purpose. Instead of being able to record the extensive bone scatter across the small headland including the Arctic fox den and then the walrus kill site on the other side of the lookout ridge, this survey was now restricted to grids I and II.

Interdisciplinarily, we firstly asked the sea mammal specialists nearby to take samples of the walrus bones on our site for later DNA analysis. Secondly, we satisfied ourselves that the reindeer bones at the surface of our site were most likely connected with Pomor activities and collected three mandibles, also for DNA analysis. Thirdly, we asked the sediment and pollen experts to take a peat core for us. It is not expected that any of the results will become available before the completion of this report. Any new findings will be reported elsewhere.

Although a second day at Dolerittneset had been planned, the tasks of the first day were completed as much as possible because there is always a chance of weather, ice, or polar bears ruling out a second landing. However, the team was able to continue at Dolerittneset on August 22, 2015, and was joined by Judith Klostermann (University of Wageningen) and Nienke Beintema (freelance journalist). As the *Ortelius* was needed elsewhere, this took the form of a drop'n'stay: the archaeological team and the vegetation team were dropped at the long beach at 09:00, and an emergency zodiac remained on shore after which the *Ortelius* left. The vegetation team would cross over the Rosenbergdalen, leaving the archaeological team with Kruse as bear watch. The team members had made packed lunches and taken plenty of spare provisions.



An extensive walkover, which included an induction for Klostermann and Beintema, lasted till 11:00. It was still calm but there were more clouds, which made it a little colder. The tide was falling, and there were again walruses on both beaches. We counted around 40, presumably males as females are said to be rare in Svalbard, of different ages (size of tusks), but none that

appeared to us extremely old. On site, the tasks were divided into continuing the soil sampling in Grid II, and Dresscher and Koeweiden completing the mapping of the animal bone. At 12:15, lunch was begun in bright sunshine, but soon low clouds or

mist moved in, reducing the visibility greatly. Lunch was cut short at 12:45 in order to move our gear closer to the Pomor hut so that the bear watch would be able to see everything on site in one glimpse. Then we went for a walk to the zodiac to make sure it was still usable in an emergency situation (not on the beach at low tide, not between the ice floes at high tide, not damaged by walruses) as well as to keep warm. The tide was coming in. At 13:30, we resumed the work, and the soil sampling in Grid II was almost done. Between 15:00 and 17:00, we had another break which could be held in the hut from 1904 as the walruses had unhurriedly vacated the beach in front of it; another walk to the zodiac to keep warm and safe.



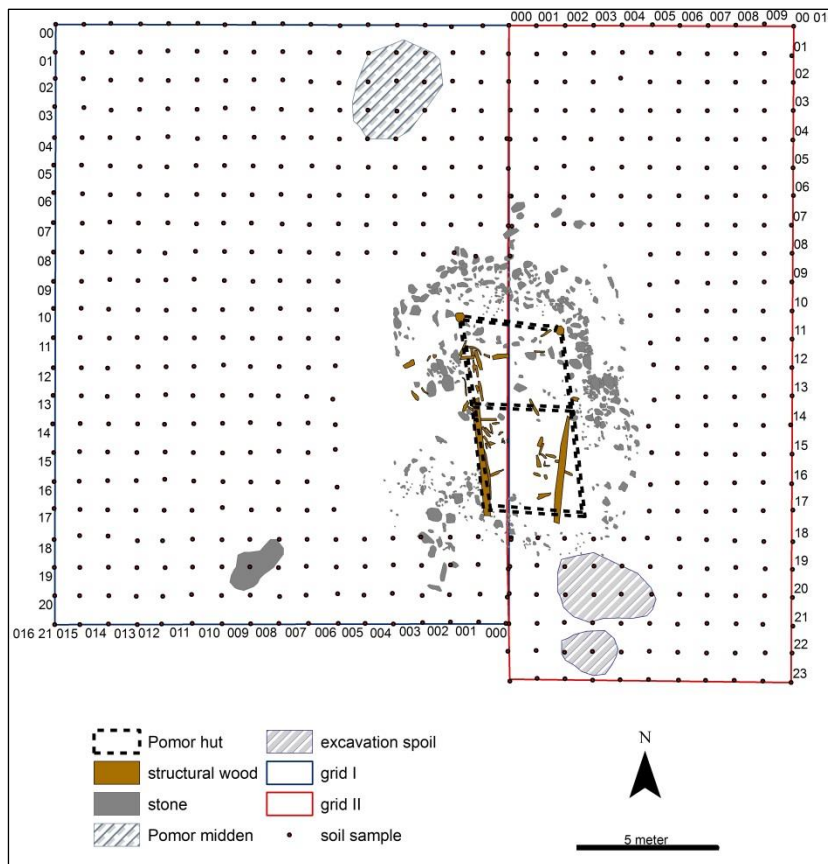
By 18:30, soil sampling in Grid I and the mapping of the animal bone scatter had also been completed. There was now some real concern over a thick belt of drift ice that was probably travelling on the current from Diskobukta. There was a chance that this ice could block off Dolerittneset, but our attempt to reach the *Ortelius* via radio or satellite phone was unsuccessful. The team went

on an extended walk until about 20:00 during which the walrus kill site was inspected with future fieldwork in mind. Surprisingly few artefacts and ecofacts to fill the archaeological landscape were found.



To stay warm and dry, as a light drizzle had set in, we entered one of the exploratory huts and ignited a fire in the stove. The vegetation team returned to Dolerittneset at 21:20. The *Ortelius* eventually picked us up at 22:45.

a) Phosphate survey



As evident in the figure, a larger copy of which is available in Appendix 3, the focal point of the phosphate survey at Dolerittneset were the remains of the Pomor hut(s). The remains themselves, which had been excavated twice and were irreversibly disturbed, were not included in the soil sampling.

The decision to sample in two grids, Grid I and Grid II, around the Pomor hut was of a practical nature: two teams of two people could carry out

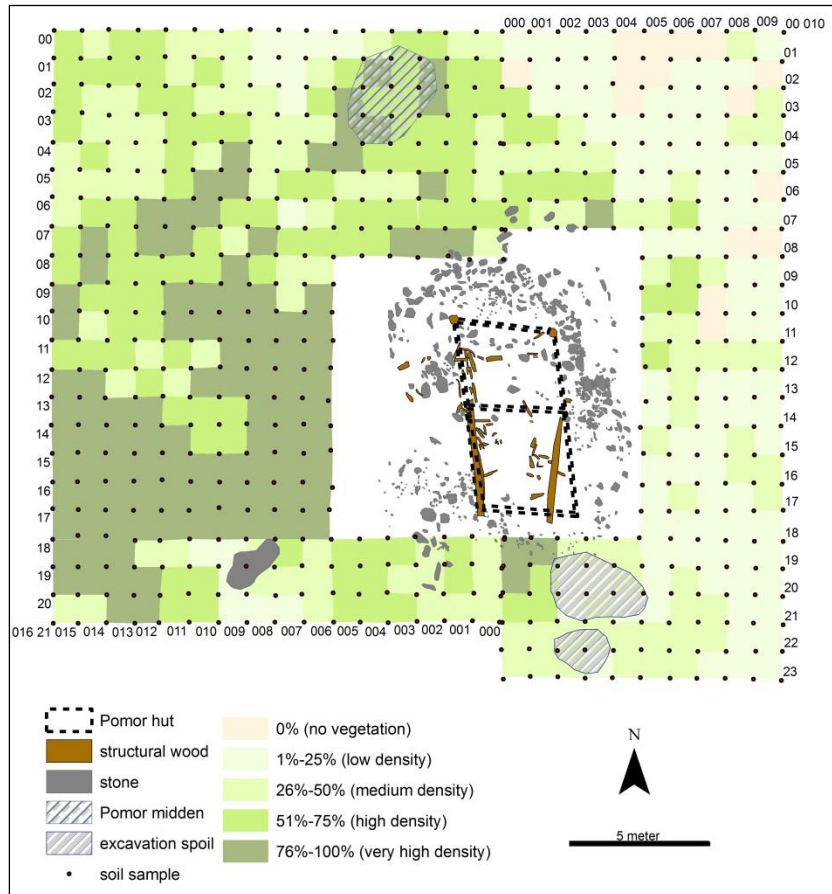
the work without getting in each other's way, thereby preventing a confusion of the sample locations or the labelling. The figure shows the arrangement of the grids, which were positioned in such a way as to be able to maximise any evidence in a single day of fieldwork while at the same time being able to extend them on a possible second day or more. Due to an unfortunate supervision error, a 2m by 10m strip of ground immediately to the west of the hut has also been excluded from sampling as well as the vegetation survey (see below).

The western extent was limited due to the presence of walruses on the beach. If we had come any closer and into full view of them, we probably would have disturbed them. The northern extent was chosen in order to include the midden and most of the animal bone surface scatter. The extent to the east and south were somewhat phenomenologically 'defined'. There did not seem to be 'anything happening' to the east – which made it intriguing for the phosphate and vegetation survey but not a priority. Slight changes in the topography to the south implied that 'one simply did not go there'. We made sure, however, that we included the spoil heaps of the 1968 excavation, which are of course disturbed but may yet provide interesting phosphate signatures in need of interpretation. This area was not a priority either, but time-permitting, it could be expanded.

For the observation and the interpretation of the vegetation and bone surveys, the grids are simply treated and described as on large one, measuring 26m W-E and a maximum of 23m N-S (with the unfortunate exclusion of said 2m by 10m strip).

At the time of writing, funding for the soil sample analysis had been secured from the Svalbard Environmental Protection Fund (project no. 15/73). The results and interpretation of the phosphate survey will be reported elsewhere.

b) Vegetation cover



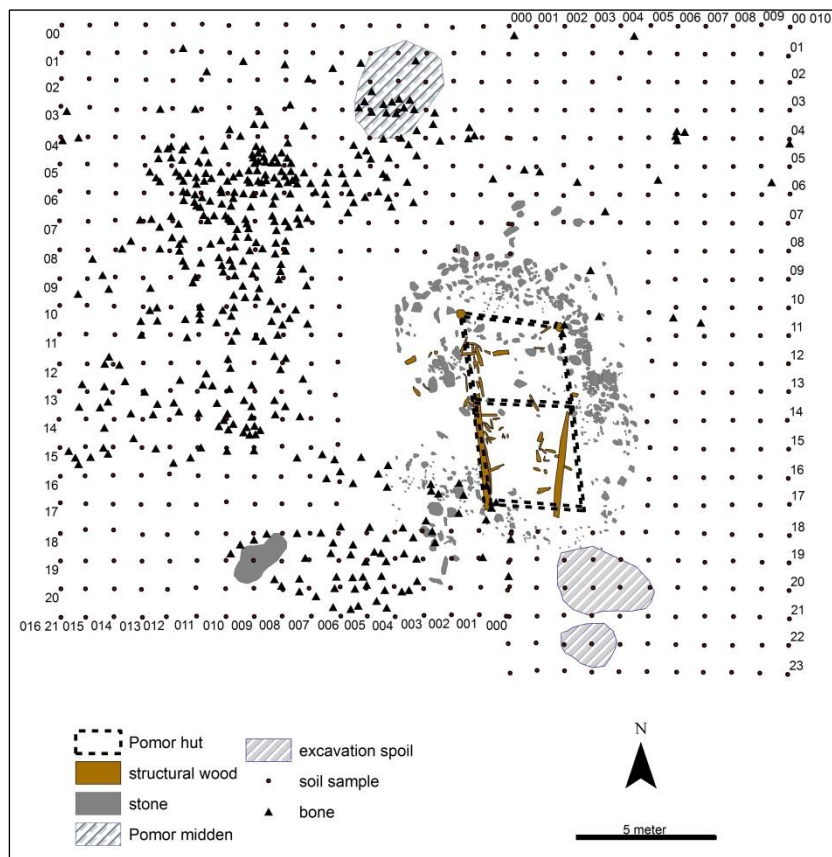
This figure shows the results of the visual survey of the vegetation cover. A larger copy is included in Appendix 3. As mentioned above, a supervision error led to an important 2m by 10m strip of ground immediately to the west of the hut being excluded from the vegetation survey. Looking at the figure, in fact, the remains of the Pomor hut should probably have been included fully, visual vegetation survey being a non-destructive method and site formation processes since the last

excavation in 1994 playing an significant role and needing to be interpreted.

Regarding the figure in its own right, i.e. without any knowledge of topography and out of the context of the wider surrounds of the hut (an exercise reserved for the site interpretation of the survey below), the basic visual pattern that emerges appears to be a general increase in vegetation cover from the top right (NE) to the bottom left (SW). The 'dividing line' seems to coincide with the eastern wall of the Pomor hut and the imaginary extension therefore to the north and south. Of the features included in the graphic, the midden may have given rise to an increased vegetation signature; there is a 75% - 100% vegetation cover on the north side of the large rock but much less on the south side; and the excavation spoil does not seem to have influenced the vegetation cover greatly although the very high density immediately to its NW may need to be explained.

Beyond vegetation cover, the archaeological team and their assistants lacked the expertise to take plant species into consideration. They made no record of biodiversity and the possibility of newly-introduced species. No vegetation samples were taken.

c) Animal bone surface scatter



This figure shows the results of the visual survey of animal bones at the surface around the Pomor hut. A larger copy is included in Appendix 3. As mentioned above, a supervision error led to the 2m by 10m strip of ground to the west of the hut being excluded from the phosphate and vegetation surveys. In the case of animal bone, however, Drescher has included said strip as well as the previously excavated remains of the hut. During the 1994

excavation, a collection of bone material took place. Unfortunately, it was not explicitly stated and is therefore not known how systematic and complete this collection was, whether it included surface materials, and whether it extended to the surface in the vicinity of the hut.

The basic visual pattern that emerges appears to be that the animal bone surface scatter is largely confined to the west of the Pomor hut. The 'dividing line' roughly coincides with the west wall of the Pomor hut and an imaginary extension to the north and south. The largest concentration of bone is to the NW and W of the hut. It does not, however, coincide with the midden, on which only few bones were recorded. This concentration decreases towards the W, SW, and S. A second, smaller surface scatter can be seen between the SW corner of the hut and the large rock. It does not extend to the west side of the rock. There were no animal bones associated with the excavation spoil.

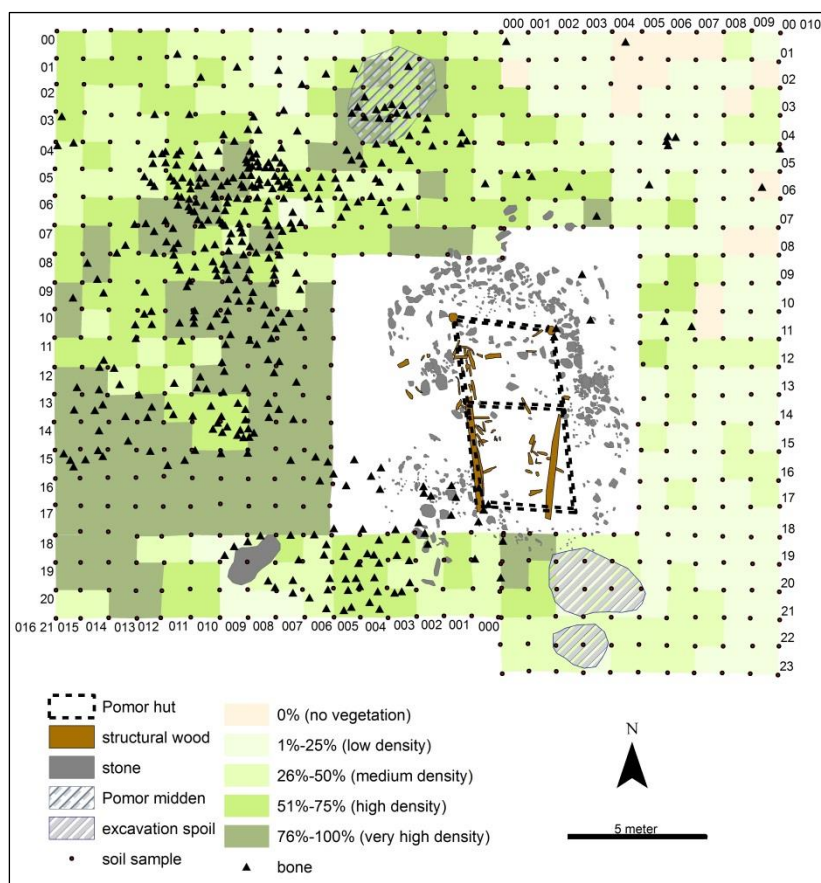
Beyond animal bone surface scatter, the archaeological team and their assistants lacked the necessary specialism to fully record the represented animal species. They were, however, able to discern large indicative reindeer bones such as antler, mandibles, hips, and limb bones (commonly worked or crushed) as well as walrus skulls, mandibles, hips, and limbs. Based on their very basic classification, the team assumes that most bones around the Pomor hut belonged to reindeer but this will need to be proven still. The number of likely walrus bones increased towards the

beach and the present walrus haul-out, but the area was outside the scope of this survey. Suffice to say that there was no kill site as such.

From experience, the archaeological team knew not to ignore the possibility of human bone at Pomor huts (see the excavation at Kokerineset) but no human bones were immediately obvious.

Three halves of reindeer mandibles were taken from the site: the archaeological team was confident that these surface finds could be associated with past Pomor activities and that they were suitable for interdisciplinary DNA analysis. The sea mammal specialists were asked to take samples of walrus bones which the team was also confident were linked with the Pomors. At the time of writing, Kruse had not seen a list of samples secured for subsequent interdisciplinary DNA analysis.

d) Overlay vegetation and animal bone



The figure shows what happens when the results of the vegetation survey are overlain with the results of the animal bone survey. A larger copy is included in Appendix 3.

If there is any pattern to speak of, it is that both high to very high vegetation cover and the highest concentration of bone are found to the west of the hut. There does not seem to be, however, an obvious correlation between the vegetation and the presence of bone, especially not

when looking at the large rock and the distribution of both around it.

This matter will be addressed again in the site interpretation below. While the analysis of the soil samples and the interpretation of the phosphate survey are outstanding, any conclusions from the visual surveys are necessarily preliminary.

Site interpretation

The fieldwork at Dolerittneset (walkover, visual survey, phosphate survey) was undertaken to generate results that would in turn inform the two guiding questions of this research. Adjusted to this particular site, these were: a) to what extent did the

Arctic landscape dictate the location of the Pomor hut at Dolerittneset, and b) what was the lasting impact of the Pomor activities at Dolerittneset?

a) To what extent did the Arctic landscape dictate the location of the Pomor hut at Dolerittneset?

The first and most important thing to notice about Dolerittneset is that since the time of the Pomors, there has been a significant change in relative sea level. Although the archaeological team did not measure this change in absolute terms, it was discernible in raised beaches, the elevated position of the walrus kill site, the escarpments caused by current erosion, and vegetation patterns.

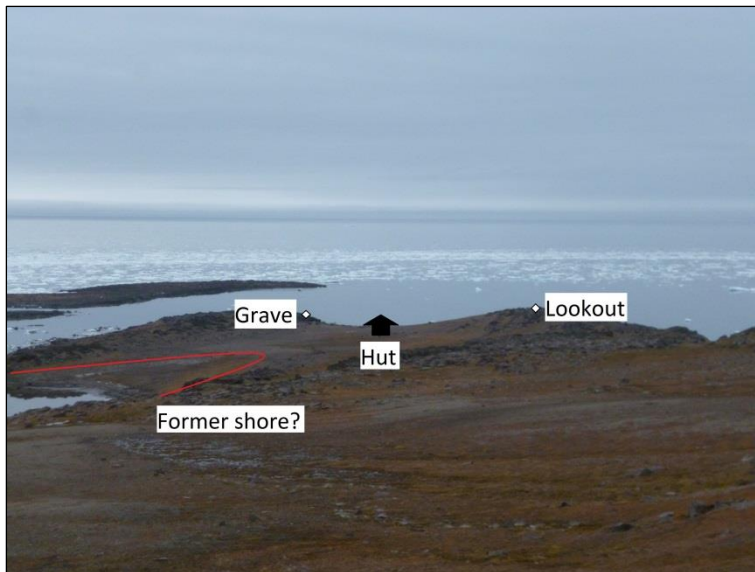


It is very likely that the long beach looked very different in the Pomor past. The gently sloping shore line may have been much further inland, leaving little room for safe construction. The location of the presently up-standing buildings may in fact have been prone to flooding. It may even have been submerged. In this case, the Pomors would certainly not have built here, but the

former landscape is subject to future investigation.



It is also likely that the short beach looked different but due to its steeper gradients, probably not as much. Even at higher relative sea level, it would still have been a good landing beach with few submerged obstacles in the direct approach.



At a higher relative sea level, the small bay to the centre left of this picture may have been much more accessible at high as well as low tide, too. Interestingly, a peat core was taken in this area during the SEES expedition, which may shed additional light on this question of relative sea level.

It appears that the location at which the Pomor hut was built was not only a local high point at a time when relative sea level would have been much higher and room for construction was limited. There also existed at least some ground, as opposed to just bare rocks, in which to bury the corner posts of the hut. That the dead could also be buried in this ground was most likely an afterthought.

Besides the consideration of relative sea level, the archaeological team also asked the question how exposed the hut would have been? What was the predominant wind direction and did it matter? Would there have been a problem with snow and ice? With the walrus kill site being so near, did the Pomors suffer the smell of the rotting carcasses? Or did they tolerate it because the food source attracted polar bears and Arctic foxes which they could hunt? Where would the nearest fresh water source have been in summer as well as in winter?

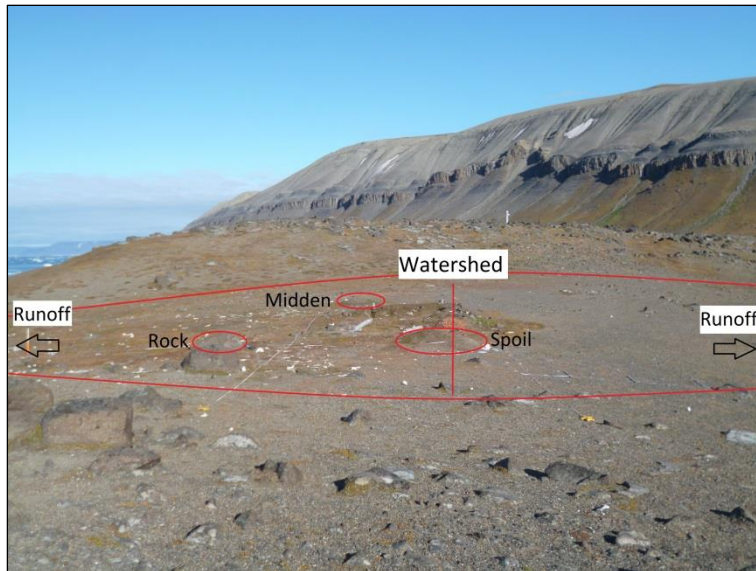
Despite the many questions regarded, and taking the availability of living resources (walrus, reindeer) in the region as the underlying driver, the relative sea level appears to have dominated the Pomors' choice of housing site. Time has proven it to have been a good one: after several centuries, and although the hut itself has long gone, the corner posts remain solidly in the ground, and the site is not threatened by coastal erosion.

b) What was the lasting impact of the Pomor activities at Dolerittneset?

It is not difficult to imagine what some of the Pomor activities around their hut may have been: building, maintaining, and repairing; processing of game animals either for commerce or subsistence; personal care. Yet it is much more difficult to prove them. The archaeological team therefore set out to use phosphate survey to pick up heightened concentrations potentially caused by animal remains, food waste, or excrement. We wanted to substantiate any patterns with the use of a metal detector, but the method failed for the reasons mentioned above. Furthermore, we think that animal processing may be evident in animal bone surface scatters. Processing and

bone scatter may in turn have leached nutrients in the soil that might have influenced the overall vegetation pattern.

The outcomes of the visual surveys – vegetation cover and animal bone surface scatter – have been described above. It was said that the emerging patterns must be seen not only within the 26m by 23m grid, but also in the context of the larger area around the Pomor hut. It is also important to come back to the site formation processes since the Pomors.



Topographically speaking, the Pomor hut lay between two rocky ridges. It is possible that especially the ridge to the north provided some shelter from storms. It had also acted as a lookout point. The hut was on locally high ground, which acted as a watershed. To the west of the hut, all precipitation and melt water would run off to the west towards the short beach. To the east of the hut,

any water would run off to the east towards the small bay. This probably meant that the ground around the hut was usually quite dry. But how did this runoff affect the soil formation and the vegetation? The team also wondered if instead of being a sheltered site, the location between the ridges acted as a wind tunnel and how that would affect soil and plants.

Regarding the current vegetation pattern, the relative richness to the west of the hut and the lack of it to the east, the team discussed that runoff and the availability of water to the plants was probably not a cause. The runoff seemed to be equal to both sides and would not discriminate. If there was a predominant wind from the east, however, what little soil there was to the east of the watershed may be blown around and plant seeds may find it difficult to take root. The effect of wind on the west side of the watershed may be slightly less but significantly so to allow for vegetation growth here. We also considered the effect of sun, especially from the south, but both sides of the watershed received an equal amount of southern light and warmth. If trampling dating from the time of the Pomors may have been a factor, then one wonders why it has had its greatest effect on the side with the least evidence for activity. Subsequent localised trampling by hunters, scientists, and tourists also seemed unlikely. There had been two excavations, but there were no signs that the east side of the watershed was more heavily impacted, e.g. by trampling, the storage of equipment, camping, or the extensive scatter of spoil, than the west side. In fact, there was little reason to believe that direct human activity either in the past or at present had brought about the differences in vegetation cover.

Furthermore, during SEES, a vegetation team was busy in Rosenbergdalen. One of the expedition's most important findings was how dramatically the vegetation in that valley had changed in the last 40 years (Maarten Loonen, pers. comm.). There were instances where areas of formerly rich vegetation were now barren and vice versa. If vegetation could shift, probably under gravity, so swiftly in a few decades, what could the archaeological team say about the vegetation at Dolerittneset over the course of a few centuries without intrusive methods?!

Regarding the animal bone, runoff, wind, and sun probably had nothing to do with the current surface scatter. Gravity was briefly considered, but the slopes were not thought to be steep enough to be a significant contributing factor. The archaeological team concluded that the pattern was primarily the result of human action. The Pomors had killed reindeer, had brought at least some of the animals or some parts of the animals to site, and had processed them in front of the hut, in front of the front door. How would that have been done? Did a Pomor always sit (or stand?) in the same processing position, what tools and aids did he, or she, use? Did they discard butchered and cracked bone behind them or all around them? Or were they neatly placed on the midden on site? If the bones were not put on the midden, why was there a midden at all and what did it comprise? For phenomenological reasons, the archaeological team was tempted to put a Pomor on a small bench about 7m to the NW of the door, facing S, throwing any unwanted bones over the shoulder to the back. Similarly, we can envisage a Pomor using the rock to the SW of the hut as a seat or an aid, discarding bones to the E. We are not, however, suggesting that this work was only ever done outside; if done inside, any leftovers may indeed have been tipped out on the midden. It would be interesting to consider a cultural approach to waste, which in this case probably attracted Arctic foxes and scavenging birds. While the Pomors would have created the original bone scatter, scavengers would have affected it greatly. For this reason, it would have been interesting to record the fox den nearby and map the 'natural' bone scatter. Subsequently, other human visitors to the site would have trampled the already cracked bones and selectively (re)moved any number, for phenomenological and sentimental reasons, especially skulls and mandibles. For this reason, it would have been informative to highlight the skulls in a detailed bone scatter map.

To explain the lack of a strong correlation between the vegetation pattern and the animal bone surface scatter, the team considered that the very high vegetation density to the west of the Pomor hut may yet have been caused by the butchering of animals and through body fluids sinking into the thin soil; the phosphate analysis may yet highlight increased nutrients here. The additional processing of the bones, however, may have taken place slightly to one side, slightly to the north. Either not enough nutrients have leached from the bones into the soil to impact on the vegetation, or (less likely) all the bones have continually been moved around over time as to not give the same strong 'ecological' signatures so well-known from old whale bones. The team thought that the midden should have greater vegetation cover than it did; a fact worth investigation.

Thus, the lasting impact of the Pomors at Dolerittneset was to create a rich archaeological site including not only the hut, lookout, and graves, but also valuable and informative ecofacts worthy of future investigation. The ecofacts, i.e. the animal bone surface scatter around the hut hinted primarily at the hunt of reindeer for subsistence but closer to the beach were walrus bones including indicative chopped skulls suggesting the commercial hunt at Dolerittneset as well.



Due to problems with the dGPS, the large walrus kill site above the long beach lay suddenly outside the scope of the investigation. A detailed landscape and ecofacts survey is likely to give a deeper insight into Pomor activities here. It is imagined that a killing of this size only took place only once, right at the beginning of the use of the site; dating the bones should therefore

generate the date of Pomor arrival. This could be substantiated by a charcoal sample from the oven in the hut, if one was at all taken during the excavations. The site certainly lends itself to cutting-edge landscape archaeology and archaeological dating.

Kraussbukta (77° 30'N 20°30'E)

Site narrative

After Dolerittneset, the SEES expedition visited Heimland at Frankenhavøya in the north of Barentsøya on August 23, 2015 (full expedition log in Appendix 1). For August 24, 2015, the original plan was to drop the archaeologists at Barkhamodden on Barentsøya, but the place could not be reached by zodiac due to ice. Instead, the expedition landed at Würzburgerhytte on Barentsøya. As no Pomor archaeology was known at either location, the team undertook no fieldwork on those days. At Würzburgerhytte, Kruse acted as the bear watch for the palaeolimnology group. On her way south, the *Ortelius* also bypassed Diskobukta, which was blocked by ice.

On August 25, 2015, the *Ortelius* arrived at Kraussbukta on Edgeøya, where the archaeological team intended to investigate the remains of a single Pomor hut and its immediate surroundings. From the moving ship, it was very difficult to see if a white speck on the beach was a sleeping polar bear or not. A zodiac was dispatched, on which Kruse was also found a place. There was in fact no polar bear, but it became obvious that much ice was caught up in the surf zone all along the beach and that landing at this location was presently impossible. It was decided to search

for a landing site in Habenichtbukta. At about 10:00, a site at the mouth of the long bay was chosen in order to avoid the extra 1.6-km shuttle to the beach and back. That meant that the archaeological team had to take themselves and their equipment, all calculated to be light and portable, 1.8 km across land, occasionally marshy, to the Pomor site in Kraussbukta.

The team consisted of Kruse, Koeweiden, Stientje van Veldhoven (Dutch politician and parliamentarian), and Hilde de Laat (minor student in Science Communication, Leiden University). Oceanwide guide Ronald Visser acted as bear watch. Because this was another drop'n'stay but in this case without the luxury of upstanding huts on site, the team had taken enough provisions for the long day in the field as well as a tent and a sleeping bag for emergencies.

The weather in the morning was overcast with a thick mist on low-lying land, which was penetrated by the mountains. There was no wind, and the sea was very calm. The sun broke through the clouds only around 17:45, after which it felt a few degrees warmer.



Seascape and approach.

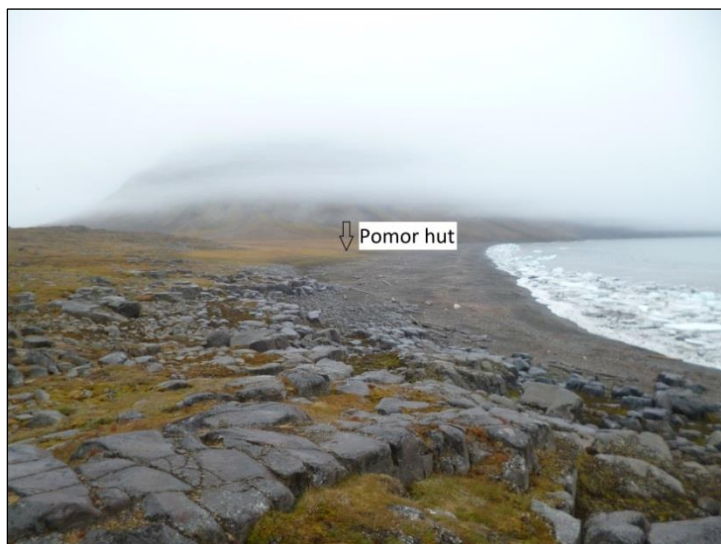
Årdalsnuten was a clear feature from the sea as it stuck out above the mist; the dolerite outcrop that juts into the sea was visible in the calm water but may have been less so at other times. No nautical marks existed, but if a zodiac aimed for the point where the slopes of Årdalsnuten met the low-lying tundra or even kept a little to the north of it, the Pomor site

would surely be found. The approach was literally straightforward, no islands or other obstacles barring the way.

Accessibility and landing. In the site settings above, there was mention of a current along the shore, and it was probably this that the present ice had been caught up in. This made the accessibility temporarily terrible and the landing impossible. Without the ice, a strong surf may yet have been a problem, but this assumption could not be tested. The foreshore itself was sandy and even. It showed no obstacles. The stream had not formed an obvious delta, the shallow waters of which are normally to be avoided.

Track to site. The landing at the rocky edge of Habenichtbukta (not at the beach where all the archaeological remains are) and the track to the site in Kraussbukta provided the team with a welcome chance to study the historical-ecological and archaeological landscape. A first whale bone (possibly a vertebra) was already logged with a handheld GPS not far inland from the landing site (10:57).

We passed the former trappers' hut and modern beacon at Svarttangen (11:23). We photo-documented the hut and noted which features may warrant additional survey if we had the time on the return. There was a thick vegetation around the derelict hut, and barely any animal bones could be made out. The team did not come back to work at this location. Along the way, the team logged more whale bones, trap-door fox traps, post settings, and possible stone cairns. The function of some small wooden structures (or are they in fact artefacts?!) escaped us, but they may previously have been fox traps.



Landscape and context of site.

Due to the thorough site settings above, the landscape encountered in Kraussbukta (12:28) bore few surprises. The beach, the dolerite out-crops, the stream, the tundra, Årdalsnuten were all accounted for. The walkover showed the Pomor hut to lie on high ground at the point where the stream channel meets the backshore. There was a substantial amount

of driftwood on the backshore. It presumably had not been harvested in a while, and there were in any case no sites around now that would benefit from the harvest. The team climbed the dolerite outcrop a little inland from the hut. The features of note here were a rectangular stone setting, possibly a tent ring; fox traps of which not all were logged; some animal bones including a couple of walrus skulls. There were a number of loose boulders which will have served a purpose at some time, but it could no longer be ascertained if as trap weights, tent rings, lookout walls, shooting butts – or all of the above.



Identification of features and site formation processes.

The Pomor hut was easily recognisable by the four corner posts, the central post, and the scatter of stone and red brick. What did surprise, however, was that the whale bones mentioned by Chochorowski and Jasinki (1990) lay so close to the hut and were so prominent that we felt they should have been included in

their site drawing. We rectified this. Furthermore, there was a small stone setting of unknown purpose very nearby, between the hut and the stream channel, and probably contemporaneous. This was photographed but not investigated further. In addition to the hut, a walrus bone scatter was noted at the northern most end of the beach. This kill site is not registered in Askeladden nor does it find mention in the sources we consulted. No other archaeology is known at this location nor within several kilometres of it. Yet the fox traps prove that hunting and trapping continued all over the area after the Pomors had left. The hunters and other visitors as suggested by the tent ring and a set of very recent footprints may have interfered with the Pomor site. For starters, the building materials of the hut are practically gone, maybe salvaged, and the walrus skulls on top of the dolerite outcrop were taken up there, thereby changing the animal bone assemblages and distribution. The possible erosion on the seaward side of the hut finds mention below.

Anchor points. The four corner posts of the Pomor hut acted as our anchor points on which to base our subsequent surveys.

Identification of research-specific features. The hut and its immediate surroundings as well as the little known walrus kill site attracted our research-specific attention. In view of the thick vegetation, the lack of animal bone, and there not having been any previous excavation or coring, it was difficult to judge the depth at which soil sampling had to take place to produce meaningful results.

Potential areas of past activity. There was nothing to suggest where the door may have been, which may have hinted at activity locations around the hut. If the layout mirrored that at Dolerittneset, the door would have been in the west wall, thus pointing out to sea. If activities had taken place at this 'front of hut', it is possible that ongoing erosion may have affected it if not destroyed it. The backshore and the vegetation line currently do not seem to be highly energetic places, but this will have been different in the past. The site was in any case sloping notably towards the beach, and gravity and runoff were probably omnipresent. Soil sampling did quite naturally stop where the slope was assuming too much of an angle.

While on site, the team did not keep a detailed log of animals encountered. Among the special sights, however, were a pod of four or five belugas which swam past the site in the early evening, three or four reindeer including a calf which grazed in the vicinity of the site all day, some barnacle geese, and a pair of red throated divers with a single chick on the nearby lake. The birds were very vigilant and alarmed by our presence when we observed them from the top of the dolerite outcrop. Kruse took a last photograph at the pick-up point in Habenichtbukta at 22:09h. The team was back on board of the *Ortelius* within the hour.

a) The archaeological landscape

Ideally, an archaeological landscape should be surveyed systematically, but this was not possible under the time constraints of the SEES expedition. Necessity dictated that the archaeological team should walk from the landing site in Habenichtbukta to

the Pomor hut in Kraussbukta. They took the opportunity to record any features of historical-ecological and archaeological interest along the way.



The interim map indicates the team's approximate track. It firstly led from the landing site on the rocky southern shore of Habenichtbukta across a river to the ruin of a hunting hut at Svarttangen, a distance of ca. 500m. In reality, the river took the form of very wet tundra, which was unpleasant to cross on foot, but not impossible at this time of year. The only feature of interest recorded along this stretch was a whale skull just inland from Habenichtbukta. The former hunting hut and the modern beacon were photo-recorded. The team observed a fuel depot in the shape of maybe a dozen barrels or so, but they made no record of this.

The next stretch led from Svarttangen along the shore via the coastal dolerite outcrop to the Pomor hut, a distance of ca. 1.5km. The team had imagined the easiest way would be along the water's edge, but the rocky foreshore here was made of loose rocks difficult to walk on, so that they opted for a route just inland of the rocks and across the tundra, even if this was occasionally wet. They walked from high point to high point, not only to keep dry but also because they expected features of interest here. The list below shows that a whale mandible, two possible waymarkers, and as many as six fox traps were recorded. In the northern corner of the beach in Kraussbukta, the team encountered a walrus kill site.

The archaeological features in the vicinity of the Pomor hut, represented by five wooden posts and a stone-and-brick scatter, were the whale bones previously unmapped by Chochorowski and Jasinski (1993), a small pile of cobbles of unknown function (the team thought the pile too small for a cross foundation or an effective waymarker), a rectangular tent ring beneath the dolerite outcrop next to which a fox trap was found, and at least two fox traps on the outcrop itself. Admittedly, the team did not do a good job mapping the archaeological landscape around the hut itself, and so there may have been more fox traps on the outcrop as well as the walrus bones and reindeer antlers which had been carried up there.

From the Pomor hut, the team undertook a walk along the beach, a distance of ca. 700m. The backshore comprised much driftwood. This can be seen throughout the photographic record, but it was not recorded in any detail. No samples were taken. The backshore also comprised an amount of beach litter, mainly plastic. This was recorded by photography and handheld GPS for an archaeological colleague

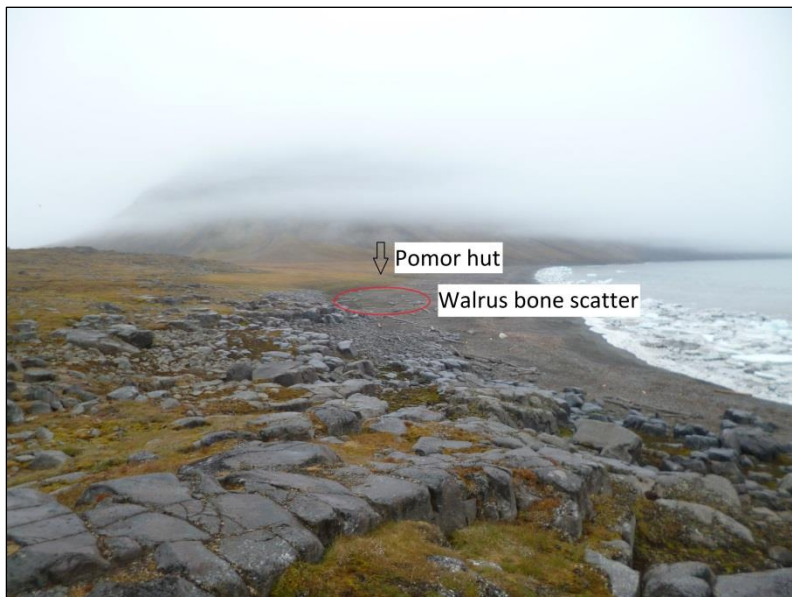
interested in ocean currents and the build-up of resources on beaches, modern litter being a proxy.

Description	Interpretation	Photo	Northing	Easting	Height AOD
<i>Landing site in Habenichtbukta</i>					
whale bone	whale vertebra	P1080951	77°31'55.7"	020°49'28.5"	3m
<i>Svarttangen</i>					
whale bone	whale mandible	P1080969	77°31'41.4"	020°49'28.5"	3m
round boulders, wooden stake	waymarker	P1080971	77°31.626'	020°49.716'	4m
angular boulders, wooden stake	waymarker	P1080974	77°31'34.4"	020°50'19.4"	3m
angular boulders, small broken pieces of wood	fox trap	P1080976			
angular boulders, wooden stakes, trapdoor trap (small antler)	2 fox traps	P1080978	77°31.361'	020°50.983'	9m
2 wooden posts, 2 wooden slats, three large boulders	fox trap?	P1080980	77°31.333'	020°51.179'	10m
3 wooden posts, large boulders	fox trap?	P1080985			
trapdoor trap, no boulders	fox trap	P1080986	77°31.288'	020°51.469'	6m
walrus bone scatter	walrus kill site	P1080989			
<i>Pomor hut and surrounds</i>					
4 whale bones, 1 wooden log, all worked	construction material, incl. 3 whale mandibles and a poss. Vertebra	P1090141			
pile of sunken cobbles near Pomor hut	unknown	P1090005			
rectangular stone setting	tent ring	P1080990			
trapdoor trap, no boulders	fox trap	P1080990			
2 piles of angular boulders, broken piece of wood	2 fox traps	P1090131	77°31.300'	020°1.809'	22m
<i>Along the shore in Kraussbukta</i>					
subangular sunken boulders	fox trap?	P1090099	77°31.008'	020°52.222'	9m
3 rounded boulders	fox trap?	P1090101	77°31.021'	020°52.172'	8m
whale bone	whale skull	P1090104			
wooden construction	unknown	P1090105			
4 rounded boulders	fox trap?	P1090108			
3 rounded boulders, broken piece of wood	fox trap?	P1090110	77°31.146'	020°51.871'	na
<i>On the return</i>					
angular boulders, trapdoor trap	fox trap	P1090163	77°31.405'	020°51.137'	14m

While the way south led along the beach, the way back followed the eroding ridge of the raised beach. Here, the team recorded four possible fox traps marked only by rounded boulders, a whale skull, and a wooden construction of unknown function. The latter lay some distance from the beach on the tundra, probably wasn't very old, and may have had a hunting or scientific purpose, but the complete lack of associated features made this difficult to judge.

On the return trip to Habenichtbukta, the team logged an additional fox trap, which they had missed on the way to Kraussbukta. It was in all likelihood far from being the only feature they missed during their linear track covering 5.4km in total. As said above, a systematic survey would provide the most complete information about the human landscape.

b) Walrus bone surface scatter



In the northern corner of the beach in Kraussbukta, the team found and recorded a walrus bone scatter. (Photo: Frigga Kruse 2015.)



The assemblage was indeed very scattered. Unlike at Dolerittneset, where humans are thought to have been the main factor in site formation, it is likely that storms, that is to say wave action, may have reworked the site in Kraussbukta. (Photo: Frigga Kruse 2015.)



The team counted 21 walrus skulls, two of which lay below the Pomor hut. There were one or two skulls on the dolerite outcrop to the NE of the hut. These are thought to have been brought up there by visiting people.

This aerial photograph, probably taken in late summer or early autumn, shows very well

that wind keeps the dolerite outcrop and other local highpoints free from snow. These are good spots for fox traps. (Photo: Google; Map: Marthe Koeweiden.)



Some walrus skulls showed signs of the animals having been killed by a blow or a stab to the head. (Photo: Ronald Visser 2015.)



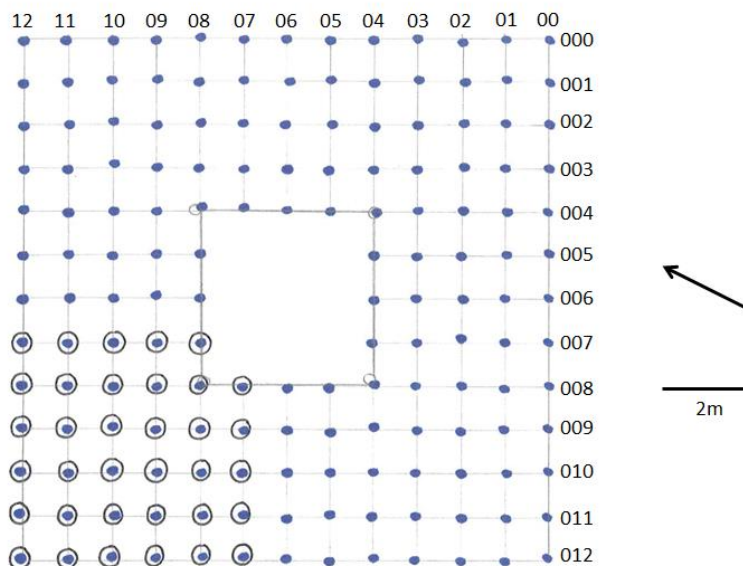
The front of the skull had been hacked off to remove the tusks. (Photo: Ronald Visser 2015.) Mandibles were found without teeth. It is not known if these had been taken by the hunters or if they had simply fallen out over time.

c) Phosphate survey



Soil sampling for later phosphate analysis was carried out around (but not in) the remains of the Pomor hut in Kraussbukta. In light of there not having been previous excavations or coring, it was difficult to establish from which depth soil samples should be taken. Koe-weiden and van Velt-hoven therefore tested this in a small trial

excavation just outside the survey grid. The trial was unsuccessful. Uniform dark brown organic-rich soil was encountered to a depth exceeding 10cm. The team decided not to dig any deeper.



Grid III (see Appendix 4) measured 12m by 12m. It was positioned so that the Pomor hut lay in its centre, also the centre of this sketch, and the interior of the hut was excluded from sampling. The whale bones lay to the west of the hut (not shown).

Without any obvious change in strata, soil samples were taken at a depth of 5cm through the entire grid.

In the vicinity of the whale bones, samples were taken at both a depth of 5cm as well as a depth of 10cm.



If 5cm turned out to be the wrong depth to sample at and no indication of Pomor activities around the hut could be discerned, the team wanted to at least test the effect of the whale bones, that is to say the leaching of nutrient, on the tundra. Hence, sampling took place at 5cm as well as 10cm.



The whale bones comprised three mandibles and what seemed to be a vertebra. In addition, there was a single wooden log. The mandibles and the wooden log showed clear signs of working, why they were thought to have been used in the construction of the Pomor hut.

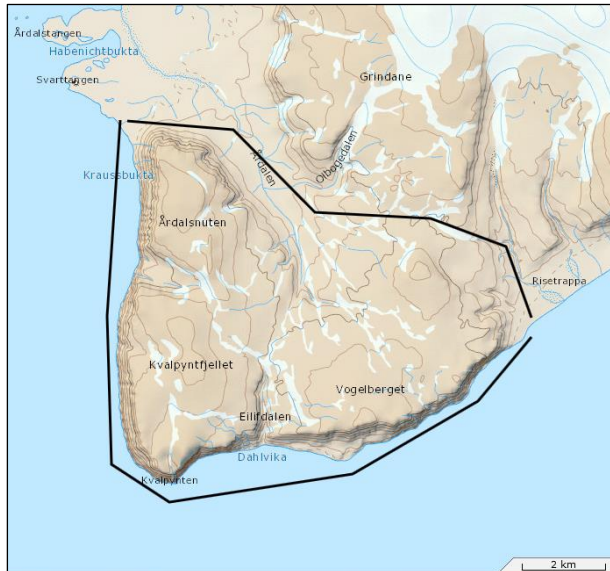
Site interpretation

The fieldwork at Kraussbukta (visual survey, phosphate survey) was undertaken to generate results that would in turn inform the two guiding questions of this research. Adjusted to this particular site, these were a) to what extent did the Arctic landscape dictate the location of the Pomor hut in Kraussbukta, and b) what was the lasting impact of the Pomor activities in Kraussbukta?

a) *To what extent did the Arctic landscape dictate the location of the Pomor hut in Kraussbukta?*

The distance between the single Pomor hut in Kraussbukta and the large Pomor site in Habenichtbukta are about 3km by land and also 3km by sea. Assuming that the

sites were contemporaneous and that there was contact between them, one has to wonder what Kraussbukta had to offer which Habenichtbukta could not provide. This question of what Kraussbukta had to offer would of course also be relevant if the site at Habenichtbukta did not exist.



Kraussbukta forms the most southerly landing beach for that part of Edgeøya before one would have to either round Kvalpynten, a boat journey of about 20km, or walk up into Årdalen and find a pass, a trip of 12km, before arriving in Keilhaubukta. There was, in fact, a Norwegian trappers' hut at the first possible habitation site at the southern end of Keilhaubukta, but this has since been or is still in the process of being washed into the sea (Reymert and Moen 2015). Under favourable conditions, the one-way journey may

probably be completed in a day, but any onward journey let alone the return trip would have to be planned over two or more days. The severity of the topography may be one reason for building a stopover at Kraussbukta.

Archaeologically speaking, the Pomors benefitted from whale bones and driftwood in Kraussbukta, from which they built their hut. There were also walruses, which they hunted. Whether the walrus kill site represents a single event or whether the walruses returned to this location after the first slaughter is not known. The length of time over which walruses could be found here may have dictated the length of time the Pomor hut was in use, but not necessarily. The Pomors further made use of beach cobbles, and they brought their own bricks. The material remains do not provide any more detail than this.

In addition to walrus bones, the team observed live beluga, reindeer, and birds at the site, but without any bones from an archaeological context, it is difficult to know if the Pomors hunted and processed these here. The many fox traps, although of later date, suggest that Arctic foxes may have been pursued. Having been channelled by the steep cliffs of Kvalpyntfjellet, polar bears may have been forced to pass by this location. Today, there is much driftwood as well as freshwater lakes and a stream near the Pomor hut, which may already have been the case in their time.

If the Pomors hunted commercial game from this location, the products may temporarily have been stored here before being taken back to Habenichtbukta for transport to Norway or Russia. If the Pomors hunted game for fresh meat, this may have been meant for the provision of the larger site in Habenichtbukta. It would be interesting to know if the rich vegetation at the Pomor hut at Kraussbukta hides cracked or worked reindeer bone or not. As far as driftwood is concerned, Kraussbukta, which comprises much driftwood today, may once have been harvested

for its driftwood, which was then taken to Habenichtbukta as construction material. If Kraussbukta was a satellite station for Habenichtbukta, it would be interesting but probably very difficult to find out what the archaeological signatures of this relationship may be. It is also possible that the two were not connected.

It appears that the topography to the south of Kraussbukta was the only factor which truly dictated the location of the Pomor hut. That is to say that the steep cliffs formed a physical barrier thereby forcing the placing of the hut on more suitable ground to the north. For the rest, the Pomors probably chose the site for its many advantages, firstly of walruses but also of a range of other resources and conveniences, such as the dolerite outcrop forming a natural lookout point. The question is if the Pomors would have built their hut here, providing shelter before or after lengthy journeys, if there had not been any walruses. This answer may only be answered in comparison with Pomor sites at which the presence of walruses is not immediately obvious or where they were, in fact, absent.

b) What was the lasting impact of the Pomor activities in Kraussbukta?

One lasting impact of past human activities is the unintentional creation of archaeological sites. In this case, the remains of the Pomor hut have almost vanished. Five posts, some substantial whale bones, and some cobbles and bricks of a possible fireplace or oven still mark the location. Seeing that Kraussbukta gives the impression of a seldom visited place, one has to wonder about the site formation processes that the site has witnessed and where all the expected building material has gone. Firstly, we could of course be expecting too much. Perhaps this Pomor hut was never a hut but only the base of a tent or some temporary walls behind which to huddle. In this case, there would not have been much building material to begin with. Alternatively, it was a 'proper' hut, a bone-and-log cabin, and the building material has been completely removed and reused. In this case, we should like to know by whom, where to, and for what purpose.

Any logs may have become the firewood of passing visitors. Whale bones do burn, but if these bones were originally collected on the raised beach they had probably lost their high oil content. They were, in any case, disregarded and stacked in a fairly neat pile next to the former hut. If passing visitors camped nearby, the logs from the hut would have been the easiest to reach before one had to go and fetch the heavy logs from the beach, assuming of course that there were logs at the beach to begin with. What may also have been the case is that the Pomors had already harvested all the driftwood from this beach and when the hut fell out of use, salvaged even those logs for use in Habenichtbukta. What we see today may have been thrown up onto the beach in later years.

People have impacted the landscape through centuries of hunting marine and terrestrial living resources. It is possible but unlikely that earlier whalers killed the walruses that gave rise to the walrus kill site. It is more likely that the animals were killed by the Pomors in one or more slaughter events. Can this be dated? At least 21 dead walruses are accounted for, and this may not seem like a large impact on the

marine ecosystem. However, the number of walrus killed with Kraussbukta as a base is invariably much higher, and it may even be the case that the walrus have avoided the beach since the time of the Pomors. The team did not find any indication of the beach having been used as a walrus haul-out in recent years. A consequence of the Pomor presence at his location may thus have been the local removal of the walrus population. It remains to be seen if walrus claim back this beach.

Without excavation, it is impossible to ascertain how the Pomors have further used the location and what their impact on other resources may have been.

Gnålodden (77° 00' N 15° 40' E)

Site narrative

Prior to the SEES expedition taking place, the plans for the return journey from Edgeøya foresaw a landing somewhere on route back to Longyearbyen. Since there were too many Pomor sites along the way, the team only prepared for those at Sørkapp but no others. It therefore came as a surprise when the *Ortelius* anchored outside Burgerbukta in Hornsund on August 25, 2015 with the aim of visiting Gnålodden. Besides the dramatic scenery and the bird cliff, the site is famous for its Norwegian trappers' hut which had at one stage been used by the famous female hunter Wanny Wolstad. The team was lucky that the site also comprised Pomor remains. These are less well known.

Seascape and approach. From the ship, the wide Bogstranda appeared to be a suitable flat area on which to put a hut, but no archaeological remains are known from this location. All along the shore were signs of heavy erosion. It was difficult to say from a distance but perhaps the resulting cliff was too formidable an obstacle to climb up. Perhaps this area was too exposed during storms. With these ideas in mind, the team considered the rocky point of Gnålodden. Neither from the map nor on location was it immediately obvious from which angle to approach the site. The thought was that because the point jutted out and comprised so many small coves, one of the small beaches would always be approachable in any weather. There was no telling how one would or could reach the site in winter. Would Hornsund be frozen over and if so could the ice be crossed or would movement have thrown up pressure ridges?

Accessibility and landing. The zodiacs aimed for the cove to the west of the Norwegian trappers' hut. The zodiac drivers were hesitant to approach the beach because everywhere in the water were rock outcrops and boulders. The falling tide made the situation increasingly worse. At the end of the visit, the beach was no longer useable. The zodiac drivers chose another cove yet further west but this, too, comprised many submerged obstacles. With experience, the landing at the site would pose less problems. The hunters in all probability used navigational marks for the smoothest approach from various directions.



Landscape and context of the site. As suggested by the site description above, there was only limited space at Gnålodden. While the Norwegian hut had some flat ground and even a small lake around it, the space at the Pomor site was severely restricted (at least to the team's feeling). In the photograph, the two boulders in the middle mark the

Pomor hut. The outcrop centre left is Gravodden, which comprises a single grave. Two small landing beaches can be seen on either side of Gravodden, a third lies off the picture to the bottom right. Little is known about any changes in relative sea level since the Pomors, but the presence of seaweed suggests that the site is even more restricted at high tide and during storms.

Anchor points. Besides a walkover, no archaeological work was undertaken here. Anchor points were thus not needed. The team would otherwise have used the corner posts of the Pomor hut.



Identification of re-search-specific features. Without having prepared for the site, the team identified the following archaeological features: the Pomor hut, Chochorowski's and Jasinski's possible second hut, the grave on Gravodden, and the Norwegian trappers' hut. They subsequently focussed their attention on the immediate sur-

roundings of the Pomor hut in the photograph with an interest in any historical-ecological features, that is to say mainly animal bones.

Potential areas of past activity. Without an indication of where there had been a door in the Pomor hut and without any surface finds to speak of, it was impossible to discern any area of past activity on the site. Or better, the whole of the limited site

had probably been used by the Pomors and perhaps by whalers and Norwegian hunters, but there was no indication of what may have taken place where. There were a total of two small bones on the Pomor site. These may have been bird bones and as such not unusual beneath a bird cliff. The team only discerned a fragment of a bone around the Norwegian hut as well as three vertebrae, perhaps beluga, along the hut wall, which may have been brought there by visitors to the site. In view of the pile of refuse behind the Norwegian hut, which also comprised a number of red bricks, it was conceivable that the whole site had been subjected to one or more clean-ups over time. The possibility that the site had been systematically sampled was discounted.

Kruse took a first and last picture at Gnålodden at 15:06 and 16:28, respectively. The team doubts that they would have discovered any more ecofacts if they had had more time. Despite the welcome opportunity to visit a Pomor site unplanned for, the team was disappointed by how little information they had been able to gather.

Site interpretation

The fieldwork at Gnålodden (visual survey only) was undertaken to generate results that would in turn inform the two guiding questions of this research. Adjusted to this particular site, these were a) to what extent did the Arctic landscape dictate the location of the Pomor hut at Gnålodden, and b) what was the lasting impact of the Pomor activities at Gnålodden?

a) *To what extent did the Arctic landscape dictate the location of the Pomor hut at Gnålodden?*

Reymert and Moen (2015) list only four locations in the whole of Hornsund at which Norwegian trappers' huts had been built: Isbjørnhamna, Adriabukta, Gåshamna – and Gnålodden. Of course, the Norwegian hunters only came after the Pomors, but the thought is that if places suited themselves to hunting and trapping, the Norwegians would probably have used them. Isbjørnhamna had access to the whole of Rålstranda and Revdalen, Adriabukta to Treskelen, and Gåshamna to Gåshamnøyra the whole of Kulmstranda. Bogstranda may have been reached from Gnålodden, but all in all the space here was restricted. It was perhaps the very limit of what could still be inhabited before it became unprofitable.

Hence, the location of the Pomor hut at Gnålodden was probably dictated by the fact that more favourable places had already been taken and that this strip of land was the only practical one still left. The only other registered Pomor site in Hornsund lies in Gåshamna, but this does not mean that other Pomor sites never existed here.

If this was not the case, one has to wonder which resources the Pomors may have sought at this location, resources that would replenish themselves often enough to warrant a hut here. In the absence of bone material, one can only guess.

b) What was the lasting impact of the Pomor activities at Gnålodden?

As with Kraussbukta above, the Pomors in the first instance created a legacy in the form of an archaeological site.

Because no bone material to speak of could be discerned during the SEES expedition, it is impossible to know from visual survey only what the Pomors may have done or may have hunted at this location and what their impact on the marine or terrestrial ecosystem would have been.

DISCUSSION

To be included in the final fieldwork report.

CONCLUSION

To be included in the final fieldwork report.

FUTURE WORK

To be included in the final fieldwork report.

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APPENDIX 1

Archaeology equipment list & expedition log

ARCHAEOLOGY EQUIPMENT LIST

SEES.NL, August 19 - 28, 2015

PRE-SITE

<input checked="" type="checkbox"/>	Project Design
<input type="checkbox"/>	RA & Safety Measures
<input checked="" type="checkbox"/>	Site Manual
<input checked="" type="checkbox"/>	Site Plan
<input checked="" type="checkbox"/>	digital map
<input checked="" type="checkbox"/>	Site File, background info
<input type="checkbox"/>	clip board
<input checked="" type="checkbox"/>	notebook / diary
<input checked="" type="checkbox"/>	paper

SETTING OUT

<input type="checkbox"/>	Service Plans
<input type="checkbox"/>	CAT Scan
<input type="checkbox"/>	Tapes 100m
<input type="checkbox"/>	2 Tapes 50m
<input type="checkbox"/>	2 Tapes 30m
<input type="checkbox"/>	sledge hammer, mallet
<input checked="" type="checkbox"/>	pegs
<input checked="" type="checkbox"/>	survey flags
<input type="checkbox"/>	spray paint

SUB-CONTRACT/HIRE

<input type="checkbox"/>	Magnetometry
<input type="checkbox"/>	Resistivity
<input type="checkbox"/>	Radar
<input type="checkbox"/>	Topo. Survey
<input type="checkbox"/>	Building Recording
<input type="checkbox"/>	Photogrammetry
<input type="checkbox"/>	JCB
<input type="checkbox"/>	Bowser

EXCAVATION

<input type="checkbox"/>	spade, shovel
<input type="checkbox"/>	mattock, pick
<input type="checkbox"/>	sweeping brush
<input type="checkbox"/>	cutters, snips
<input type="checkbox"/>	Dutch hoe
<input type="checkbox"/>	4 trowel
<input type="checkbox"/>	hand shovel
<input type="checkbox"/>	hand brush
<input type="checkbox"/>	bucket
<input type="checkbox"/>	wheel barrow
<input type="checkbox"/>	kneeling mat
<input checked="" type="checkbox"/>	waterproof bags
<input checked="" type="checkbox"/>	ziplock bags
<input type="checkbox"/>	metal rod, dowsing rod
<input type="checkbox"/>	6 spoons

RECORDING

<input checked="" type="checkbox"/>	pro forma
<input checked="" type="checkbox"/>	camera, digital
<input type="checkbox"/>	camera, slide + films
<input type="checkbox"/>	camera, colour + films
<input type="checkbox"/>	camera, B&W + films
<input checked="" type="checkbox"/>	N arrow
<input checked="" type="checkbox"/>	compass
<input type="checkbox"/>	2 ranging poles 2m
<input type="checkbox"/>	4 ranging poles 1m
<input type="checkbox"/>	2 scales 30cm, 10cm
<input type="checkbox"/>	2 Nobo board & letters
<input type="checkbox"/>	1 chalk board & chalk
<input type="checkbox"/>	tripod
<input type="checkbox"/>	ladder
<input type="checkbox"/>	dumpy level
<input type="checkbox"/>	staff 5m
<input type="checkbox"/>	water spray can

DRAWING

<input type="checkbox"/>	planning frame 20cm
<input type="checkbox"/>	planning frame 5cm
<input type="checkbox"/>	1 tape 10m
<input type="checkbox"/>	tape 8m
<input type="checkbox"/>	tape 3m
<input type="checkbox"/>	string and nails
<input type="checkbox"/>	plumb bob
<input type="checkbox"/>	spirit level
<input type="checkbox"/>	drawing board
<input checked="" type="checkbox"/>	permatrace
<input checked="" type="checkbox"/>	graphpaper
<input checked="" type="checkbox"/>	masking tape
<input checked="" type="checkbox"/>	pencil, eraser, sharpener
<input checked="" type="checkbox"/>	scale ruler

SAMPLING

<input type="checkbox"/>	floatation tank (rubber gloves)
<input type="checkbox"/>	sieves
<input type="checkbox"/>	tubs, lids, stickers
<input checked="" type="checkbox"/>	bags, ties, labels
<input type="checkbox"/>	bowls
<input type="checkbox"/>	1 brushes, toothbrushes

H&S

<input type="checkbox"/>	signs, hazard tape
<input type="checkbox"/>	barriers, road pins
<input type="checkbox"/>	herras fencing
<input checked="" type="checkbox"/>	PPE
<input checked="" type="checkbox"/>	First Aid Box
<input checked="" type="checkbox"/>	Wet Wipes
<input type="checkbox"/>	2 thermal blankets

WELFARE

<input type="checkbox"/>	container
<input type="checkbox"/>	loo
<input type="checkbox"/>	washing facilities
<input type="checkbox"/>	van (fuel card, oil, screen wash)
<input checked="" type="checkbox"/>	mobile & charger
<input checked="" type="checkbox"/>	x toilet paper

OTHER

<input type="checkbox"/>	1 metal detector
<input type="checkbox"/>	plywood sheet
<input type="checkbox"/>	plastic sheeting
<input type="checkbox"/>	hammer
<input type="checkbox"/>	saw
<input type="checkbox"/>	crowbar
<input type="checkbox"/>	eye protection
<input type="checkbox"/>	fuel (petrol, paraffin)
<input type="checkbox"/>	1 contact thermometer
<input type="checkbox"/>	thermal camera

<input checked="" type="checkbox"/>	batteries AAA, AA
<input checked="" type="checkbox"/>	batteries lithium, 9V
<input type="checkbox"/>	battery charger
<input type="checkbox"/>	torch
<input type="checkbox"/>	1 whistle
<input type="checkbox"/>	sun screen
<input type="checkbox"/>	2 laptop
<input checked="" type="checkbox"/>	life vests (Oceanwide)
<input checked="" type="checkbox"/>	survival suits (Oceanwide)
<input type="checkbox"/>	

<input checked="" type="checkbox"/>	gun (Oceanwide)
<input checked="" type="checkbox"/>	radio (Oceanwide)
<input checked="" type="checkbox"/>	signal pistol / - pen / flares (Oc.)
<input type="checkbox"/>	trip wire with flares
<input type="checkbox"/>	other bear deterrents
<input type="checkbox"/>	4 handheld GPS
<input type="checkbox"/>	handheld PDA
<input type="checkbox"/>	1 dGPS
<input checked="" type="checkbox"/>	Satellite phone (Oceanwide)
<input type="checkbox"/>	distress beacon

If found, please return to:

Arctic Centre, Aweg 30, 9718 CW Groningen, NL

Snacks:

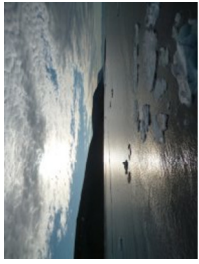
- 6 chocolate bars (200g)
- 2 peanuts (large bags)
- 1 cashew nuts (large bag)
- 2 liquorice (large bags)
- 2 cookies (large packs)

Warm drink:

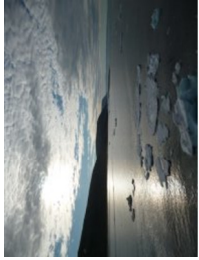
- 3 soup
- 1 tea
- 2 thermos
- 3 cups

APPENDIX 2

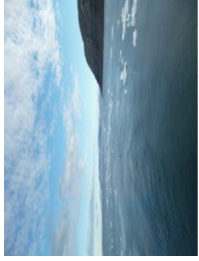
Photographic record



P1080679.JPG



P1080680.JPG



P1080681.JPG



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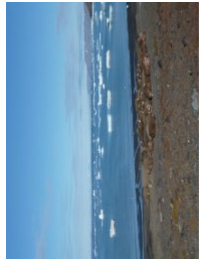
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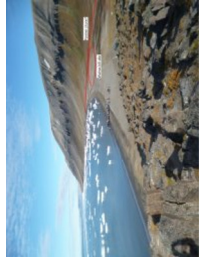
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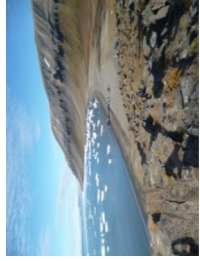
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P1080693.JPG



P1080694 edit.jpg



P1080694.JPG



P1080696.JPG



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P1080699.JPG



P1080700.JPG



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P1080705.JPG



P1080706.JPG



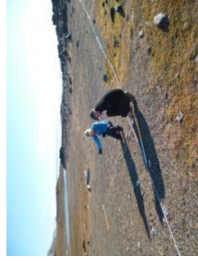
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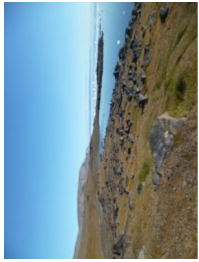
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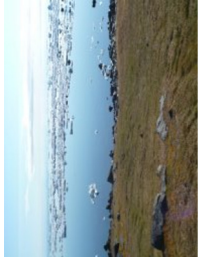
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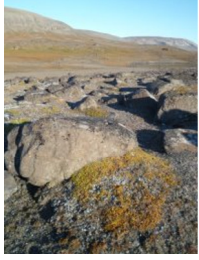
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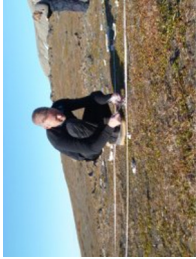
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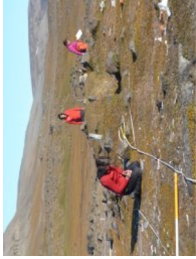
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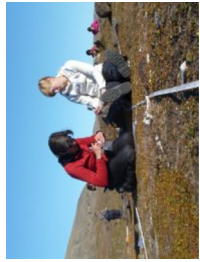
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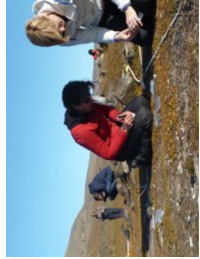
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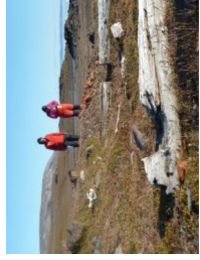
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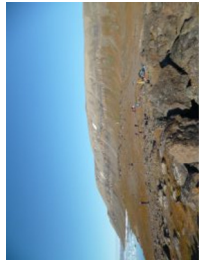
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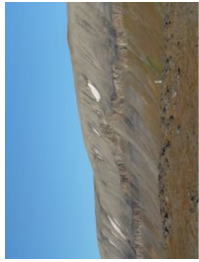
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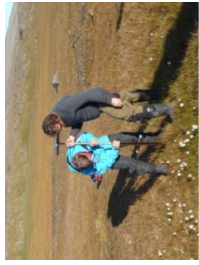
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P1080760.JPG

PHOTOGRAPHIC INDEX			
Site: Edgeöya, Dolerittneset EDO15			
B/W or C/P or C/S or Digital	Film No / Shot No e.g. (1/2)	Location, Main Feature/s, Scale/s, Orientation, Remarks (e.g. weather, lighting conditions, bracketing)	Date & Initials
Digital	P1080679	Approaching Dolerittneset on the Ortelius in the morning, sunny, some cloud, little wind, little ice, promising day for fieldwork, looking SE	FK, 21/08/15
Digital	P1080680	Approaching Dolerittneset on the Ortelius in the morning, sunny, some cloud, little wind, little ice, promising day for fieldwork, looking SE	FK, 21/08/15
Digital	P1080681	View from the Ortelius in the direction of Kapp Lee at a distance of 4km, Barentsöya in the background, conditions are very good, the dolerite sill (dark layers of rock) is clearly visible in the site of the mountain, looking N	FK, 21/08/15
Digital	P1080684	Team for the day (left to right): Kim van Dam, Liesbeth Noor, Monique de Vries, Frigga Kruse, Sarah Dresscher, Marthe Koeweiden	FK, 21/08/15
Digital	P1080685	Team for the day (left to right): Kim van Dam, Liesbeth Noor, Monique de Vries, Frigga Kruse, Sarah Dresscher, Marthe Koeweiden	FK, 21/08/15
Digital	P1080687	Archaeological team (left to right): Sarah Dresscher, Marthe Koeweiden, Frigga Kruse, with fieldwork equipment including gun, metal detector, dGPS, tripod, food and drink	FK, 21/08/15
Digital	P1080689	Archaeological team (left to right): Sarah Dresscher, Marthe Koeweiden, Frigga Kruse, with fieldwork equipment including gun, metal detector, dGPS, tripod, food and drink	FK, 21/08/15
Digital	P1080690	The team has arrived at Dolerittneset. After putting down the equipment, the members take photos of the walruses that lie on the short beach just in front of the Pomor hut. Ortelius in the background, perfect weather conditions, looking W.	FK, 21/08/15
Digital	P1080691	The team has arrived at Dolerittneset. After putting down the equipment, the members take photos of the walruses that lie on the short beach just in front of the Pomor hut. Ortelius in the background, perfect weather conditions, looking W.	FK, 21/08/15
Digital	P1080692	A group (herd, pod, or huddle) of walruses on the short beach in front of the Pomor hut at Dolerittneset, falling tide, looking W.	FK, 21/08/15
Digital	P1080693	A herd of walruses on the short beach in front of the Pomor hut at Dolerittneset, falling tide, looking NW.	FK, 21/08/15
Digital	P1080694	At the Pomor lookout point at Dolerittneset (Askeladden ID 92729-31): below a group of tourists are preparing to approach a herd of walruses (out of view just below the rocks), the roof of the octagonal hut (1904) can be seen centre right. The dolerite sill is very clear as is the lie of the land, some greenness on the slopes. Perfect conditions, looking N.	FK, 21/08/15
Digital	P1080696	The team during the walkover, identifying known archaeology, in this case the Pomor lookout, looking SE.	FK, 21/08/15
Digital	P1080697	View of the walrus herd on the short beach from the lookout, the Pomor hut just off centre left, beyond the walruses a dolerite outcrop and an island of dolerite, little ice, southern tip of Spitsbergen at the horizon, looking SW.	FK, 21/08/15

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Site: Edgeöya, Dolerittneset EDO15			
B/W or C/P or C/S or Digital	Film No / Shot No e.g. (1/2)	Location, Main Feature/s, Scale/s, Orientation, Remarks (e.g. weather, lighting conditions, bracketing)	Date & Initials
Digital	P1080698	To archaeologist, these loose rocks in the vicinity of the Pomor lookout look suspicious. Were they brought up here to build the lookout? Have they been moved since? If so, why? Was there a tent or a fox trap here? Looking SE.	FK, 21/08/15
Digital	P1080699	To archaeologist, these loose rocks in the vicinity of the Pomor lookout look suspicious. Were they brought up here to build the lookout? Have they been moved since? If so, why? Was there a tent or a fox trap here? Looking SE.	FK, 21/08/15
Digital	P1080700	One of five Pomor graves at Dolerittneset, probably Askeladden ID 92729-29, remarkable greenness around, looking W.	FK, 21/08/15
Digital	P1080791	The team after Oceanwide guide Arjen Dorst (took photo) could stand guard during the day, back left to right: Kim van Dam, Karen Mulders, Frigga Kruse, Sarah Dresscher, front: Monique de Vries, Liesbeth Noor, Miriam Vermeij, Marcel Paul, Marthe Koeweiden	FK, 21/08/15
Digital	P1080702	Karen Mulders demonstrating that Kim van Dam and she had tested the metal detector, but the rock contained too much metal and the walrus in the background were too sensitive to the noise; the metal detecting was not carried out, looking W	FK, 21/08/15
Digital	P1080703	Liesbeth Noor and Miriam Vermeij taking soil samples in Grid 1. A baseline had been laid parallel to the western wall of the hut and an L-shaped grid was sampled at 1m intervals. On the calm day, the plastic bags could be kept in position to provide a spatial reference for the vegetation and bone surveys, looking W.	FK, 21/08/15
Digital	P1080704	Liesbeth Noor and Miriam Vermeij taking soil samples in Grid 1. A baseline had been laid parallel to the western wall of the hut and an L-shaped grid was sampled at 1m intervals. On the calm day, the plastic bags could be kept in position to provide a spatial reference for the vegetation and bone surveys, looking W.	FK, 21/08/15
Digital	P1080705	The film team took some interest in our work on the first real day of fieldwork. Marcel Paul taking soil samples in Grid 2. A baseline had been laid parallel to the eastern wall of the hut and an L-shaped grid was sampled at 1m intervals, looking SW.	FK, 21/08/15
Digital	P1080706	The film team took some interest in our work on the first real day of fieldwork. Marcel Paul taking soil samples in Grid 2. A baseline had been laid parallel to the eastern wall of the hut and an L-shaped grid was sampled at 1m intervals, looking SW.	FK, 21/08/15
Digital	P1080707	Monique de Vries labelling plastic bags in the foreground while the film team and other 'community archaeologists' go about their tasks, looking SW.	FK, 21/08/15
Digital	P1080710	While Liesbeth Noor and Miriam Vermeij sample soils, Sarah Dresscher and Marthe Koeweiden try to decide how to map the surroundings of the Pomor hut using dGPS, looking NW.	FK, 21/08/15

PHOTOGRAPHIC INDEX Site: Edgeöya, Dolerittneset EDO15			
B/W or C/P or C/S or Digital	Film No / Shot No e.g. (1/2)	Location, Main Feature/s, Scale/s, Orientation, Remarks (e.g. weather, lighting conditions, bracketing)	Date & Initials
Digital	P1080711	While Liesbeth Noor and Miriam Vermeij sample soils, Marthe Koeweiden tries to map the surroundings of the Pomor hut using dGPS, and Sarah Dresscher considers the bone assemblage, looking NW.	FK, 21/08/15
Digital	P1080715	Monique de Vries and Marcel Paul begin a new row in Grid 2, looking SE.	FK, 21/08/15
Digital	P1080716	Monique de Vries and Marcel Paul begin a new row in Grid 2, looking SE.	FK, 21/08/15
Digital	P1080717	After the failed metal detecting, Karen Mulders and Kim van Dam carry out a vegetation survey in the surroundings of the Pomor hut, looking N.	FK, 21/08/15
Digital	P1080718	After the failed metal detecting, Karen Mulders and Kim van Dam carry out a vegetation survey in the surroundings of the Pomor hut, looking N.	FK, 21/08/15
Digital	P1080719	After the failed metal detecting, Karen Mulders and Kim van Dam carry out a vegetation survey in the surroundings of the Pomor hut, looking N.	FK, 21/08/15
Digital	P1080720	The Pomor hut lies at the centre of the fieldwork activities but it is not the focus. The team members take soil samples in Grids 1 and 2, carry out a vegetation survey, and map the bone distribution, looking NE.	FK, 21/08/15
Digital	P1080722	To the left, Miriam Vermeij holds the end of the tape which indicates the maximum length of the sampling grid as dictated by the presence of the walrus (on the beach off to the left). Much animal bone can be seen, incl a walrus skull. In the medium distance is the dolerite ridge with the Pomor lookout, in the background is the dolerite sill, looking NW.	FK, 21/08/15
Digital	P1080723	Autumn colours (I forgot why I took this picture.)	FK, 21/08/15
Digital	P1080724	Overview from the dolerite ridge just to the south of the Pomor hut, very grassy, striking igneous rock, the small bay beyond, between the hills at the medium distance to the left (east) is the mouth of Rosenbergdalen, clear sky, very little ice, perfect conditions, looking SE.	FK, 21/08/15
Digital	P1080725	View from the dolerite ridge just to the south of the Pomor hut, very grassy, rocky shore with many submerged rocks not great for landing, some ice, hardly any current, looking down Storfjorden to the S.	FK, 21/08/15
Digital	P1080726	Rusty tin used for target practise.	FK, 21/08/15
Digital	P1080727	Route to Rosenbergdalen, rich vegetation, looking E.	FK, 21/08/15
Digital	P1080728	Miriam Vermeij labelling plastic bags for the soil samples, beyond her the route to Rosenbergdalen, looking E.	FK, 21/08/15
Digital	P1080731	Marcel Paul taking soil samples in Grid 1 surrounded by animal bone, most likely reindeer, a reindeer antler in the foreground; Sarah Dresscher mapping the bone scatter, looking NE.	FK, 21/08/15
Digital	P1080732	Marcel Paul taking soil samples in Grid 1 surrounded by animal bone, most likely reindeer; Sarah Dresscher mapping the bone scatter, looking NE.	FK, 21/08/15

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Site: Edgeöya, Dolerittneset EDO15			
B/W or C/P or C/S or Digital	Film No / Shot No e.g. (1/2)	Location, Main Feature/s, Scale/s, Orientation, Remarks (e.g. weather, lighting conditions, bracketing)	Date & Initials
Digital	P1080735	In the centre the substantial embankment that marks the north wall of the Pomor hut, activity all around it: Miriam Vermeij is taking soil samples in Grid 1, Kim van Dam and Karen Mulders are mapping the vegetation in Grid 2, looking E.	FK, 21/08/15
Digital	P1080736	In the centre the substantial embankment that marks the north wall of the Pomor hut, activity all around it: Miriam Vermeij and Liesbeth Noor taking soil samples in Grid 1, Kim van Dam and Karen Mulders mapping the vegetation in Grid 2, Marthe Koeweiden recording the site with a handheld GPS, looking E	FK, 21/08/15
Digital	P1080737	Miriam Vermeij and Liesbeth Noor taking soil samples in Grid 1, looking E	FK, 21/08/15
Digital	P1080739	All teams at work: Miriam Vermeij and Liesbeth Noor taking soil samples, Kim van Dam and Karen Mulders mapping the vegetation, Marthe Koeweiden recording the site by GPS, Sarah Dresscher mapping the bone scatter (and Frigga Kruse taking photos), looking E.	FK, 21/08/15
Digital	P1080740	All teams at work: Miriam Vermeij and Liesbeth Noor taking soil samples, Kim van Dam mapping the vegetation, Marthe Koeweiden recording the site by GPS, Sarah Dresscher mapping the bone scatter (and Frigga Kruse taking photos), looking E	FK, 21/08/15
Digital	P1080742	Remains of the Pomor hut in the foreground: clearly worked logs, embankments, a scatter of red bricks, Kim van Dam and Karen Mulders mapping the vegetation in Grid 2, looking E	FK, 21/08/15
Digital	P1080743	Remains of the Pomor hut in the foreground: clearly worked logs, embankments, a scatter of red bricks, Kim van Dam and Karen Mulders mapping the vegetation in Grid 2, looking E	FK, 21/08/15
Digital	P1080745	Overview of the site, the group just to the west of the Pomor hut, the person on the left is at a safe distance to the walruses that stayed at the beach throughout our presence, looking N.	FK, 21/08/15
Digital	P1080746	Geological formation: the dolerite sill at Dolerittneset, often mistaken for a sedimentary rock because of its regularity, but sedimentary rocks don't have kinks like this unless very faulted, the black layers below and above indicate that the intrusive rock exploited a shale or similar as a line of weakness, looking NE	FK, 21/08/15
Digital	P1080748	Interdisciplinary research in action: the archaeologists asked the cores team to take a peat core near the Pomor hut: Wim Hoek with the corer, looking N.	FK, 21/08/15
Digital	P1080750	Interdisciplinary research in action: the archaeologists asked the cores team to take a peat core near the Pomor hut: Wim Hoek and Tom van Hoef with the corer, looking N.	FK, 21/08/15
Digital	P1080751	Interdisciplinary research in action: the archaeologists asked the cores team to take a peat core near the Pomor hut: Wim Hoek and Tom van Hoef with the corer, looking E.	FK, 21/08/15

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Site: Edgeöya, Dolerittneset EDO15			
B/W or C/P or C/S or Digital	Film No / Shot No e.g. (1/2)	Location, Main Feature/s, Scale/s, Orientation, Remarks (e.g. weather, lighting conditions, bracketing)	Date & Initials
Digital	P1080752	Interdisciplinary research in action: the archaeologists asked the cores team to take a peat core near the Pomor hut: Wim Hoek and Tom van Hoef with the corer, looking E.	FK, 21/08/15
Digital	P1080754	Interdisciplinary research in action: peat core taken near the Pomor hut at Dolerittneset.	FK, 21/08/15
Digital	P1080755	Extracting samples from the peat core at Dolerittneset, from left to right: Keechy Akkerman, JW Cooper, Wim Hoek, Tom van Hoef, Ben Bekooy.	FK, 21/08/15
Digital	P1080756	Extracting samples from the peat core at Dolerittneset, from left to right: Keechy Akkerman, JW Cooper, Wim Hoek, Tom van Hoef, Ben Bekooy.	FK, 21/08/15
Digital	P1080757	Extracting samples from the peat core at Dolerittneset, from left to right: Keechy Akkerman, JW Cooper, Wim Hoek, Tom van Hoef, Ben Bekooy.	FK, 21/08/15
Digital	P1080758	Extracting samples from the peat core at Dolerittneset, from left to right: Keechy Akkerman, JW Cooper, Wim Hoek.	FK, 21/08/15
Digital	P1080759	Extracting samples from the peat core at Dolerittneset, from left to right: Keechy Akkerman, JW Cooper, Wim Hoek.	FK, 21/08/15
Digital	P1080760	Completed soil sampling in the evening sun at Dolerittneset, Pomor midden centre left, looking SW.	FK, 21/08/15



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P1080762.JPG



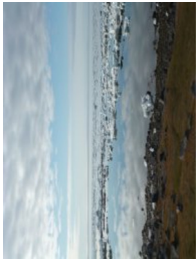
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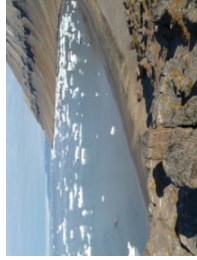
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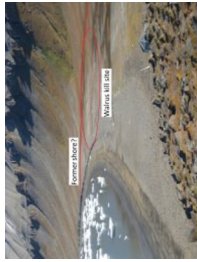
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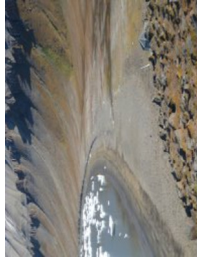
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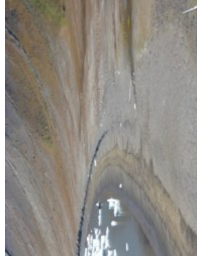
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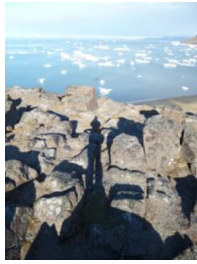
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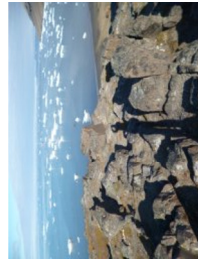
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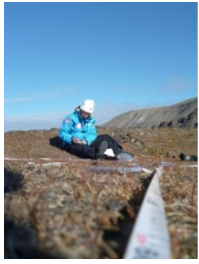
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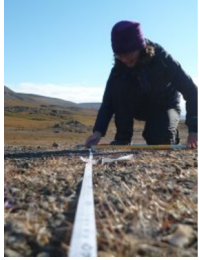
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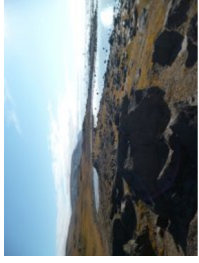
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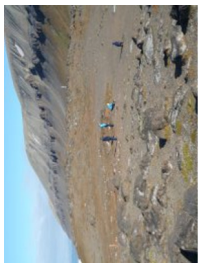
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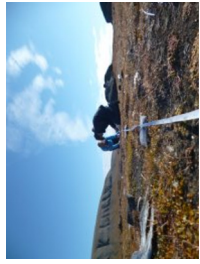
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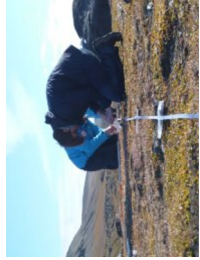
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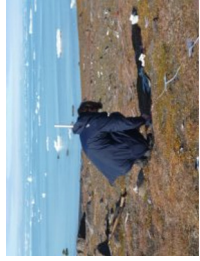
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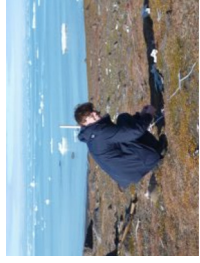
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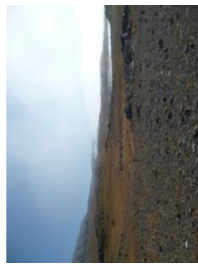
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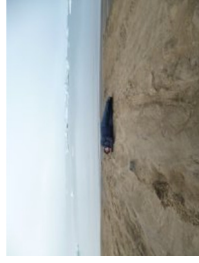
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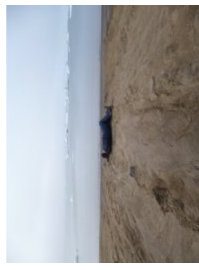
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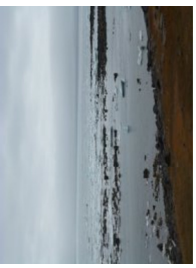
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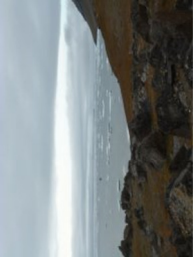
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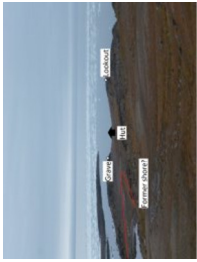
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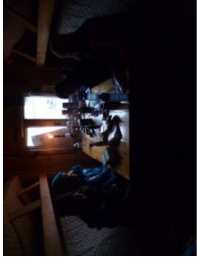
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Site: Edgeöya, Dolerittneset EDO15			
B/W or C/P or C/S or Digital	Film No / Shot No e.g. (1/2)	Location, Main Feature/s, Scale/s, Orientation, Remarks (e.g. weather, lighting conditions, bracketing)	Date & Initials
Digital	P1080761	Kill site, no detailed study is known but presumably all walrus, three upstanding buildings in the background: the octagonal hut from 1904 and two exploration huts from the late 1960s, to the right of the 1904 hut lie a small number of walruses, on the dolerite ridge is the Pomor lookout, some cloud, little to no wind, some ice in the bay, looking SW	FK, 22/08/15
Digital	P1080762	Kill site, no detailed study is known but presumably all walrus, three upstanding buildings in the background: the octagonal hut from 1904 and two exploration huts from the late 1960s, to the right of the 1904 hut lie a small number of walruses, on the dolerite ridge is the Pomor lookout, some cloud, little to no wind, some ice in the bay, looking SW	FK, 22/08/15
Digital	P1080765	The archaeological team of the day: Marthe Koeweiden, Nienke Beintema, Judith Klostermann, and Sarah Dresscher, carrying equipment from the landing site on the long beach across the lookout ridge to the Pomor hut, two upstanding buildings from the late 1960s below, the former Dutch research station stood between and behind them, a group of French tourists also landing at the beach, the kill site barely visible beyond them, looking N	FK, 22/08/15
Digital	P1080766	The archaeological team of the day: Marthe Koeweiden, Nienke Beintema, Judith Klostermann, and Sarah Dresscher, carrying equipment from the landing site on the long beach across the lookout ridge to the Pomor hut, two upstanding buildings from the late 1960s below, the former Dutch research station stood between and behind them, a group of French tourists also landing at the beach, the kill site barely visible beyond them, looking N	FK, 22/08/15
Digital	P1080767	Kruse had the bear watch all day and wandered between the lookout ridge and the ridge south of the hut, this is a view over the ice to the south of the hut, looking S	FK, 22/08/15
Digital	P1080768	Some clouds, calm, some ice to the south of the hut, looking S.	FK, 22/08/15
Digital	P1080769	Rocky shore and poor landing to the SW of the hut looking at the island across the water, a sand dune had gathered here, looking W	FK, 22/08/15
Digital	P1080770	Rocky shore and poor landing to the SW of the hut looking at the island across the water, a sand dune had gathered here, looking W	FK, 22/08/15
Digital	P1080771	Vegetation on the sand dune, photo taken for the vegetation team, looking W	FK, 22/08/15
Digital	P1080772	Vegetation on the sand dune, photo taken for the vegetation team, looking W	FK, 22/08/15
Digital	P1080773	Vegetation on the sand dune, photo taken for the vegetation team, looking E	FK, 22/08/15
Digital	P1080774	Submerged rocks between the ridge and the island, looking W	FK, 22/08/15
Digital	P1080775	Same herd of walruses between the southern ridge and the lookout ridge, falling tide, looking NE	FK, 22/08/15
Digital	P1080776	View from the lookout: walruses at the beach and in the water, calm, falling tide, ice in the bay, looking N	FK, 22/08/15

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Site: Edgeöya, Dolerittneset EDO15			
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Digital	P1080777	Overview of Dolerittneset: two of the upstanding hut, view across the low-lying wet area toward the kill site, some walruses, falling tide, some ice in the bay, looking N	FK, 22/08/15
Digital	P1080778	Overview of Dolerittneset, zooming in on the kill site: does the kill site lie on a raised beach? Is the sea eroding the shore and endangering the kill site? There are some bits of driftwood both on the raised beach and on the current beach, but did they erode down? Looking N	FK, 22/08/15
Digital	P1080779	Overview of Dolerittneset, zooming in on the kill site: does the kill site lie on a raised beach? Is the sea eroding the shore and endangering the kill site? There are some bits of driftwood both on the raised beach and on the current beach, but did they erode down? The zodiac in the water had been left with the archaeological team as a means of escape; we could not let it be stranded at low tide lest we not be able to push it back in the water; we could not let it float freely lest it be damaged by walrus or ice. Looking N	FK, 22/08/15
Digital	P1080780	Overview of Dolerittneset, looking N.	FK, 22/08/15
Digital	P1080781	Standing at the lookout: view of the sea and ice conditions, the walruses, and any ships, looking NW	FK, 22/08/15
Digital	P1080782	Standing at the lookout: view of the sea and ice conditions, the walruses, and any ships, looking NW	FK, 22/08/15
Digital	P1080783	Not isolated and never alone: visiting French tourists receive a Pomor talk from Sarah Dresscher, looking N	FK, 22/08/15
Digital	P1080784	Not isolated and never alone: visiting French tourists receive a Pomor talk from Sarah Dresscher, looking NE	FK, 22/08/15
Digital	P1080787	Not isolated and never alone: visiting French tourists receive a Pomor talk from Sarah Dresscher, looking SE	FK, 22/08/15
Digital	P1080789	Pomor remains in the foreground: corner posts and stone walls, Sarah Dresscher talking to visiting French tourists, walruses in the water, looking W	FK, 22/08/15
Digital	P1080790	Pomor remains in the foreground: corner posts and stone walls, Sarah Dresscher talking to visiting French tourists, walruses in the water, looking W	FK, 22/08/15
Digital	P1080791	Pomor remains in the foreground: corner posts and stone walls, Sarah Dresscher talking to visiting French tourists, walruses in the water, looking W	FK, 22/08/15
Digital	P1080792	Judith Klostermann labelling plastic bags (spoil from 1968 excavation behind her, reindeer antler in front), Marthe Koeweiden trying to solve the problem with the dGPS, looking W	FK, 22/08/15
Digital	P1080793	Judith Klostermann labelling plastic bags (spoil from 1968 excavation behind her, reindeer antler in front), Marthe Koeweiden trying to solve the problem with the dGPS, looking W	FK, 22/08/15
Digital	P1080794	Judith Klostermann labelling plastic bags (spoil from 1968 excavation behind her, reindeer antler in front), Marthe Koeweiden trying to solve the problem with the dGPS, looking W	FK, 22/08/15

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Digital	P1080795	Nienke Beintema taking soil samples (note the sparse vegetation in Grid 2), Judith Klostermann labelling plastic bags, Marthe Koeweiden working with the dGPS, Sarah Dresscher talking to French tourists, looking W	FK, 22/08/15
Digital	P1080796	Nienke Beintema taking soil samples (note the sparse vegetation in Grid 2), Judith Klostermann labelling plastic bags, Marthe Koeweiden working with the dGPS, Sarah Dresscher talking to French tourists, looking W	FK, 22/08/15
Digital	P1080798	Nienke Beintema taking soil samples (note the sparse vegetation in Grid 2), Judith Klostermann labelling plastic bags, Marthe Koeweiden working with the dGPS, Sarah Dresscher talking to French tourists, looking W	FK, 22/08/15
Digital	P1080799	Judith Klostermann labelling plastic bags, Marthe Koeweiden working with the dGPS, Sarah Dresscher talking to French tourists, clouds coming in, looking NW	FK, 22/08/15
Digital	P1080800	Judith Klostermann labelling plastic bags (spoil from 1968 excavation behind her, reindeer antler in front), Marthe Koeweiden trying to solve the problem with the dGPS, looking W	FK, 22/08/15
Digital	P1080801	Judith Klostermann labelling plastic bags (spoil from 1968 excavation behind her), looking N	FK, 22/08/15
Digital	P1080802	Nienke Beintema taking soil samples in Grid 2, looking E	FK, 22/08/15
Digital	P1080803	Nienke Beintema and Judith Klostermann taking soil samples in Grid 2, looking N	FK, 22/08/15
Digital	P1080804	View in the direction of Rosenbergdalen (where the vegetation team is recording changes), some more ice drifting in from the east, looking E	FK, 22/08/15
Digital	P1080805	The Pomor hut at a local high point between 'the front' of the hut' (in the direction of the beach) and 'the back of the hut', more vegetation in the front than in the back, what could have caused this gradient? Wind? Water? Runoff? Availability of nutrients?, looking N	FK, 22/08/15
Digital	P1080806	The Pomor hut at a local high point between 'the front' of the hut' (in the direction of the beach) and 'the back of the hut', more vegetation in the front than in the back, what could have caused this gradient? Wind? Water? Runoff? Availability of nutrients?, looking N	FK, 22/08/15
Digital	P1080808	The Pomor hut at the centre of activities with baselines strung along its west wall and its east wall, looking N	FK, 22/08/15
Digital	P1080809	The Pomor hut at the centre of activities with baselines strung along its west wall and its east wall, looking N	FK, 22/08/15
Digital	P1080810	Marthe Koeweiden and Sarah Dresscher taking soil samples in Grid 1, looking E	FK, 22/08/15
Digital	P1080811	Marthe Koeweiden and Sarah Dresscher taking soil samples in Grid 1, looking E	FK, 22/08/15
Digital	P1080812	Marthe Koeweiden and Sarah Dresscher taking soil samples in Grid 1, looking E	FK, 22/08/15
Digital	P1080813	Marthe Koeweiden and Sarah Dresscher taking soil samples in Grid 1, looking E	FK, 22/08/15

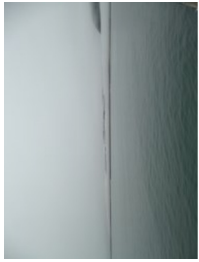
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Site: Edgeöya, Dolerittneset EDO15			
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Digital	P1080815	Marthe Koeweiden taking soil samples in Grid 1, walruses at the beach and in the water behind her, looking W	FK, 22/08/15
Digital	P1080816	Marthe Koeweiden taking soil samples in Grid 1, walruses at the beach and in the water behind her, looking W	FK, 22/08/15
Digital	P1080817	The Pomor hut in the centre with the surrounding under investigation, from left to right the whole extent of our field site, looking N	FK, 22/08/15
Digital	P1080818	The Pomor hut in the centre with the surrounding under investigation, from left to right the whole extent of our field site, looking N	FK, 22/08/15
Digital	P1080819	Lunch break with (left to right) Judith Klostermann, Nienke Beintema, Marthe Koeweiden, and Sarah Dresscher, as of yet perfect conditions	FK, 22/08/15
Digital	P1080820	Lunch break with (left to right) Judith Klostermann, Nienke Beintema, Marthe Koeweiden, and Sarah Dresscher, as of yet perfect conditions	FK, 22/08/15
Digital	P1080823	Lunch break with (left to right) Judith Klostermann, Nienke Beintema, Marthe Koeweiden, and Sarah Dresscher, as of yet perfect conditions	FK, 22/08/15
Digital	P1080824	Lunch break with Judith Klostermann and Nienke Beintema, as of yet perfect conditions	FK, 22/08/15
Digital	P1080825	Our field site, full extent from left to right, as fog is coming in from the E, looking SE	FK, 22/08/15
Digital	P1080826	Our field site, full extent from left to right, as fog is coming in from the E, looking SE	FK, 22/08/15
Digital	P1080827	Our field site, zooming in on the Pomor hut at the centre, looking S	FK, 22/08/15
Digital	P1080828	Perfect conditions no more, fog coming in from the E, looking SE	FK, 22/08/15
Digital	P1080829	Marthe Koeweiden makes another attempt with the dGPS, looking W	FK, 22/08/15
Digital	P1080830	Marthe Koeweiden makes another attempt with the dGPS, looking W	FK, 22/08/15
Digital	P1080831	Marthe Koeweiden makes another attempt with the dGPS, looking NW	FK, 22/08/15
Digital	P1080823	Marthe Koeweiden makes another attempt with the dGPS, looking NW	FK, 22/08/15
Digital	P1080834	Marthe Koeweiden makes another attempt with the dGPS, looking NW	FK, 22/08/15
Digital	P1080835	Last soil samples being taken as the weather worsens, poor visibility, the bear watch wanders from ridge to ridge, looking W	FK, 22/08/15
Digital	P1080836	The small group of walrus has left the location next to the octagonal hut, the team investigates: marks left by walrus tusks	FK, 22/08/15
Digital	P1080837	Marthe Koeweiden in the middle of a track left by a walrus rolling sideways into the water	FK, 22/08/15
Digital	P1080838	Marthe Koeweiden being a walrus	FK, 22/08/15
Digital	P1080839	Marthe Koeweiden being a walrus	FK, 22/08/15

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Digital	P1080840	Marthe Koeweiden not being as long as a walrus	FK, 22/08/15
Digital	P1080841	Marthe Koeweiden still being a walrus, keeping the team entertained and thereby warm	FK, 22/08/15
Digital	P1080842	Sorry, Marthe, you're still not as long as the walrus, but you're almost in the water now	FK, 22/08/15
Digital	P1080842	Walrus urine. The team considered if we should sample it for the sea mammal specialists, but we didn't have a container	FK, 22/08/15
Digital	P1080844	Walrus diarrhea; we didn't have a container to sample this either	FK, 22/08/15
Digital	P1080845	The team collecting insects for other researchers	FK, 22/08/15
Digital	P1080846	The team collecting insects for other researchers	FK, 22/08/15
Digital	P1080849	The team collecting insects for other researchers	FK, 22/08/15
Digital	P1080850	As site work continued, clouds moved in and so did more ice from the direction of Diskobukta to the E, the bear watch kept an eye on it, looking E	FK, 22/08/15
Digital	P1080851	Ice drifting in from Diskobukta, looking SW	FK, 22/08/15
Digital	P1080852	Ice beginning to drift around the dolerite islands and in front of the landing beaches, looking W	FK, 22/08/15
Digital	P1080853	Overcast and more ice on the move, looking N	FK, 22/08/15
Digital	P1080854	On another walk to keep warm and check on the zodiac, the team investigated the extent of the kill site. This is the view from above. Some of the walrus skulls appear to lie very high in the 'tundra', environmental history and human activities would need to be studied, looking W	FK, 22/08/15
Digital	P1080855	On another walk to keep warm and check on the zodiac, the team investigated the extent of the kill site. This is the view from above. Some of the walrus skulls appear to lie very high in the 'tundra', environmental history and human activities would need to be studied, looking W	FK, 22/08/15
Digital	P1080856	A last walk took the team up to some height 'behind' the Pomor hut, the ice continued to round the islands, looking W	FK, 22/08/15
Digital	P1080857	View back on the Pomor hut central to the photo. Why did they choose this location? Is it a wind tunnel? Is it more stable, drier than the location of the upstanding huts? Was the location of the upstanding huts too close to the water's edge at the time the Pomors used the site?	FK, 22/08/15
Digital	P1080858	At the end of the fieldwork that day and with probably a long wait for the Ortelius ahead of them, the team sought shelter in one of the 1960s huts and found it to be very cosy. They made a fire in the stove.	FK, 22/08/15
Digital	P1080858	At the end of the fieldwork that day and with probably a long wait for the Ortelius ahead of them, the team sought shelter in one of the 1960s huts and found it to be very cosy. They made a fire in the stove.	FK, 22/08/15

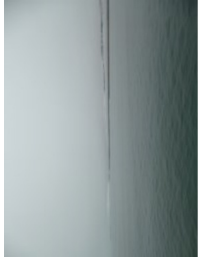
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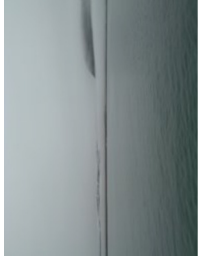
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Digital	P1080860	At the end of the fieldwork that day and with probably a long wait for the Ortelius ahead of them, the team sought shelter in one of the 1960s huts and found it to be very cosy. They made a fire in the stove.	FK, 22/08/15



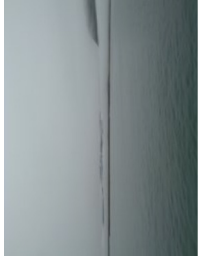
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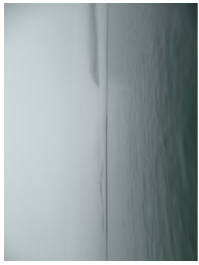
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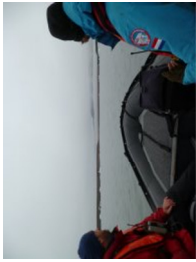
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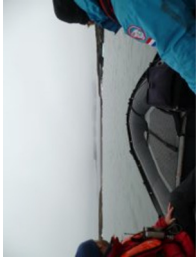
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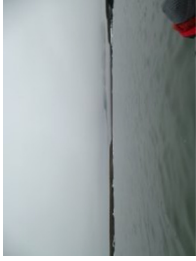
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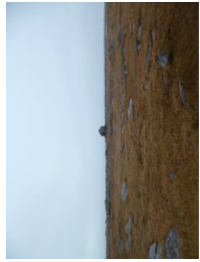
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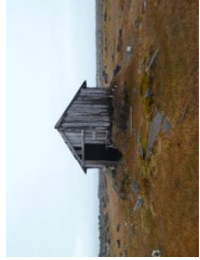
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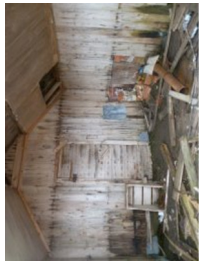
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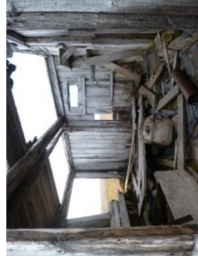
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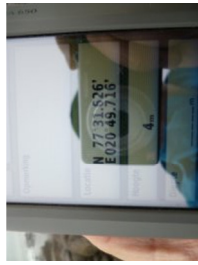
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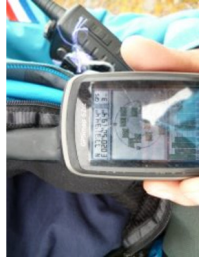
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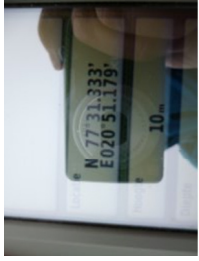
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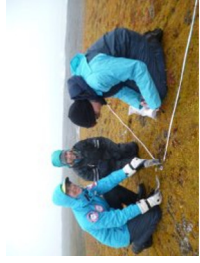
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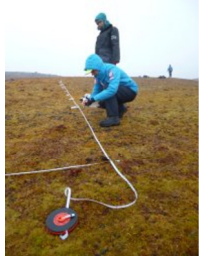
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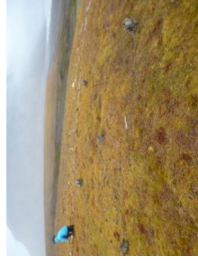
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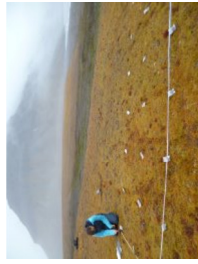
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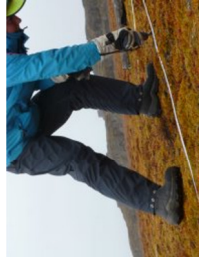
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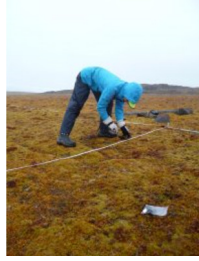
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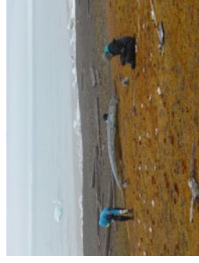
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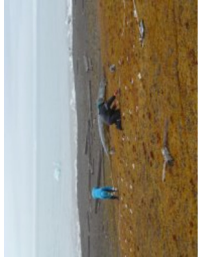
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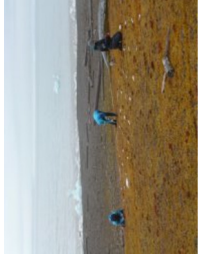
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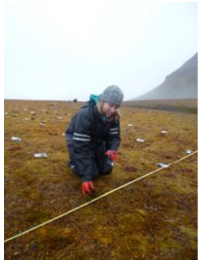
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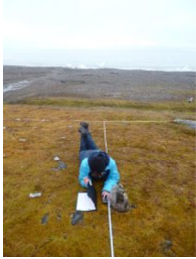
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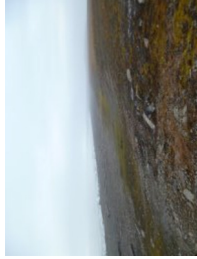
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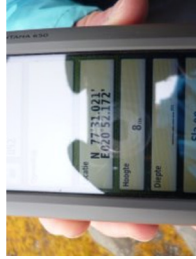
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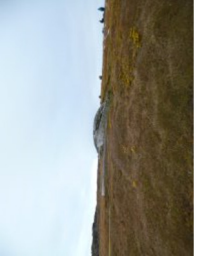
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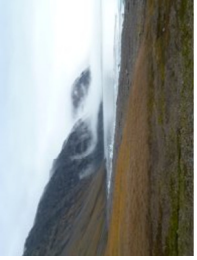
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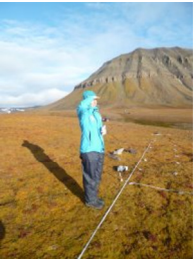
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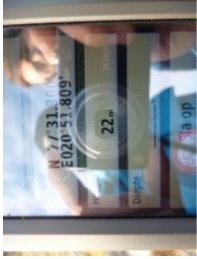
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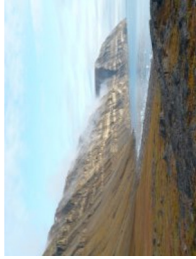
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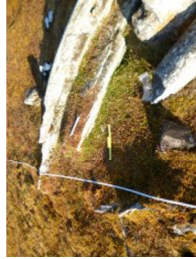
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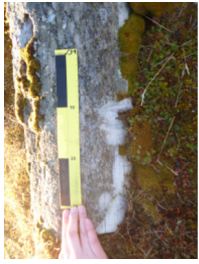
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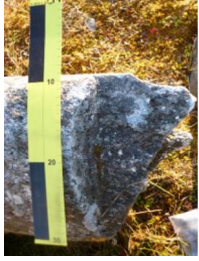
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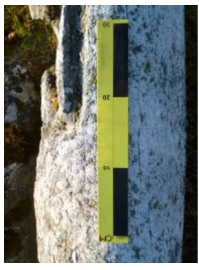
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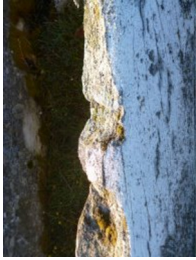
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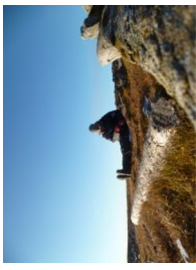
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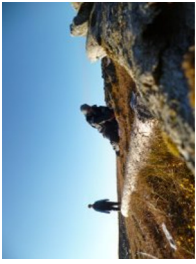
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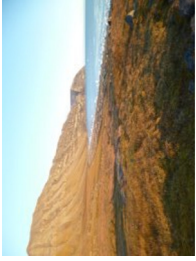
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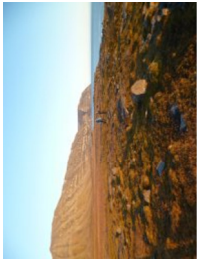
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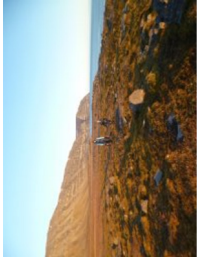
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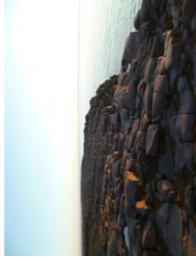
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Digital	P1080943	View from the sea towards the Pomor hut site in Kraussbukta (Askeladden ID 92829), calm but overcast, mist along the cost, Årdalsnuten to centre right, looking E	FK, 25/08/15
Digital	P1080944	View from the sea towards the Pomor hut site in Kraussbukta (Askeladden ID 92829), calm but overcast, mist along the cost, Årdalsnuten to centre right, looking E	FK, 25/08/15
Digital	P1080945	View from the sea towards the Pomor hut site in Kraussbukta (Askeladden ID 92829), calm but overcast, mist along the cost, Årdalsnuten to centre right, looking E	FK, 25/08/15
Digital	P1080946	View from the sea towards the Pomor hut site in Kraussbukta (Askeladden ID 92829), calm but overcast, mist along the cost, Årdalsnuten to centre right, looking E	FK, 25/08/15
Digital	P1080947	View from the sea towards the Pomor hut site in Kraussbukta (Askeladden ID 92829), calm but overcast, mist along the cost, Årdalsnuten to centre right, looking E	FK, 25/08/15
Digital	P1080948	Landing at the beach below the Pomor hut was not possible due to ice; the reconnaissance zodiac investigated the mouth of Habenichtbukta, looking into Habenichtbukta E	FK, 25/08/15
Digital	P1080949	Landing at the beach below the Pomor hut was not possible due to ice; the reconnaissance zodiac investigated the mouth of Habenichtbukta, looking into Habenichtbukta E	FK, 25/08/15
Digital	P1080950	Landing at the beach below the Pomor hut was not possible due to ice; the reconnaissance zodiac investigated the mouth of Habenichtbukta, looking into Habenichtbukta E	FK, 25/08/15
Digital	P1080951	Whale bone in Habenichtbukta	FK, 25/08/15
Digital	P1080952	Coordinates of whale bone above	FK, 25/08/15
Digital	P1080953	Hunting station at Svarttangen (Askeladden ID 92880), site may have been in use as early as 1901, but hut is more recent, Askeladden records a wintering in 1969/70, looking W	FK, 25/08/15
Digital	P1080954	Hunting station at Svarttangen (Askeladden ID 92880), site may have been in use as early as 1901, but hut is more recent, Askeladden records a wintering in 1969/70, looking W	FK, 25/08/15
Digital	P1080955	Hunting station at Svarttangen (Askeladden ID 92880), site may have been in use as early as 1901, but hut is more recent, Askeladden records a wintering in 1969/70, looking NW	FK, 25/08/15
Digital	P1080956	Hunting station at Svarttangen (Askeladden ID 92880), site may have been in use as early as 1901, but hut is more recent, Askeladden records a wintering in 1969/70, looking N	FK, 25/08/15
Digital	P1080957	Hunting station at Svarttangen (Askeladden ID 92880), site may have been in use as early as 1901, but hut is more recent, Askeladden records a wintering in 1969/70, looking NE	FK, 25/08/15
Digital	P1080958	Hunting station at Svarttangen (Askeladden ID 92880), site may have been in use as early as 1901, but hut is more recent, Askeladden records a wintering in 1969/70, looking E	FK, 25/08/15
Digital	P1080959	Hunting station at Svarttangen (Askeladden ID 92880), site may have been in use as early as 1901, but hut is more recent, Askeladden records a wintering in 1969/70, looking SE	FK, 25/08/15

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Digital	P1080960	Hunting station at Svarttangen (Askeladden ID 92880), site may have been in use as early as 1901, but hut is more recent, Askeladden records a wintering in 1969/70, looking S	FK, 25/08/15
Digital	P1080961	Hunting station at Svarttangen (Askeladden ID 92880), site may have been in use as early as 1901, but hut is more recent, Askeladden records a wintering in 1969/70, looking SW	FK, 25/08/15
Digital	P1080962	Interior of hunting hut at Svarttangen, note location of interior door and location of stove	FK, 25/08/15
Digital	P1080963	Construction detail of hunting hut at Svarttangen, birch bark used for insulation, eroding embankment next to main door facing land-inward E	FK, 25/08/15
Digital	P1080964	More recent insulation material in the hut at Svarttangen, above the east-facing main door	FK, 25/08/15
Digital	P1080965	Workshop / shed could be reached from exterior door facing S and interior door	FK, 25/08/15
Digital	P1080966	Workshop / shed could be reached from exterior door facing S and interior door	FK, 25/08/15
Digital	P1080967	The last stove used at the hunting hut at Svarttangen, lying outside, no maker's mark	FK, 25/08/15
Digital	P1080968	Interior of hunting hut at Svarttangen, position of stove, bricks do not seem to be whalers' or Pomor bricks	FK, 25/08/15
Digital	P1080969	Whale bone along track to Pomor site	FK, 25/08/15
Digital	P1080970	Coordinates of whale bone above	FK, 25/08/15
Digital	P1080971	Wooden post and supporting stones along track, not a re-used fox trap, note roundness of stones, looking SW	FK, 25/08/15
Digital	P1080973	Coordinates of wooden post above	FK, 25/08/15
Digital	P1080974	Wooden post and supporting stones along track, how weathered would a whalers' or Pomor post be by now? probably not a re-used fox trap, note angularity of stones, looking SW	FK, 25/08/15
Digital	P1080975	Coordinates of wooden post above	FK, 25/08/15
Digital	P1080976	Fox trap, note rounded as well as angular stones, looking SE	FK, 25/08/15
Digital	P1080977	A local high point made of more angular than rounded boulders, looking S	FK, 25/08/15
Digital	P1080978	Two fox traps, angular boulders, a reindeer antler (was it cut?), looking SE	FK, 25/08/15
Digital	P1080979	Coordinates of fox traps above	FK, 25/08/15
Digital	P1080980	A possible fox trap? Semi-rounded boulders	FK, 25/08/15
Digital	P1080981	Coordinates of possible fox trap above	FK, 25/08/15

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Digital	P1080982	First overview of Kraussbukta, from a dolerite outcrop towards Årdalsnuten, landing is made impossible by ice moving about in the surf zone, the foreshore or beach face is partially exposed, the berm crest is marked by brown seaweed, there is some driftwood on the backshore, there is a clear vegetation line to a raised beach covered by mossy tundra, a dolerite outcrop forms a local high point centre left, it is calm and dry, the fog has somewhat lifted but low clouds remain, looking SE	FK, 25/08/15
Digital	P1080983	Landing in Kraussbukta is made impossible by ice in the surf zone all along the coast, the ice belt widens where the current gets traps somewhat where beach meets dolerite outcrop, looking SE	FK, 25/08/15
Digital	P1080984	At the point where beach meets dolerite outcrop, there is seemingly a shift in currents where the ice gets caught up, there no wind, looking W	FK, 25/08/15
Digital	P1080985	Possible fox trap	FK, 25/08/15
Digital	P1080986	Fox trap , note lack of weights	FK, 25/08/15
Digital	P1080987	Coordinates of fox trap above	FK, 25/08/15
Digital	P1080988	View along the raised beach along which the Pomor hut can be found, the place where the stream meets the backshore zone is marked by a thin brown line a little above centre, looking SE	FK, 25/08/15
Digital	P1080989	The backshore zone, some vegetation, driftwood logs, animal bones, presumably walrus vertebrae and ribs, looking SE	FK, 25/08/15
Digital	P1080990	A possible tent ring and the remains of a fox trap as seen from the top of the dolerite outcrop closest to the Pomor hut, stream bed beyond, looking SE	FK, 25/08/15
Digital	P1080991	Stientje van Veldhoven (SV), Hilde de Laat (HL), and Marthe Koeweiden (MK) at the beginning of the soil sampling around the Pomor hut, looking SW	FK, 25/08/15
Digital	P1080992	SV, HD, and MK at the beginning of the soil sampling around the Pomor hut, looking SW	FK, 25/08/15
Digital	P1080993	Thick mossy tundra covers the remains of the Pomor hut, step 1 for soil sampling was to cut a square out a square of the width of the trowel (~5cm) at each sampling point	FK, 25/08/15
Digital	P1080994	Step 2 was to lift out a wad of tundra moss / soil	FK, 25/08/15
Digital	P1080995	Step 3 was to cut off a piece of the very organic-rich deposit at a depth of ~5cm and bag that	FK, 25/08/15
Digital	P1080996	SV and HD taking soil samples at intervals of 1m	FK, 25/08/15
Digital	P1080997	Without a corer to investigate the archaeological layers it was very difficult to decide at which horizon to sample, away from the actual hut we tested the soil profile, the organic-rich deposit was at least 10cm thick and gave no indicate of the Pomor horizon, we decided to keep sampling at 5cm	FK, 25/08/15
Digital	P1080998	SV and MK testing the soil profile, the corner post in the background indicates the distance form the hut (>4m)	FK, 25/08/15

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Digital	P1080999	SV and MK testing the soil profile to a depth of ~10cm	FK, 25/08/15
Digital	P1090001	SV and MK testing the soil profile	FK, 25/08/15
Digital	P1090002	The remains of the Pomor hut marked by four corner posts, looking SE	FK, 25/08/15
Digital	P1090003	In side the Pomor hut, the probably remains of an oven as suggested by stones and esp. bricks	FK, 25/08/15
Digital	P1090004	The soil sampling in progress, on this calm day, plastic bags could be left in place, marking the squares in the grids, looking SE	FK, 25/08/15
Digital	P1090005	An undefined stone setting between the Pomor hut and the stream bed	FK, 25/08/15
Digital	P1090006	Two whale bones (lower jaw), a wooden log, and presumably another whale bone (lower jaw) completely covered in vegetation immediately west of the Pomor hut, western corner post visible, looking NW	FK, 25/08/15
Digital	P1090007	SV, MK, and HL at the beginning of the fourth transect of the phosphate survey, the fifth will lead long the SE wall of the Pomor hut, after which the interior of the hut will not be sampled, looking E	FK, 25/08/15
Digital	P1090008	HL labelling plastic bags	FK, 25/08/15
Digital	P1090009	SV taking soil samples, note the dolerite outcrop and local high point in the background, looking NE	FK, 25/08/15
Digital	P1090010	SV taking soil samples, note the dolerite outcrop and local high point in the background, looking NE	FK, 25/08/15
Digital	P1090011	SV taking soil samples, note the boulders and log behind her, note the dolerite outcrop and local high point in the background, looking NE	FK, 25/08/15
Digital	P1090012	Immediately to the west of the hut are three whale bones (lower jaws), a smaller piece of whale bone, and a log, note the rich vegetation around the bones, the sampling grid was laid out in such a way as to investigate the effect of the bones on the soil phosphate content, note the dolerite outcrop in the background, looking NE	FK, 25/08/15
Digital	P1090013	SV and HL taking soil samples, whale bones, driftwood, ice in the surf zone, looking W	FK, 25/08/15
Digital	P1090014	Soil sampling in progress, looking W	FK, 25/08/15
Digital	P1090015	Soil sampling in progress, looking W	FK, 25/08/15
Digital	P1090016	Soil sampling in progress, looking W	FK, 25/08/15
Digital	P1090017	Soil sampling in progress, looking W	FK, 25/08/15
Digital	P1090018	HL taking soil samples	FK, 25/08/15
Digital	P1090019	HL taking soil samples, the fifth row is parallel to the western wall of the Pomor hut, the sixth row will avoid the interior of the hut	FK, 25/08/15

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Digital	P1090020	MK taking GPS coordinates of the corner posts and other prominent features, behind her a view of the beach below the hut, the stream water disappearing into the beach deposits centre left, looking SW	FK, 25/08/15
Digital	P1090021	MK employing the GPS	FK, 25/08/15
Digital	P1090022	MK employing the GPS	FK, 25/08/15
Digital	P1090023	SV and HL taking soil samples, MK employing the GPS, top right Ronald Visser (RV) is keeping bear watch, looking NE	FK, 25/08/15
Digital	P1090024	SV and HL taking soil samples, MK employing the GPS, top right Ronald Visser (RV) is keeping bear watch, looking NE	FK, 25/08/15
Digital	P1090025	Section of the stream very near its mouth where a water sample was taken (bottle centre bottom) for other researchers, note the dep stream channel, looking NE	FK, 25/08/15
Digital	P1090026	coordinates of water sample above	FK, 25/08/15
Digital	P1090027	RV keeping bear watch, note how much flat tundra lay at the back of the Pomor hut, looking NE	FK, 25/08/15
Digital	P1090094	Ice along the shore, looking NW	FK, 25/08/15
Digital	P1090095	Ice along the shore and in the surf zone, looking NE	FK, 25/08/15
Digital	P1090096	Looking back along the beach in the direction of the Pomor hut, a sequence of backshore with driftwood, former berm and vegetation line, vegetated raised beach, former berm, raised beach above, looking NW	FK, 25/08/15
Digital	P1090097	View from a raised beach down onto newer vegetation and the present backshore with driftwood, looking NW	FK, 25/08/15
Digital	P1090098	Point where the beach in Kraussbukta meets the slopes of Årdalsnuten, looking SE	FK, 25/08/15
Digital	P1090099	Possible fox trap	FK, 25/08/15
Digital	P1090100	Coordinates of possible fox trap above	FK, 25/08/15
Digital	P1090101	Possible fox trap, note rounded boulders	FK, 25/08/15
Digital	P1090102	Coordinates of possible fox trap above	FK, 25/08/15
Digital	P1090103	View along the raised beach towards the Pomor hut near the dolerite outcrop, looking NW	FK, 25/08/15
Digital	P1090104	Whale bone (skull) covered in vegetation on the raised beach	FK, 25/08/15
Digital	P1090105	Unidentified wooden construction, not in relation to any other structures, artefacts, or ecofacts	FK, 25/08/15
Digital	P1090106	Unidentified wooden construction, not in relation to any other structures, artefacts, or ecofacts	FK, 25/08/15
Digital	P1090107	Unidentified wooden construction, not in relation to any other structures, artefacts, or ecofacts	FK, 25/08/15

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Digital	P1090108	Possible fox trap, note the rounded boulders	FK, 25/08/15
Digital	P1090109	Overview of the beach from the raised beach, looking SE	FK, 25/08/15
Digital	P1090110	Overview of the beach from the raised beach, possible fox trap, looking NW	FK, 25/08/15
Digital	P1090111	Looking along the raised beach towards the Pomor hut, the stream channels is marked as a dark line, our field equipment is in the centre, the whale jaw bones are a little centre left, note the possible fox trap bottom left, looking NW	FK, 25/08/15
Digital	P1090112	Coordinates of fox trap above	FK, 25/08/15
Digital	P1090113	Wide stream bed, could it have been washed out by the sea? Is the Pomor hut beyond threatened by erosion? Looking NW	FK, 25/08/15
Digital	P1090114	Wide stream bed, could it have been washed out by the sea? Looking NE	FK, 25/08/15
Digital	P1090115	Upper northern edge of stream bed, no Pomor artefacts or anything else of immediate interests to archaeology or historical ecology was found to be eroding out of the side, looking NW	FK, 25/08/15
Digital	P1090116	Upper northern edge of stream bed, no Pomor artefacts or anything else of immediate interests to archaeology or historical ecology was found to be eroding out of the side, are the cobbles rounded?	FK, 25/08/15
Digital	P1090117	Flowers growing downslope from the whale bones next to the Pomor hut, looking NE	FK, 25/08/15
Digital	P1090118	Meanwhile, the fog and low clouds had almost cleared, calm and beautiful evening, looking SE	FK, 25/08/15
Digital	P1090119	Calm weather, perfect fieldwork conditions, looking NW	FK, 25/08/15
Digital	P1090120	MK taking field notes, view of Kraussbukta, looking SE	FK, 25/08/15
Digital	P1090121	MK taking field notes, view of Kraussbukta, looking SE	FK, 25/08/15
Digital	P1090122	MK taking field notes, view of MK taking field notes, view of Årdalsnuten with dolerite sills, looking E	FK, 25/08/15
Digital	P1090123	View of phosphate survey in Kraussbukta, looking SE	FK, 25/08/15
Digital	P1090124	MK taking field notes and HL taking soil samples, looking SE	FK, 25/08/15
Digital	P1090125	SV enjoying the view, looking SE (no, not SV, the photographer is looking SE)	FK, 25/08/15
Digital	P1090126	RV doing what hobby photographers do	FK, 25/08/15
Digital	P1090127	Overview of Kraussbukta, Pomor site marked by three blue coats, looking SE	FK, 25/08/15
Digital	P1090128	Årdalsnuten, on its top are supposed to be archaeological remains of expeditions, looking SE	FK, 25/08/15
Digital	P1090129	Overview of Kraussbukta, Pomor site marked by three blue coats, looking SE	FK, 25/08/15

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B/W or C/P or C/S or Digital	Film No / Shot No e.g. (1/2)	Location, Main Feature/s, Scale/s, Orientation, Remarks (e.g. weather, lighting conditions, bracketing)	Date & Initials
Digital	P1090130	View from the dolerite outcrop (local high point) towards the fresh water lake marked on the map, looking N	FK, 25/08/15
Digital	P1090131	Possible fox trap in dolerite outcrop, reindeer in the distance, looking N	FK, 25/08/15
Digital	P1090132	Coordinates of possible fox trap above	FK, 25/08/15
Digital	P1090133	SV enjoying the quiet and the view, a reindeer, looking NE	FK, 25/08/15
Digital	P1090134	SV enjoying the quiet and the view, a reindeer, looking NE	FK, 25/08/15
Digital	P1090135	HL and MK enjoying the quiet and the view, looking E	FK, 25/08/15
Digital	P1090136	HL and MK enjoying the quiet and the view, looking E	FK, 25/08/15
Digital	P1090137	Kraussbukta and Årdalsnuten, looking SE	FK, 25/08/15
Digital	P1090138	Although the dolerite outcrop is a local high point rising above the Pomor site, it is level with the tundra at the back, Årdalsnuten, looking SE	FK, 25/08/15
Digital	P1090139	SV, RV, HL, and MK during 5 minutes of silence, looking N	FK, 25/08/15
Digital	P1090140	SV, RV, HL, and MK during 5 minutes of silence, looking N	FK, 25/08/15
Digital	P1090141	Completing the phosphate survey, HL sampling around the whale bones at the Pomor hut, by now we are sampling at both 5cm deep and 10cm deep to test the effect of the bones, looking NE	FK, 25/08/15
Digital	P1090142	Close-up of the vegetation just downslope from the whale bones, scale 30cm.	FK, 25/08/15
Digital	P1090143	Close-up of vegetation and whale bones, scale 30cm.	FK, 25/08/15
Digital	P1090144	Close-up of vegetation and whale bones, scale 30cm.	FK, 25/08/15
Digital	P1090145	Close-up of vegetation and whale bones, scale 30cm.	FK, 25/08/15
Digital	P1090146	Close-up of vegetation and whale bones, scale 30cm.	FK, 25/08/15
Digital	P1090147	Close-up of vegetation and whale bones, scale 30cm.	FK, 25/08/15
Digital	P1090148	Close-up of vegetation and whale bones, scale 30cm.	FK, 25/08/15
Digital	P1090149	Close-up of vegetation and whale bones.	FK, 25/08/15
Digital	P1090150	Close-up of cut marks on whale bone, scale 30cm.	FK, 25/08/15
Digital	P1090151	Close-up of cut marks on whale bone, scale 10cm.	FK, 25/08/15
Digital	P1090152	Close-up of cut marks on whale bone, scale 30cm.	FK, 25/08/15
Digital	P1090153	Close-up of cut marks on whale bone, scale 30cm.	FK, 25/08/15

PHOTOGRAPHIC INDEX			
Site: Edgeøya, Kraussbukta EKR15			
B/W or C/P or C/S or Digital	Film No / Shot No e.g. (1/2)	Location, Main Feature/s, Scale/s, Orientation, Remarks (e.g. weather, lighting conditions, bracketing)	Date & Initials
Digital	P1090154	Close-up of cut marks on whale bone, scale 30cm.	FK, 25/08/15
Digital	P1090155	Close-up of cut marks on whale bone, scale 30cm.	FK, 25/08/15
Digital	P1090156	Close-up of cut marks on whale bone.	FK, 25/08/15
Digital	P1090157	Close-up of cut marks on whale bone, scale 30cm.	FK, 25/08/15
Digital	P1090158	HL completing the phosphate survey, looking SE.	FK, 25/08/15
Digital	P1090159	HL completing the phosphate survey, looking SE.	FK, 25/08/15
Digital	P1090160	HL completing the phosphate survey, looking SE.	FK, 25/08/15
Digital	P1090161	Looking back on Kraussbukta in the evening, clear sky, warm and calm, looking SE.	FK, 25/08/15
Digital	P1090162	Looking back on Kraussbukta in the evening, clear sky, warm and calm, looking SE.	FK, 25/08/15
Digital	P1090163	Fox trap, angular boulders.	FK, 25/08/15
Digital	P1090164	Coordinates of fox trap above	FK, 25/08/15
Digital	P1090165	Walking back from Kraussbukta to Habenichtbukta, our track was determined by wet tundra, looking SE.	FK, 25/08/15
Digital	P1090166	Walking back from Kraussbukta to Habenichtbukta, our track was determined by wet tundra, looking SE.	FK, 25/08/15
Digital	P1090167	Break at the beacon at Svarttangen.	FK, 25/08/15
Digital	P1090168	Break at the beacon at Svarttangen.	FK, 25/08/15
Digital	P1090169	Break at the beacon at Svarttangen.	FK, 25/08/15
Digital	P1090170	Break at the beacon at Svarttangen.	FK, 25/08/15
Digital	P1090171	Calm condition in Habenichtbukta where the team would be picked up, note the rounded rocks, looking NE.	FK, 25/08/15
Digital	P1090172	Calm condition in Habenichtbukta where the team would be picked up, note the rounded rocks, Ortelius on the horizon, if the captain had been able to come closer to shore he would have done, looking SW.	FK, 25/08/15



P1090196.JPG



P1090197.JPG



P1090198.JPG



P1090199.JPG



P1090200.JPG



P1090201.JPG



P1090202.JPG



P1090203.JPG



P1090204.JPG



P1090205.JPG



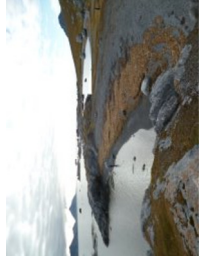
P1090206.JPG



P1090207.JPG



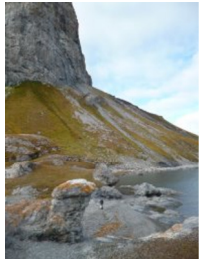
P1090208.JPG



P1090209.JPG



P1090210.JPG



P1090211.JPG



P1090212.JPG



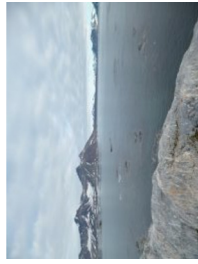
P1090213.JPG



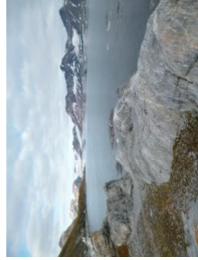
P1090214.JPG



P1090215.JPG



P1090216.JPG



P1090217.JPG



P1090218.JPG



P1090219.JPG



P1090220.JPG



P1090221.JPG



P1090222.JPG



P1090223.JPG



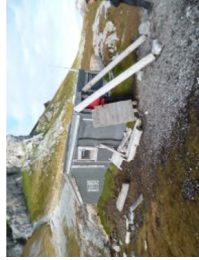
P1090224.JPG



P1090225.JPG



P1090226.JPG



P1090227.JPG



P1090228.JPG



P1090229.JPG



P1090230.JPG



P1090231.JPG



P1090232.JPG



P1090233.JPG

PHOTOGRAPHIC INDEX			
Site: Spitsbergen, Gnålodden			
B/W or C/P or C/S or Digital	Film No / Shot No e.g. (1/2)	Location, Main Feature/s, Scale/s, Orientation, Remarks (e.g. weather, lighting conditions, bracketing)	Date & Initials
Digital	P1090196	On board Ortelius at Gnålodden, view towards Bogstranda and Fannytoppen (390m), some cloud, a little wind, looking W	FK, 25/08/15
Digital	P1090197	Remains of a Pomor hut (Askeladden ID 138481) at Gnålodden, view towards Gravodden, looking S	FK, 25/08/15
Digital	P1090198	Remains of a Pomor hut (Askeladden ID 138481) at Gnålodden, view towards a small landing beach and across Hornsund towards Reischachtoppen and Traunkammen, looking SE	FK, 25/08/15
Digital	P1090199	Remains of a Pomor hut at Gnålodden, view across Austre Burgerbukta towards, Wibebreen, Kruseryggen, and Krusebreen, looking NE	FK, 25/08/15
Digital	P1090200	Remains of a Pomor hut at Gnålodden, view across Austre Burgerbukta towards, Wibebreen, Kruseryggen, and Krusebreen, looking NE	FK, 25/08/15
Digital	P1090201	Detail of Pomor hut, dropwall construction	FK, 25/08/15
Digital	P1090202	Detail of Pomor hut, brick	FK, 25/08/15
Digital	P1090203	Detail of Pomor hut, dropwall construction	FK, 25/08/15
Digital	P1090204	Remains of a Pomor hut at Gnålodden, view towards the foot of Gnalberget, looking W	FK, 25/08/15
Digital	P1090205	Detail of Pomor hut, plank	FK, 25/08/15
Digital	P1090206	View from Pomor hut towards Austre Burgerbukta, few artefacts or ecofacts, looking NE	FK, 25/08/15
Digital	P1090207	To the north of the Pomor hut (see P1090205) a spread of brick rubble (Chochorowski and Jasinski believe this to be the remains of a second hut)	FK, 25/08/15
Digital	P1090208	To the north of the Pomor hut (see P1090205) in the spread of brick rubble small fragments of wood (Chochorowski and Jasinski believe this to be the remains of a second hut)	FK, 25/08/15
Digital	P1090209	View from a local high point over the location of the Pomor hut remains towards Gravodden, beaches between the different rock outcrops, but can they be reached at any state of tide and weather?, view towards the mouth of Hornsund with Hohenlohefjellet at centre left, looking SW	FK, 25/08/15
Digital	P1090210	View from a local high point over the location of the Pomor hut remains towards Gravodden (marked by two rocks to the left of M. Koeweiden), beaches between the different rock outcrops, but can they be reached at any state of tide and weather?, what does the vegetation pattern mean?, view towards the foot of Gnalberget, looking W	FK, 25/08/15
Digital	P1090211	View from a local high point immediately north of Gravodden along the eastern slope of Gnalberget, landing possible at high tide? In calm weather? What would the conditions in winter be? Looking NW	FK, 25/08/15
Digital	P1090212	Gnalberget as seen from Gravodden, were the birds/eggs a resource in summer? What was the attraction of the location in winter, looking NW	FK, 25/08/15

PHOTOGRAPHIC INDEX			
Site: Spitsbergen, Gnålodden			
B/W or C/P or C/S or Digital	Film No / Shot No e.g. (1/2)	Location, Main Feature/s, Scale/s, Orientation, Remarks (e.g. weather, lighting conditions, bracketing)	Date & Initials
Digital	P1090213	Gnalberget, south face, as seen from Gravodden, looking W	FK, 25/08/15
Digital	P1090214	View from a local high point across many visible and submerged rocks and Hornsund towards Körberbreen and Krykkjestupet, the many submerged rocks form a formidable obstacle to boats wanting to land at Gnålodden, looking SE	FK, 25/08/15
Digital	P1090215	View from a local high point over mostly submerged rocks and Emoholmane at the medium distance across Hornsund towards Reischachtoppen (452m) and Traunkammen (444m and 464m), looking SE	FK, 25/08/15
Digital	P1090216	View from a local high point across the mouth of Burgerbukta towards Mariatoppen (482m) and Hyrnefjellet (711m) as well as the low-lying Treskelen, here too many submerged obstacles, looking E	FK, 25/08/15
Digital	P1090217	View from a local high point into Burgerbukta and Austre Burgerbukta, towards Wibebreen and Kruseryggen, the submerged rocks appear to only lie near the shore, deceiving?, looking NE	FK, 25/08/15
Digital	P1090218	View of Gravodden, considering the beach immediately to the NE of Gravodden as a possible landing beach, many submerged rocks would need navigational marks on the shore, sheltered in some weathers but exposed in other wind directions? What about winter? looking SW	FK, 25/08/15
Digital	P1090219	Grave (Askeladden ID 139632) on Gravodden (hence the name), looking across the Pomor site, does the vegetation pattern suggest large storms or a relative sea level drop?, looking N	FK, 25/08/15
Digital	P1090220	Grave on Gravodden	FK, 25/08/15
Digital	P1090221	Grave on Gravodden	FK, 25/08/15
Digital	P1090222	Unidentified stone setting at Gravodden/Gnålodden (a navigation mark?)	FK, 25/08/15
Digital	P1090223	View from the Pomor site along the north side of Gravodden and along another possible landing beach, same questions about accessibility under different conditions, looking in the direction of a hunter's hut (Askeladden ID 99362, not visible), looking SW	FK, 25/08/15
Digital	P1090224	The archaeological team looked out for animal bones and other ecofacts, hardly any were found, Kruse made this picture of two small bones in the vicinity of the Pomor hut, tidied up?!	FK, 25/08/15
Digital	P1090225	Hunter's hut at Gnålodden, photo taken in a hurry, some bones, looking WSW	FK, 25/08/15
Digital	P1090226	Hunter's hut at Gnålodden, photo taken in a hurry, some bones, looking W	FK, 25/08/15
Digital	P1090227	Hunter's hut at Gnålodden, photo taken in a hurry, looking NE	FK, 25/08/15
Digital	P1090228	Hunter's hut at Gnålodden, photo taken in a hurry, looking E	FK, 25/08/15
Digital	P1090229	The archaeological team looked out for animal bones and other ecofacts, hardly any were found, Kruse made this picture of a small bone in the vicinity of the hunter's hut, tidied up?!	FK, 25/08/15

PHOTOGRAPHIC INDEX

Site: Spitsbergen, Gnålodden

B/W or C/P or C/S or Digital	Film No / Shot No e.g. (1/2)	Location, Main Feature/s, Scale/s, Orientation, Remarks (e.g. weather, lighting conditions, bracketing)	Date & Initials
Digital	P1090230	Hunter's hut at Gnålodden, photo taken in a hurry, looking E	FK, 25/08/15
Digital	P1090231	Detail of pile of bricks at hunter's hut at Gnålodden	FK, 25/08/15
Digital	P1090232	SEES expedition members leaving Gnålodden at yet another possibly landing site, the tide had gone out, making the arrival site unusable due to submerged rocks, looking S	FK, 25/08/15
Digital	P1090233	SEES expedition members leaving Gnålodden at yet another possibly landing site, the tide had gone out, making the arrival site unusable due to submerged rocks, looking S	FK, 25/08/15

APPENDIX 3

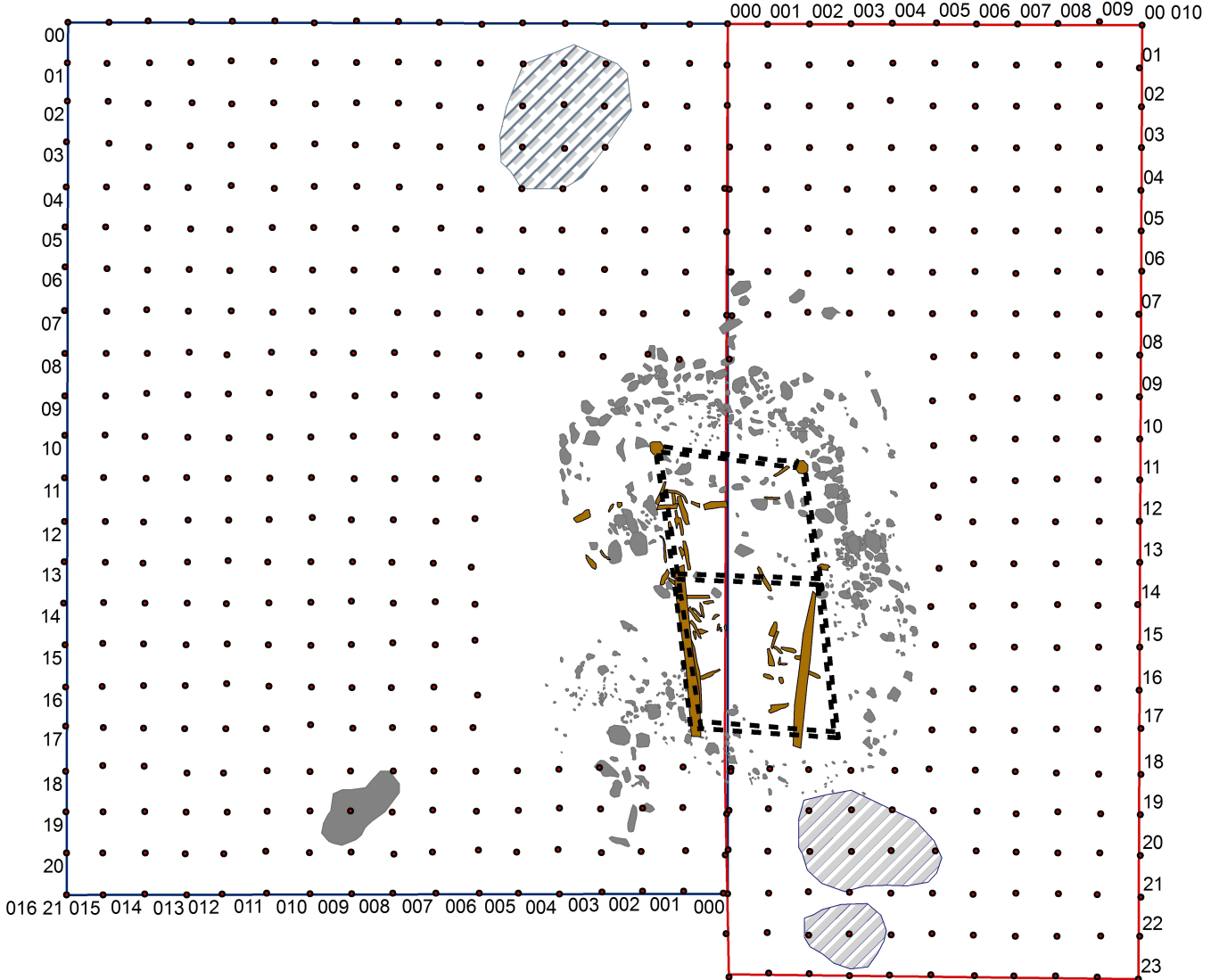
Results Dolerittneset









Map phosphate survey

Map vegetation cover

Map animal bone surface
scatter

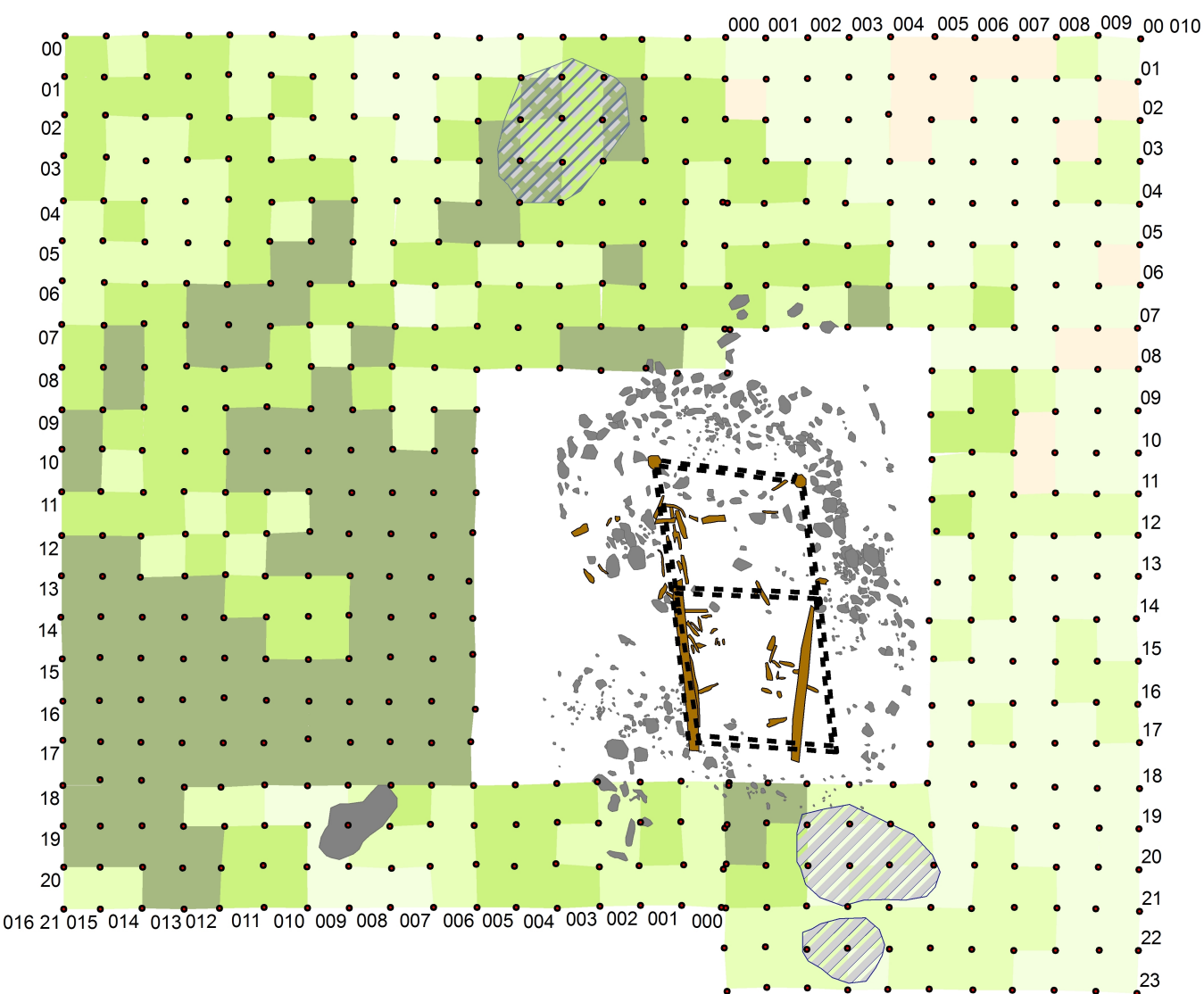
Map vegetation cover and
animal bone scatter



-  Pomor hut
-  structural wood
-  stone
-  Pomor midden
-  excavation spoil
-  grid I
-  grid II
-  soil sample



5 meter



Pomor hut



structural wood



stone



Pomor midden



excavation spoil

• soil sample

0% (no vegetation)

1%-25% (low density)

26%-50% (medium density)

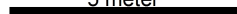
51%-75% (high density)

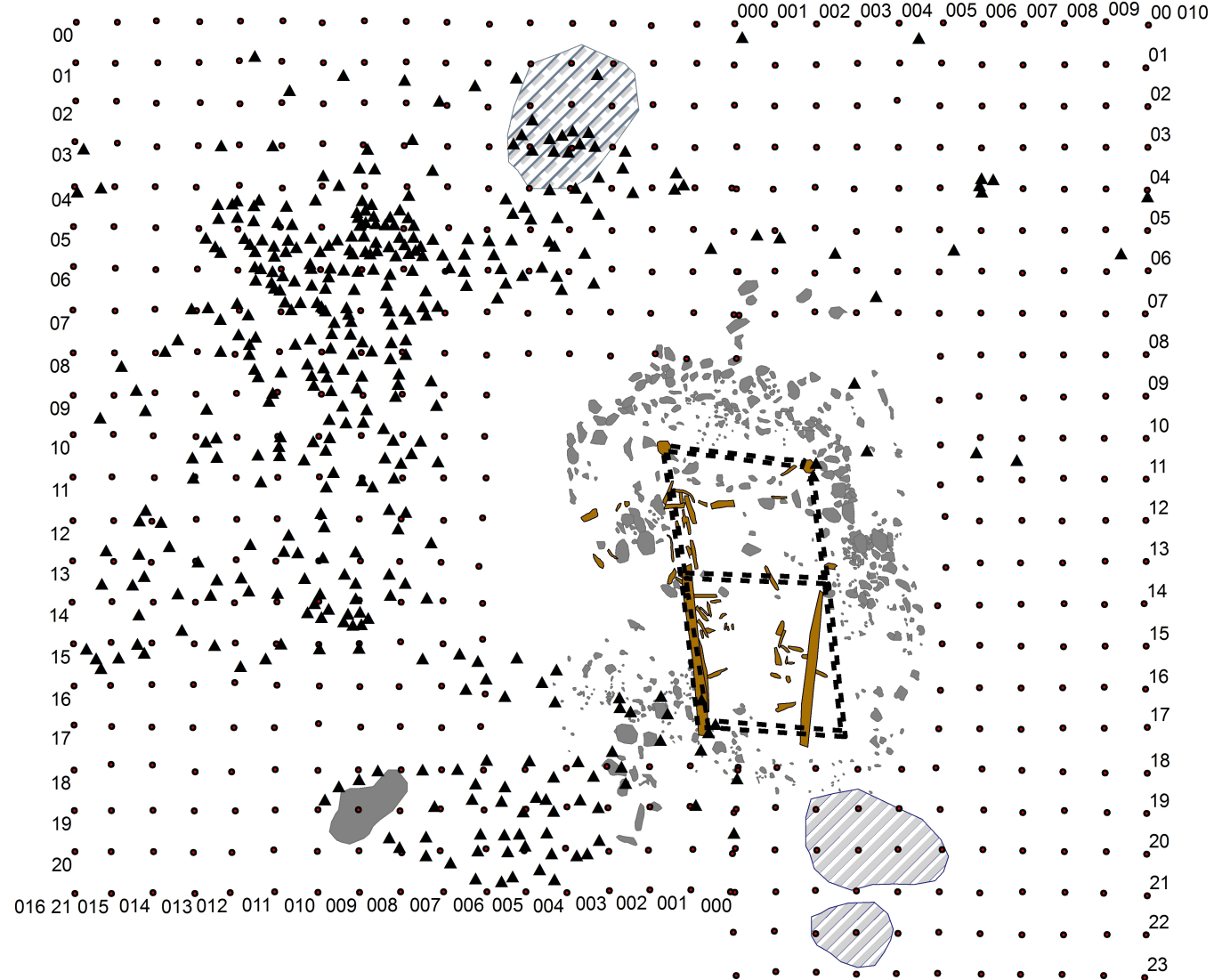
76%-100% (very high density)

N



5 meter





Pomor hut



structural wood



stone



Pomor midden



excavation spoil



soil sample



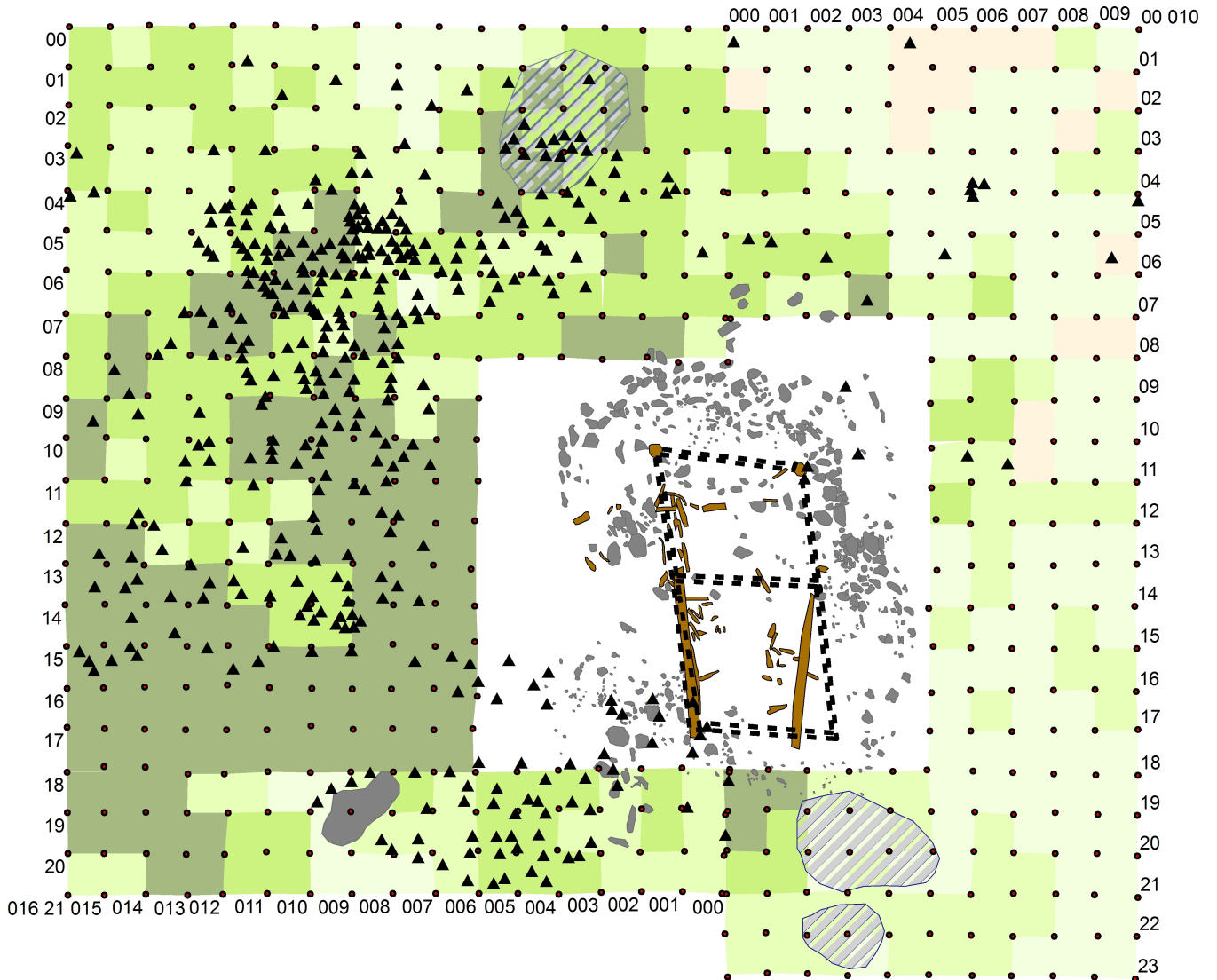
bone

N



5 meter





Pomor hut



structural wood



stone



Pomor midden



excavation spoil

• soil sample

▲ bone

0% (no vegetation)

1%-25% (low density)

26%-50% (medium density)

51%-75% (high density)

76%-100% (very high density)

N

5 meter

APPENDIX 4

Results Kraussbukta

Map archaeological
landscape

Map walrus skull surface
scatter

Map phosphate survey

Årdalstangen

Habenichtbukta

Svarttangen

Årdalselva

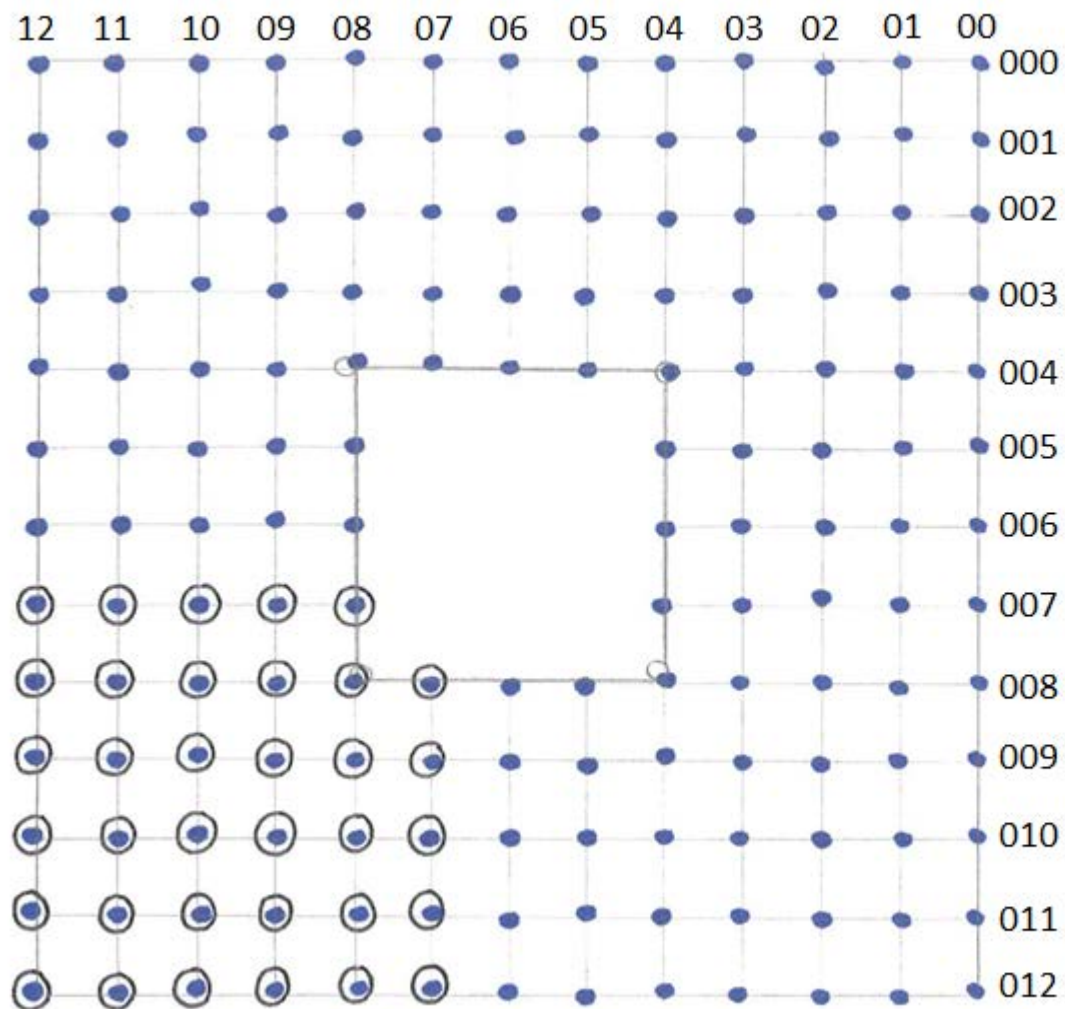
Kraussbukta

250

500 m







APPENDIX 5

Interdisciplinary fieldwork

Archaeology and interdisciplinary sampling and analysis

What we can do ourselves:

- **BASIC ARCHAEOLOGICAL SURVEY:** site and landscape descriptions, digital photography, dGPS survey, sketching/drawing
- **ANIMAL BONES:** visually inspecting animal bone assemblages at the surface, digital photography of indicative features, dGPS survey
- **VEGETATION:** visually inspecting plant communities, digital photography of indicative features, collection of samples, dGPS survey (supported by Maarten Loonen, Arctic Centre)
- **DRIFTWOOD:** taking wood cores (supported by Andre van Holk, GIA)
- **METAL DETECTING**
- **GEOCHEMICAL SURVEY:** setting out the grids and collecting small soil samples (supported by Adri Ufkes, GIA)
- **WATER SAMPLES:** collecting water samples of freshwater lakes
- **COMMUNITY ARCHAEOLOGY:** involving the scientific community and the tourists in the visual inspection of surface finds and features
- **ARCHAEOLOGY AT RISK:** collecting vulnerable and/or exceptionally valuable surface finds and deliver them to the Svalbard Museum

Where we need help and why:

- **ANIMAL BONES:** identifying suitable 'historical' animal bones for DNA analysis, collecting these bones or taking appropriate samples, DNA analysis – *a comparison of animal DNA from archaeological sites and recent examples may give an indication of the effect of hunting on animal populations*
- **VEGETATION:** identifying introduced species on archaeological sites, DNA analysis – *it is possible that some species were introduced by humans as early as 400 years ago (although introduction may to some degree be ongoing); it would be interesting to see if grasses in particular have genetically diversified*
- **METAL DETECTING:** this may be labour-intensive and some scientists/passengers may be willing to help (community archaeology)
- **GEOCHEMICAL SURVEY:** this may be labour-intensive and some scientists/passengers may be willing to help (community archaeology)
- **SEDIMENT CORES:** taking sediment cores from freshwater lakes (and coastal zones?) near archaeological sites, analysis – *layers within the cores (organic material, diatoms, phosphates) may give an indication of human occupation in the vicinity; the resolution should address the last 400 years*
- **PEAT CORES:** taking peat cores near archaeological sites – *the pollen record may give an indication of human occupation in the vicinity; the resolution should address the last 400 years*
- **ARCHAEOLOGY AT RISK:** since the archaeologists will not be able to visit everywhere themselves, scientists and tourists could help identify 'archaeology at risk'

APPENDIX 6

Community archaeology

Archaeology Pitch

- We perceive the Arctic as a pristine wilderness, but is this still the case for Spitsbergen?
- Humans arrived on Spitsbergen in the 16th century. What was their impact on Edgeøya?
- Archaeologists can reconstruct the human impact on Edgeøya using material remains as well as written sources.
- We want to move away from investigating individual archaeological sites such as hunting stations to studying the Arctic landscape they are situated in.
- We intend to conduct a pilot study of using phosphate survey under Arctic conditions in order to distinguish areas of different past activities, for example, the processing of animals.

ALLEEN VOOR SEES WETENSCHAPPERS (ivm verzekering)

Maak het waar:

ARCHEOLOOG VOOR EEN DAG!

Tijdens de SEES expeditie hebben jullie de kans om mee te doen aan het archeologisch onderzoek van het Arctisch Centrum (RUG, Groningen). Samen zoeken wij naar sporen van russische walrus jagers, de Pomoren, van de 18^{de} en 19^{de} eeuw.

Geef je nu op en let op de plannen voor de volgende dagen.

DATE	VERWACHT	NAAM	ORGANISATIE	KAMER
24.08.2015		1.	1.	1.
		2.	2.	2.
		3.	3.	3.
		4.	4.	4.
25.08.2015		1.	1.	1.
		2.	2.	2.
		3.	3.	3.
		4.	4.	4.
26.08.2015		1.	1.	1.
		2.	2.	2.
		3.	3.	3.
		4.	4.	4.

Onze veldwerkplannen zijn sterk afhankelijk van de dagelijkse omstandigheden – wees dus flexibel. Ook gaan we niets opgraven.

Vragen? De archeologen (Frigga, Sarah en Marthe) zijn de vinden op openbare plekken of in kamer 428.

ARCHEOLOOG VOOR EEN DAG!

Let op! Ivm met verzekering mogen de **SEES wetenschappers** altijd met Frigga (externe wapendrager) mee. De **Arctic Academy** mag alleen mee, als er een Oceanwide gids bij is. Zodra we weten hoeveel belangstelling er is, weten we hoe we de groepen kunnen indelen. Dus geef je op.

[illegible]

APPENDIX 7

Publicity and outreach



Met een klein slangetje diertjes opzuigen



Oorzwammen



Diertjes uit het net zuigen



De slachtoffers gaan een buisje met alcohol in



Walrusbotten bij Kapp Lee



Walrussen



Op de uitkijk

Spitsbergen Een Nederlandse expeditie bezoekt het Poolgebied. „We moeten niet aan de zijlijn blijven toekijken.”

Tekst en Foto's **Nienke Beintema**

Aankomst per rubber **motorboot**

De witte stip blijkt wel degelijk een ijsbeer

Heel zachtjes glijden we met de rubberen motorboot tussen de ijsbrokken door, over het spiegelgladde water. Zodra de boot met de punt het kiezelstrand raakt, springt onderzoeksleider Maarten Loonen aan land. Met het geweer over de schouder gaat hij als eerste verkennen of er geen ijsbeer achter een richel verscholen zit. De kust is veilig: we kunnen aan land. Met de laarzen door het water.

Met elf man zijn we afgezet aan het begin van het prachtige Rosenbergdal. Zwarte kliffen torenen uit boven een groene vallei met een meanderende rivier. Hier gaan wij een hele dag veldwerk doen: vegetatie karteren en insecten zoeken. We halen net de laatste spullen uit de rubberboot als iemand roept: „Is dat een ijsbeer?” Paniek is er niet, want het witte stipje op de berg is twee kilometer weg. Maar hij kan hier binnen tien minuten zijn, als hij er zin in heeft. Meestal is een beer daarom reden om meteen te vertrekken. Maar is het wel echt een ijsbeer? „Volgens mij is het een rendier.” „Maar beweegt 'ie wel echt?” Tien man staan nu ingespannen door hun verrekijkers te turen. „Blijft er ook wel iemand naar de andere kant kijken?”, vraagt Loonen.

Andere groepjes wetenschappers zijn elders gedropt hier op het eiland Edgeøya, aan de zuidoostkant van

Spitsbergen. Een paar kilometer ten noorden van ons ligt het voormalige Nederlandse onderzoeksstation bij Kapp Lee. Vier Nederlandse biologen hebben daar in 1968 en 1969 veertien maanden gebivakkeerd. Drie van hen zijn nu ook mee met deze expeditie. Het is stralend weer (14 graden Celsius) en windstil. Dat is gunstig, want dan vliegen er relatief veel insecten. Veel meer dan je zou verwachten in dit barre klimaat. Gewapend met een prikkebeen-netje loop ik over de toendra, met het netje vlak boven de grond. Ik vang grote vliegen, kleine mugjes en prachtige, piepkleine wespijjes. Die laatste zijn een halve centimeter groot, glimmend zwart, en ze hebben sierlijke voelsprieten. Ik lever ze in bij onderzoekster Elise Biersma, die ze opzuigt door een slangetje en dan in een buisje met alcohol doet. Opgeofferd voor de wetenschap. Intussen ligt haar collega Stef Bokhorst op zijn buik, met net zo'n slangetje in zijn mond. Onder stenen vindt hij mijten, springstaarten en spinnetjes.

De wetenschappers willen de insecten genetisch onderzoeken. Zijn het dezelfde soorten als aan de warmere westkust van Spitsbergen? En als op Antarctica? Daar is aan deze oostkant nog nooit onderzoek naar gedaan. Nieuwe soorten denken ze niet te vinden - maar wel nieuwe ideeën over de verspreiding van soorten, en over de glaciologische geschiedenis van het noordpoolgebied. Het voorkomen

van dieren en planten, in combinatie met hun genetische diversiteit, vertelt veel over waar het ijs tijdens de ijstijd precies heeft gelegen, en hoe die soorten de kale gebieden daarna weer hebben heroverd. Tijdens het vliegenvangen mag ik niet te ver van de groep afwaken. Maximaal dertig meter mag er tussen mij en het dichtstbijzijnde geweer zitten. Als ik moet plassen, dan moet ik dat melden aan een geweerdrager - ik mag niet zomaar achter een steen verdwijnen - en dan moet dat binnen die dertig meter. Ook als dat in de open toendra is.

Intussen is er een vegetatieteam op pad gegaan. In 1977 hebben biologen hier op verschillende plekken gekeken welke planten er groeiden. Die plekken zijn precies op de kaart ingetekend. Vijf planten- en mossenkenners gaan die plekken nu systematisch af, om te kijken wat er is veranderd. Veertig jaar geleden was het hier een grijze steenmassa, vertelt Mennobart van Eerden, die er toen ook bij was. Nu is het hele dal weelderig groen. Vrijwel overal groeit een dikke laag mos, die veel water vasthoudt. Er groeien ook grassen, korstmossen en allerlei bloemen. Drastisch anders dan in 1977. Klimaatverandering? Het is te vroeg om dat te zeggen, aldus Van Eerden. In elk geval is er iets heel spannends aan de gang, vindt hij. En het is duidelijk dat de

De beweging van het zee-ijs baart ons zorgen. Ons schip is te ver weg voor radiocontact

Arctis steeds in beweging is.

We eindigen de dag bovenaan de klif, met fenomenaal uitzicht. Aan de overkant van de rivier grazen vier rendieren, op een ijsschots liggen twee walrussen te ruziën. De ijsbeer die misschien een rendier was en misschien toch een rots, blijkt nu wel degelijk een ijsbeer te zijn. De lulak heeft de hele dag roerloos op de helling liggen slapen, en loopt nu kalmmpjes naar de baai. Hij springt op een ijsschots en gaat daar weer liggen. Maar we houden hem scherp in de gaten, want voor je het weet is hij in het water verdwenen, en dan kan hij zo hier opduiken.

Vandaag help ik een team van archeologen. We zijn met ons vijven gedropt bij Kapp Lee, op de plek waar de vier Nederlanders destijds overwinterden. Hun hut staat er niet meer, maar nog wel drie kleinere houten hutjes. We zijn hier vandaag om de restanten te onderzoeken van een Russische jagershut uit circa 1760. Deze jagers, of Pomoren, waren uit op walrusvoor en de kostbare huiden van poolvos en ijsbeer. De sporen van hun bloedige werk - en dat van de West-Europeanen die na hen kwamen - zijn hier overal te zien: waar je maar kijkt liggen botten.

Ons schip heeft ons verlaten en vaart nu met de overige onderzoekers naar de overkant van de grote fjord, twee uur varen. Daar gaan ze vogelko-

lonies bezoeken en een weerstation opzetten op een gletsjer. We zijn tot een uur of tien vanavond op onszelf aangewezen. Voor noodgevallen hebben we een walkietalkie en een satelliettelefoon mee. We moeten in de gaten houden of het pakjes dat vannacht massaal vanuit het zuiden is komen aandrijven, niet onze ondiepe baai zal afsluiten van de fjord.

De resten van de Pomorenhut liggen in een vallei tussen twee rotsrichels, achter de houten hutjes. Onderzoekster Frigga Kruse, die het geweer draagt, gaat op verkenning uit. Zij doet vandaag geen onderzoek, want ze loopt steeds rond, op de uitkijk voor ijsberen. Ook houdt ze het oprukkende zee-ijs in de gaten.

Van de Pomorenhut reteren alleen nog de houten hoekpalen, een paar balken en de verhoogde contouren. Noorse archeologen hebben hier al opgravingen gedaan, enkele decennia geleden, vertelt Sarah Dresscher. Daarom liggen er geen voorwerpen meer. Wij zijn hier vandaag om de hut en de omliggende botten nauwkeurig in te tekenen en om bodemonsters te nemen. Dat doen we op zo'n honderd plekken op een nauwkeurig uitgemeten grid. Het fosfaatgehalte in de bodem, zo vertelt Kruse, verraadt of er op die plek organische resten hebben gelegen. Slachtafval, etensresten, uitwerpselen. Die kennis helpt om te ontdekken hoe de jagers leefden. Dagboeken lieten ze niet na.

Al snel komt een koude mist opzetten. Soms is het zicht zo slecht dat het te gevaarlijk is. We lopen daarom terug naar het strand; dan kunnen we meteen kijken of onze rubberboot niet aan het droogvallen is door het afgaand tij. Dan zouden we hem niet snel genoeg in het water kunnen krijgen, mocht er een ijsbeer komen. We maken daarom het touw iets langer - maar ook weer niet te lang, want dan gaat de boot tegen de ijsbrokken aan schuren en dan raakt hij wellicht lek.

VIJFTIG WETENSCHAPPERS EN BEKENDE NEDERLANDERS 10 DAGEN OP NOORDPOOL

De Scientific Expedition Edgeøya Spitsbergen (SEES) is een initiatief van het Arctisch Centrum van de Rijksuniversiteit Groningen, ondersteund door de Nederlandse organisatie voor Wetenschappelijk Onderzoek (NWO). Vijftig wetenschappers uit allerlei disciplines doen tien dagen onderzoek. Er varen ook toeristen mee, pers, kunstenaars en een politica.

De wetenschappers onderzoeken de invloed van menselijke handelen in de poolgebieden. Ze vergelijken bijvoorbeeld de aanwezigheid van planten en dieren met veertig jaar geleden, en doen experimenten om te kij-

De mist is weer opgetrokken, maar nu waait het stevig. Om de beurt rennen we rondjes om warm te blijven. De beweging van het zee-ijs baart ons zorgen. Een breed lint van dicht pakjes drijft nu in hoog tempo onze baai in. Ons schip is te ver weg voor radiocontact. Kruse probeert de satelliettelefoon, maar tevergeefs. Er zit niets anders op dan door te werken. Ook wel mooi, zegt Kruse, dat de natuur weer even laat weten wie er hier de baas is.

Een breed lint van dik pakjes drijft nu in hoog tempo onze baai in

land heeft een grote staat van dienst in het poolonderzoek”, zegt Monique de Vries, voorzitter van de Nederlandse Poolcommissie. „We willen dat graag laten zien en er nu een nieuwe impuls aan geven. Alleen dan kan Nederland werkelijk blijven meepraten over de ontwikkelingen in het poolgebied.” De internationale belangstelling voor het gebied neemt snel toe. Het smelten van het ijs maakt het olie en gas bereikbaar. Dat geeft nu al geopolitieke spanningen. „Nederland moet niet aan de zijlijn blijven toekijken”, zegt De Vries. „Je kunt je betrokkenheid laten zien door relevant en goed onderzoek te blijven doen.”

Na twaalf uur werken vinden we het wel mooi geweest; we zijn koud tot op het bot. Het lint van ijs heeft de baai nu vrijwel helemaal afgesloten. Het is negen uur 's avonds, maar van het schip is nog geen spoor te zien. We besluiten de kachel aan te maken in een van de houten hutjes, en sprokkelen wat afgedankt timmerhout. Dat zijn geen archeologische resten, lacht Kruse, want ze zijn van na de Tweede Wereldoorlog. Al gauw stijgt de temperatuur in de hut van vier naar tien graden: luxe! We denken aan de mannen die hier in 1968 en 69 een lange donkere winter doorbrachten. In het gastenboek, dat dateert uit 1969 en dat nog altijd in gebruik is, lezen we verhalen van gestrande reizigers.

We hebben weer radiocontact! Het schip is onderweg, een uur later dan gepland. Om elf uur 's avonds bereikt het de baai. En het ploegt gewoon door het ijs heen. Blijkbaar is de baai daar nog niet te ondiep. Het lijkt wel of het lint van ijs nu wat verder van de kust ligt dan vanmiddag. Gelukkig maar. We hadden hier best de nacht kunnen doorbrengen, met pinda's en chocola, maar een warme douche aan boord is nu wel zo prettig.

NRC-medewerker Nienke Beintema neemt deel aan de poolreis op uitnodiging en deels op kosten van NWO. Ze doet ook voor NWO verslag van de reis.

Arctische archeologie: met een geweer om de schouder

DVHN | Gepubliceerd op 28 augustus 2015, 12:09 Laatst bijgewerkt op 01 september 2015, 12:26



EDGEØYA - Groningse archeologen van het Arctisch Centrum zoeken tijdens de Nederlandse poolexpeditie in Spitsbergen naar sporen van Russische jagers uit de achttiende en negentiende eeuw. Iedereen aan boord mag meehelpen.

Op de toendra zit D66-politica Stientje van Veldhoven op haar knieën. Om de meter neemt ze een schepje van vijf centimeter diep uit de grond en stopt het onderste laagje in een plastic zakje. Op het zakje schrijft ze, met ijskoude vingers, de coördinaten. Dan schuifelt ze door, langs het meetlint, naar de volgende monsterplek.

Archeoloog voor een dag

Van Veldhoven is archeoloog voor een dag. Ze helpt de Groningse archeologen van het Arctisch Centrum tijdens de SEES-expeditie met hun onderzoek bij de overblijfselen van een hut van Pomoren, Russische jagers die in de achttiende en negentiende eeuw op Spitsbergen zaten.

De politica wordt bewaakt door Frigga Kruse, archeoloog met een geweer om de schouder. Dertien uur lang, van tien uur 's ochtends tot elf uur 's avonds, scant ze de omgeving op ijsberen.

'Fysiek fit en in staat om een geweer te dragen'. Die eisen zullen niet vaak gesteld worden bij een vacature voor een archeoloog. Maar voor een arctisch archeoloog die onderzoek doet op Spitsbergen zijn het noodzakelijke eigenschappen.

729 schepjes grond

De schepjes grond die Van Veldhoven neemt zijn fosfaatmonsters, een techniek die op Spitsbergen nog nauwelijks is toegepast. Mensen en dieren laten met plas, poep en bloed fosfaatsporen na die honderden jaren later terug te vinden zijn. Op Kapp Lee op Edgeøya hebben de archeologen in twee dagen een site van 26 bij 26 meter bemonsterd - dat zijn 729 schepjes grond. Hier op Kraussbukta, ook op Edgeøya, doen ze een stuk van 12 bij 12.

Kruse onderzoekt de menselijke invloed op de ecologie van Spitsbergen, het effect vooral op walvissen, walrussen, ijsberen en poolvossen in de afgelopen vierhonderd jaar. Sarah Dresscher doet promotieonderzoek specifiek naar de Pomoren.

Peter de Grote

Die Pomoren zijn waarschijnlijk naar Spitsbergen gestuurd nadat Peter de Grote in Nederland onder de indruk was geraakt van de walvisvaart. Opgravingen op de plekken waar Pomoren hebben gezeten zijn al decennia geleden gedaan. Maar de Groningse archeologen willen meer weten.

„Als je mij vraagt wat ik de hele dag doe, geef ik je toch ook geen foto van mijn huis?“, zegt Kruse. „Dat is ouderwetse archeologie, alleen kijken naar gebouwen. Wij zoeken sporen van activiteiten.”

Dat kan dus een spoor zijn van een Pomor die even stond te plassen naast de hut, de merg uit een rendierbot zoog of een walrus afslachtte – walvissen waren er door de intensieve vangst in de eeuw daarvoor langs de kusten van Spitsbergen al bijna niet meer te vinden.

Andere disciplines

De SEES-expeditie is voor de Groningse archeologen een bescheiden aanvulling op hun onderzoek. Ze gebruiken de expeditie vooral om contacten te leggen met wetenschappers uit andere disciplines – het netwerken dat een belangrijk achterliggend doel is van expeditieleider Maarten Loonen. „In Nederland ben ik gewend om te werken met paleologen, geologen, biologen”, zegt Dresscher. „Maar hier op Spitsbergen gebeurt dat nog heel weinig omdat er zo veel nationaliteiten werken en iedereen geld krijgt uit andere potjes.”

Daarnaast laten ze zo veel mogelijk mensen meehelpen - ‘community archeology’ heet dat. Doel is het publiek bewust te maken van cultureel erfgoed waar ze vaak onnadenkend overheen lopen. Kruse: „Ik kan het niet allemaal beschermen. Dat moeten de mensen uiteindelijk zelf doen.”

Stientje van Veldhoven, die vroeger altijd archeoloog wilde worden vindt dit, op haar knieën monsters nemend, de mooiste dag van de expeditie.

Meer thermometers voor klimaatverandering

Stientje van Veldhoven is de enige politicus die op de uitnodiging van de SEES-expeditie (Scientific Expedition Edgeøya Svalbard) is ingegaan. Ze is woordvoerder klimaat en duurzaamheid in de Tweede Kamer en dus ook veel bezig met klimaatverandering.

„Je ziet tijdens deze expeditie dat er in vijftig jaar echt al dingen zijn veranderd. De gletsjers zijn kleiner, de vegetatie is anders, de walrussen zijn terug, ijsberen beginnen eieren te eten. Er zijn zo veel meer thermometers voor klimaatverandering dan alleen de zeespiegelstijging. De hele voedselketen verandert. Dat is niet alleen maar slecht – met de rendieren en de ganzen gaat het juist goed – maar het gaat zo snel dat er nauwelijks tijd is voor aanpassing. We kunnen het misschien niet stoppen, maar wel afremmen door de CO₂-uitstoot te beperken en zo het ecosysteem meer tijd te geven om zich aan te passen.’’



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SHUTDOWN!

Store Norske votes to end nearly all mining by next summer, only 100 of 270 workers likely to remain

By MARK SABBATINI
Editor

Store Norske plans to shut down virtually all mining operations and downsize all but 100 employees by next summer following a meeting of the company's board of directors this week.

"The downsizing will hit many hard," said

Analysis: Is Store Norske in its death throes or forcing the government's hand?

icepeople.net

Wenche Ravlo, the company's administrative director, in a prepared statement. "We must ensure that this happens as gently as possible."

The decision comes after a year-long crisis caused primarily by a collapse in coal prices, forcing the company to obtain a 500-million-kroner bailout package from the Norwegian government this year to avoid bankruptcy. The assistance was supposed to ensure Store Norske could continue operating through 2016, but

See SHUTDOWN, page 8



PHOTOS COURTESY OF THE WAGENINGEN RESEARCH CENTER

Dutch biologists, left, examine marine life samples off the coast of Edgeøya while geologists, right, examine a deep meltwater channel in a glacier.

Going Dutch

Researchers return to 'completely different' island 40 years later

By MARK SABBATINI
Editor

When Ko de Korte, 72, first came to Svalbard to study birds in 1966, he and three fellow Dutch students knew they'd be dealing with lots of isolation and a need to be highly self-

dependent. Forty years later he was anything but alone during his observations, but there was still an element of isolation.

"Everyone's looking at their iPads," he said with a laugh.

See RETURN, page 6



SARAH DRESSCHER / RUG AC

Dutch researchers spend "13 hours taking soil samples in the cold," according to a participant.

Time to go to battle?



North Korea:
War rage triples
coal production
Page 2

There's homework?



Bear census
done, but math
just starting
Page 3

Revealing foldout



Why is this guy
taking dirty
pictures?
Page 4

Drug-free high



Recovering
addicts take on
the Arctic
Page 5



ERIC FILPSE



NOS

At left, Paul de Groot, Eric Flipse, Ko de Korte and Piet Oosterveld brave the elements while spending the winter of 1968-69 at a research station on Edgeøya. At right, Korte, center, discusses changes on the island this summer with Oosterveld and Groot, the other surviving members of the expedition.

Familiar site, strange sights

RETURN, from page 1

Korte, now an Arctic programs consultant for Oceanwide Expeditions, was essentially a tribal elder during a large-scale return by the Dutch to Edgeøya to see how things have changed since he spent three years there during the late 1960s, including overwintering in 1968-69. About 55 researchers and roughly an equal number of tourists explored the island and its waters from Aug. 19 to 28 in what is believed to be the largest-ever Dutch expedition in the polar regions.

He said there are vast overall changes, such as previously lush areas now devoid of vegeta-

tion, as well as smaller ones involving the gull colonies he observed.

"I found they're breeding one week earlier," he said, adding he doesn't yet know why.

One huge human-related change is that, despite far more footprints from people on the island, there are far more polar bears than during the 1960s, Korte said.

"At that time there was enormous hunting," he said.

Back then he and his companions were trapping the bears, often with snares, in order to study them. This year, of course, "we don't give them the chance to react because we stay so far

away."

Korte also shot numerous birds during his studies in the 1960s to see what they ate, and the men's diet was carefully rationed with set meal times. Now preservation of wildlife and the environment is carefully regulated, while people are free to indulge in a culinary free-for-all aboard the cruise ship that brought them to Edgeøya.

"The food then tasted better," Korte said. "Quality and taste is subjective. We were very hungry. We were physically very active."

Korte found himself accompanied by about 20 researchers and tourists during his outings this summer to observe the gulls, but he said the companionship wasn't unwelcome.

"It was stimulating because those tourists had to adapt," he said. "It gave a zeal to the trip."

Another advantage: "I felt kind of a relief I didn't have to make so many notes as I did in the past."

The next step for the scientists will be analyzing the data, an intensive process in both the short and long term. Annette Scheepstra, one of the trip's organizers and guides, said researchers from The Netherlands have been coming to Svalbard almost every year since 2007, but this year's long-planned expedition still resulted in surprising findings.

"They expected a change, but what they didn't expect was that it would be completely different," she said.

Scheepstra said they hope to keep visiting the island in future years, but in something a bit more reminiscent of the old days, with fewer participants staying for a longer time doing more detailed research.

Blogs, videos and other information about the expedition are available at <http://sees.nl>. **There's more! Visit www.icepeople.net for the complete story.**



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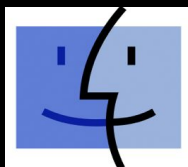
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Selvsyn ga økt budsjett



ARKEOLOG FOR EN DAG: Den nederlandske toppolitikeren Stientje van Veldhoven (t.v.) fikk være arkeolog for en dag på Edgeøya. Her sammen med sosiolog Hilde de Laat og arkeolog Marthe Koeweiden i Kraussbukta. FOTO: FRIGGA KRUSE

Nederlandsk toppolitiker var blant de som selv fikk grave i pomorhistorien på Edgeøya.

» Christopher Engås

■ Nederland har alltid hatt en høy profil på Spitsbergen, og engasjementet på øya er fortsatt tilstede. I august ble den såkalte SEES-ekspedisjonen (Scientific Expedition Edgeøya Spitsbergen) gjennomført.

– I tillegg til vitenskapsfolk som meg selv, hadde vi med oss turister og politikere. Turens formål var primært å studere nærmere restene av pomorenes aktiviteter på Edgeøya i det 18. og 19. århundre. Alle fikk sjansen til å være arkeologer for en dag, sier Frigga Kruse.

Barndomsdrøm

Stientje van Veldhoven, er gruppesekretær for partiet D66, som har tolv seter av totalt 150 i den nederlandske nasjonalforsamlingen. Toppolitikeren, som også er nasjonalforsamlingens talskvinne for klima og bære-

kraft, grep begjærlig sjansen da SEES-ekspedisjonen ville ha med politikere.

– Det bevilges etter min mening for lite penger til arkeologisk forskning i Arktis. Derfor ville vi gjerne ha noen fra høyere hold med på ekspedisjonen, slik at de skulle få se hva det hele dreier seg om, forteller Kruse.

Og det skulle vise seg å være et lønnsomt trekk.

Slakteplass

I Kraussbukta på Edgeøya ligger rester av hvalrossaktiviteten til pomorene. SEES-ekspedisjonen tok prøver fra grunnen på stedet for å kunne studere det som skjedde for hundrevis av år siden nærmere i laboratorium.

– Prøvene skal nå analyseres, spesielt med hensyn til fosfater. Fosfater kommer av urin, ekskrementer og blod. Hvordan disse er distribuert på et arkeologisk sted, kan si mye om hvordan aktiviteten i sin tid foregikk, sier Kruse.

Mer penger

Stientje van Veldhoven lot



SLAKTEPLASS: Aktiviteten til Pomorene er fortsatt synlig. Bildet er fra Kapp Lee. FOTO: FRIGGA KRUSE

seg imponere av det hun så og opplevde på turen. I tillegg til å få innsikt i arkeologi i Arktis, ble hun inspirert til å jobbe hardere med klimasaken. Da ekspedisjonen kom tilbake til Longyearbyen, ventet den nederlandske utenriksministeren Bert Koenders på følget.

– Han annonserte da at forskningsbudsjettet for Arktis skal doubles, fra 300.000 euro i dag til 600.000 euro. Det er selvfølgelig bra, sier Frigga Kruse.



POMORSTUDIER: Frigga Kruse. FOTO: CHRISTOPHER ENGÅS

Aan het eind van de zomervakantie voer de Netherlands Scientific Expedition Edgeøya Spitsbergen (SEES) uit vanuit het Noorse Longyearbyen. Tien dagen lang onderzochten vijftig biologen, aardwetenschappers, klimatologen en archeologen de gevolgen van menselijk handelen in de poolgebieden. De expeditie was een initiatief van het Arctisch Centrum van de Rijksuniversiteit Groningen en het Willem Barentsz Poolinstituut, ondersteund door NWO en Oceanwide Expeditions. Aan boord waren niet alleen wetenschappers, maar ook kunstenaars, een Kamerlid, toeristen en pers. Nienke Beintema voer mee en deed verslag voor NWO.

TEKST NIENKE BEINTEMA BEELD RONALD VISSER

Wetenschap tussen de ijsberen

Rosenbergdal, 21 augustus

Het is stralend weer. We varen in zodiacs – rubber motorboten – tussen grote ijsbrokken over een spiegelgladde zee. We zijn op weg naar een kiezelstrand op het eiland Edgeøya, aan de zuidoostkant van Spitsbergen. Met kisten vol spullen stappen we aan land, met de laarzen door het water. Onze gids, gewapend met geweer, heeft al verkend of er geen ijsberen in de buurt zijn. De kust is veilig!

Op dit eiland aan deze ruige oostkant van Spitsbergen deden vier Nederlanders in 1968-1969 veertien maanden onderzoek. Drie van hen zijn nu ook mee met deze expeditie. Hun aanwezigheid en verhalen geven de expeditie een bijzonder historisch tintje. We keren nu terug om te kijken hoe de natuur er sindsdien is veranderd.

Met een klein groepje wetenschappers breng ik de hele dag door in het prachtige Rosenbergdal. Boven ons uit torenen steile zwarte kliffen. Een vegetatieteam gaat systematisch de plekken langs waar in de jaren zeventig de begroeiing in kaart is gebracht. Mossen, grassen, paddenstoelen, bloeiende bloemen: het is hier bijzonder weelderig. ‘Heel anders dan bijna veertig jaar geleden’, zegt Mennobart van Eerden van Rijkswaterstaat. ‘Toen was het hier een grijze steenmassa.’ Klimaatverandering? Het is te vroeg om dat te zeggen. Maar blijkbaar kan Arctische plantengroei veel sneller veranderen dan altijd werd gedacht.

Ondertussen ligt Stef Bokhorst op zijn buik tussen de stenen. De ecooloog van de VU Amsterdam, die onderzoek doet binnen het Nederlands Polair Programma (NPP) van NWO, zuigt met een slangetje insecten en andere kleine beestjes op. Hij onderzoekt de interacties tussen vegetatie en bodemdierpjes, en de invloed daarop van klimaatverandering. ‘Kijk’, zegt hij, ‘hier zitten er een heleboel.’ Hij wijst op minuscule, glimmende zwarte bolletjes: mijten. Hij vond ook al springstaarten, spinnetjes, vliegen en mugjes. Een verbazende diversiteit in dit barre klimaat.

Kapp Lee, 22 augustus

Vandaag ben ik op pad met drie archeologen van de Rijksuniversiteit Groningen. Ze onderzoeken de resten van een Russische jagershut uit 1760. Deze jagers, Pomoren, kwamen hier om op walrussen, poolvossen en ijsberen te jagen. Overal liggen de stille getuigen van hun werk: ribben, wervels, schedels.

De leider van dit NPP-project is Frigga Kruse. Met een geweer over de schouder staat zij op de uitkijk voor ijsberen. Haar taak wordt steeds lastiger: er komt



een dikke mist opzetten. Een beer kan dan zomaar opduiken, in dit onoverzichtelijke terrein. Ook houdt ze nauwlettend in de gaten of onze baai niet wordt afgesloten door pakij. Dan zou ons schip ons niet meer kunnen oppikken.

Met een geweer over de schouder staat zij op de uitkijk voor ijsberen

‘We proberen te reconstrueren hoe jagers in het verleden het ecosysteem beïnvloedden’, vertelt Kruse. ‘Traditioneel bestuderen archeologen vooral huizen en voorwerpen. Maar die zeggen niet hoe de mensen jaagden, waarop en op welke schaal. Wij kijken daarom naar de hele omgeving. Waar stonden de hutten, in welk landschap? Waar liggen de botten, welke en hoeveel?’ Ook nemen de onderzoekers honderden monsters. Het fosfaatgehalte in de bodem verradt of er organische resten hebben gelegen. Slachtafval, etensresten, uitwerpselen. Die kennis helpt om te reconstrueren hoe de jagers te werk gingen – dagboeken lieten ze niet na.>>



In de scheepsbar, 23 augustus

Bodil Hoekzema (20 jaar) zit te stralen. Ze vaart mee als toerist, samen met haar vader Olav. En ze geniet met volle teugen. Van het landschap, de ijsberen en de walvissen. Maar ook van de wetenschap aan boord. ‘We hebben bewust deze reis geboekt’, zegt ze, ‘en niet zomaar een toeristencruise. Ik wil altijd alles weten. Nu praat ik zo veel mogelijk met de onderzoekers, en ik ga naar alle lezingen. Ik vind het machtig interessant.’

In het lab, 24 augustus

Het is een druilerige dag. Voor Douwe Maat van het Koninklijk Nederlands Instituut voor Zeeonderzoek (NIOZ) maakt dat niets uit. Prima weer om vanuit een zodiac zeewatermonsters te nemen vlakbij een indrukwekkend gletsjerfront. Nu is Maat aan het werk in het lab, in een overkapte ruimte op het achterdek. Hij doet NPP-onderzoek naar de effecten van silt- en kleideeltjes op het mariene voedselweb. ‘Het smeltwater van gletsjers brengt dit fijne materiaal naar zee’, vertelt Maat. ‘We noemen het gletsjermelk: zo wit is het soms.’ Door klimaatverandering smelten gletsjers steeds sneller. Daardoor komt er ook steeds meer sediment in zee terecht. ‘Wij willen weten wat dat doet met de interacties tussen virussen, bacteriën en eencellige algen’, vertelt Maat. ‘Die zijn in zee veel belangrijker dan veel mensen denken.’ Plantaardig plankton vormt de basis voor het mariene voedselweb. De eerste stap is begrazing: de ene groep plankton eet de andere op. Maar doordat sedimentdeeltjes even groot zijn als eencellige algen en bacteriën, kunnen ze die begrazing fysiek verstoren.

Een andere belangrijke interactie tussen deze micro-organismen is infectie door virussen. Daarbij gaat een groot deel van het voedsel voor grazers verloren – op sommige plekken wel 50 procent. Maat: ‘Wij vermoeden dat dat percentage gaat afnemen als er meer silt en klei in het water komt, doordat die deeltjes iets elektrisch geladen zijn. Ze trekken virussen aan. Op wereldschaal kunnen zulke processen grote invloed hebben op de cycli van energie en nutriënten.’

Op het achterdek, 25 augustus

Wat Stefan Ligtenberg betreft is de expeditie nu al geslaagd. Samen met zijn collega's van het Institute of Marine and Atmospheric research Utrecht heeft hij deze week een weerstation geplaatst op een gletsjer. ‘We hadden een aantal potentiële plekken uitgezocht’, vertelt Ligtenberg, die eerder dit jaar een Veni-beurs ontving. ‘Maar deze bleek ideaal: we hoefden niet lang over morenen te lopen en er waren weinig spleten. En deze gletsjer ligt op het hoofdeiland, niet op Edgeøya, dus je kunt er relatief gemakkelijk heen, met een sneeuwscooter vanuit Longyearbyen.’ Minstens vijf jaar gaat het weerstation het weer vastleggen en meten hoe snel de gletsjer smelt. Het station zendt de informatie naar Nederland, en maakt zo deel uit van een netwerk van meetstations in de beide poolgebieden. De gegevens helpen om de relatie in kaart te brengen tussen klimaatverandering en het smelten van gletsjers.

In een zodiac, 26 augustus

SEES-onderzoeksleider Maarten Loonen, die zelf vanuit het Groningse Arctisch Centrum NPP-onderzoek doet naar ganzen, maakt met het eind in zicht de eerste balans op. ‘Het kon niet mooier’, zegt hij. ‘Het is

Minstens vijf jaar gaat het weerstation het weer vastleggen en meten hoe snel de gletsjer smelt

een enorme puzzel om al het onderzoek in die paar dagen te passen, met al die verschillende plekken waar mensen moeten zijn. En dan kunnen pakij, slecht weer en ijsberen nog roet in het eten gooien. Dat is tot nu toe niet gebeurd. We hebben de belangrijkste dingen kunnen doen. Geweldig.’

Hornsund, 27 augustus

We staan aan land in een spectaculaire fjord op de terugweg naar Longyearbyen. We kijken uit op enorme gletsjers, spitse bergen en een baai vol ijsbergen. Een vogelrots met duizenden krijsende drieteenmeeuwen torent boven ons uit. De wetenschappers verzamelen nog snel de laatste bodemonsters, planten en insecten. De toeristen drentelen rond en maken foto's.

Bijchriften?

‘Prachtig om de wetenschappers tijdens de hele expeditie zo bezig te zien en allerlei nieuwe samenwerkingen te zien ontstaan’, zegt Dick van der Kroef, directeur van NWO-gebied Aard- en Levenswetenschappen, waar het NPP onder valt. ‘Van het geld dat beschikbaar was voor het Internationaal Pooljaar (2007-2008, red.) was nog zo'n 155 duizend euro over. Dat hebben we kunnen inzetten voor deze expeditie’, vertelt Van der Kroef. ‘Een hoofddoel was om breed aandacht te vragen voor het Nederlandse poolonderzoek en voor de rol die dat kan spelen in internationale discussies over klimaat en geopolitiek. Je ziet nu dat SEES het nationale gespreksplatform is geworden dat we voor ogen hadden en dat wetenschappers verbindt en inspireert.’

Longyearbyen, 28 augustus

Minister Bert Koenders van Buitenlandse Zaken bezoekt het afsluitende SEES-symposium. ‘Het Nederlandse poolonderzoek levert belangrijke informatie op over klimaatverandering, maar het zorgt ook dat we internationaal mogen meepraten.’ Het budget voor poolonderzoek moet daarom flink omhoog, vindt hij. Hij kondigt aan dat het ministerie de bijdrage de komende jaren verhoogt van 250 duizend naar 600 duizend euro per jaar. ‘Relatief weinig’, geeft hij toe, ‘maar we willen nu vooral een signaal afgeven. Ik hoop dat de andere ministeries die betrokken zijn bij het poolonderzoek ons voorbeeld zullen volgen.’ <<



► Op zoek naar sporen van vroege jagers op Spitsbergen



Archeologisch veldwerk tussen de *walrus*

In augustus j.l. reisden 55 Nederlandse wetenschappers naar Spitsbergen. Biologen, geologen, meteorologen – maar ook archeologen. Zij onderzochten de sporen van de 18^e- en 19^e-eeuwse walrusjacht. 'We kijken niet alleen naar de hutten, maar naar het hele landschap. Anders krijg je het verhaal nooit compleet.'

22 augustus 2015. Het is een gure, mistige dag. Een graad of vier – niet ongevoel voor de tijd van het jaar.

Diep weggedoken in onze kragen dragen we de uitrusting hoger het keienstrand op. Het is een adembenemende plek. We kijken uit op een ondiepe baai vol met grillige ijsbrokken. Steile zwarte kliffen torenen uit boven een glooiend toendralandschap, dat is doorsneden met ruige rotsrichels. Dit is onze werkplek van vandaag.

We zijn met ons vijven: drie archeologen van de Rijksuniversiteit Groningen en twee assistenten, onder wie ikzelf. Met een zodiac, een stevige rubber motorboot, zijn we vanochtend vanaf ons expeditieschip naar deze baai gevaren. Het schip maakte daarna rechtsomkeert en is nu nog maar een stipje aan de horizon. Het vaart vandaag helemaal naar de overkant van de grote fjord, twee uur varen, om andere onderzoeksteams af te zetten. Een daarvan gaat op zoek naar broedplaatsen van de zeldzame ivoormeeuw. Een ander team gaat een weerstation op een gletsjer plaatsen. Minstens vijf jaar lang gaat dat station het plaatselijke weer registreren en meten hoe snel de gletsjer smelt.

Overal botten

Wij hebben een heel andere taak. Niet ver van de houten hutjes bij een voormalig Nederlands onderzoeksstation (zie kader) liggen de resten van een oude Pomorenhut. Pomoren waren Russische jagers die in de 18^e en 19^e eeuw naar Spitsbergen kwamen, op zoek naar ijsberen, poolvossen en walrusen. Die eerste twee voor hun mooie pelzen, de laatste voor hun spek, huiden en ivoor. De archeologen, onder leiding van Frigga Kruse, willen graag weten hoe ze leefden en vooral hoe ze te werk gingen. 'Die vroege jagers hadden al een behoorlijke impact op het ecosysteem', vertelt Kruse. De sporen van hun bloedige werk zijn hier overal te zien: waar je maar kijkt liggen botten. Schedels, ribben, wervels, hier en daar gerangschikt in lugubere kunstwerken. Opvallend genoeg zie je alleen de achterkanten van de

schedels. De voorkanten met de kostbare lange slagstanden zijn er destijds ruw afgehakt met bijlen of kapmessen. Tienduizenden botten moeten het zijn. Ze liggen gek genoeg tot vrij hoog op de helling. Kruse en haar collega's lopen er voorzichtig tussen door, wijzend en kijkend, zorgvuldig stappend om niets te verstoren. 'Wij willen graag uitzoeken hoeveel walrusen er destijds waren', zegt Kruse, 'en hoeveel de Pomoren er vingen. Hoe groot was hun invloed nu echt?'

Mist en ijsbrokken naderen

Waarschijnlijk waren er halverwege de 19^e eeuw, toen de Pomoren het voor gezien hielden, al niet veel walrusen meer op Spitsbergen. Maar Noorse jagers zetten de jacht nog voort, tot de soort in 1952 officieel werd beschermd. Nu nemen de aantallen weer langzaam toe. Wij hebben geluk: vandaag ligt er een clubje op het strand, vlakbij de houten hutjes. Ze liggen dicht tegen elkaar aan en verspreiden een stevige ammoniakgeur. Sommige slapen op hun rug, hun tanden in de lucht, andere liggen uitgezakt op hun zij. Ze maken boerende brulgeluiden en krabben zichzelf op de buik. Er liggen er ook een paar in het water. Een groot mannetje komt lillend in beweging en laat zichzelf slow-motion het water in rollen, twee keer om zijn lengteas.

Een eindje hoger op en landinwaarts ligt de plek waar we vandaag aan het werk gaan: een vallei tussen twee rotsrichels. Hier liggen de resten van een Pomorenhut uit circa 1760. Kruse, die het geweer draagt, gaat op verkenning uit. Zij loopt vandaag steeds rond, op de uitkijk voor ijsberen. Een full-time taak in dit onoverzichtelijke terrein, zeker nu er een dichte mist komt opzetten. Ook houdt Kruse het oprukkende zee-ijs in de gaten. Vanuit het zuiden stroomt er een breed lint van ijsbrokken onze kant op. Als die de baai helemaal afsluiten, dan kunnen we vanavond niet meer wegvaren met onze rubberboot. We houden het scherp in de gaten. Wordt het te spannend, dan zullen we het schip moeten oproepen om ons te komen halen.

◀ Landschapsbeeld Spitsbergen.

EXPEDITIE SPITSBERGEN

De Scientific Expedition Edgeøya Svalbard (SEES, 19-29 augustus 2015) was een initiatief van het Arctisch Centrum van de Rijksuniversiteit Groningen, ondersteund door de Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO) en Oceanwide Expeditions. Tien dagen lang voeren 55 Nederlandse wetenschappers langs de koude oostkant van Spitsbergen. Samen onderzochten ze de invloed van menselijk handelen op het poolgebied. De reis moest niet alleen belangrijke data opleveren, maar ook een nieuwe impuls geven aan het Nederlandse poolonderzoek. Nieuwe verbindingen leggen, het onderzoek internationaal op de kaart zetten – en Nederland een stem geven in internationale discussies over de toekomst van het poolgebied.

De SEES-wetenschappers keerden terug naar de plek waar vier Nederlandse biologen in 1968-69 veertien maanden verbleven. Ze wilden in kaart brengen wat er sindsdien is veranderd en hoe het ecosysteem eraan toe is. Planten, dieren, gletsjers, zee, bodem en klimaat: alles werd onderzocht.

Aan boord waren ook drie archeologen van de Rijksuniversiteit Groningen. Zij onderzochten de sporen van de aanwezigheid van Pomoren, Russische jagers uit de 18^e en 19^e eeuw. Wetenschapsjournalist Nienke Beintema reisde mee om verslag te doen voor NWO en NRC Handelsblad – en voor Archeologie Magazine. ▶▶

Resterende sporen

Van de Pomorenhut resteren alleen nog de houten hoekpalen, een paar balken en de verhoogde contouren. Noren hebben hier al opgravingen gedaan, vertelt Sarah Dresscher: amateur-archeologen in 1968 – die niet al te zorgvuldig te werk gingen – en professionals in 1994. Daarom liggen er geen voorwerpen meer. We zien wel een stapel gebroken bakstenen. 'Die namen de Pomoren mee uit Rusland, als ballast', aldus Dresscher, 'en om oventjes van te maken.' Archeologen, zo vertelt Kruse, kijken traditioneel vooral naar huizen en hun directe omgeving. Waar waren de huizen van gemaakt, welke artefacten liggen er? 'Maar die huizen en artefacten vertellen altijd maar een deel van het verhaal', zegt Kruse. 'Als je wilt weten hoe mensen werkten, dan moet je het hele landschap bestuderen.'

Archeologiestudente Marthe Koeweide struint de vallei af om de verspreiding van de botten te registreren met een dGPS (differential Global Positioning System). Dat is een apparaat op een driepoot dat een referentiepunt neemt ten opzichte van satellieten, en dan van een grote serie punten snel en nauwkeurig de plaats kan bepalen. 'Zo krijgen we een beeld van de aantallen', vertelt Koeweide, 'maar ook bijvoorbeeld van wáár ze de dieren slachtten. Was dat op de plek waar ze werden gedood, of hadden ze een efficiënter systeem ontwikkeld om grote aantallen te verwerken?' De plek van de hut vertelt ook al veel. 'Dit lijkt niet een logische plek voor een hut', zegt Dresscher, 'zo ver van het strand en zonder goed zicht op ijsbergen. Misschien hebben ze de hut expres een eindje landinwaarts gebouwd, uit de wind, om de stank van die enorme hoeveelheid rottende karkassen te ontvluchten.'

Op zoek naar organische resten

De restanten van de hut zijn door de Noorse archeologen al eens nauwkeurig op een kaart ingetekend, maar dat is ruim twintig jaar geleden. En in dit Arctische gebied is het landschap door sneeuw, ijs en vorstwerking steeds in beweging. Ook wij maken nu dus tekeningen. Het koude klimaat heeft ook



▲ Vol gas met de zodiac (rubber motorboot) tussen de ijsbergen door.

► Resten van de onderkaken van de Groenlandse walvis, hier geslacht ten tijde van de walvisjacht in de 17^e en 18^e eeuw.

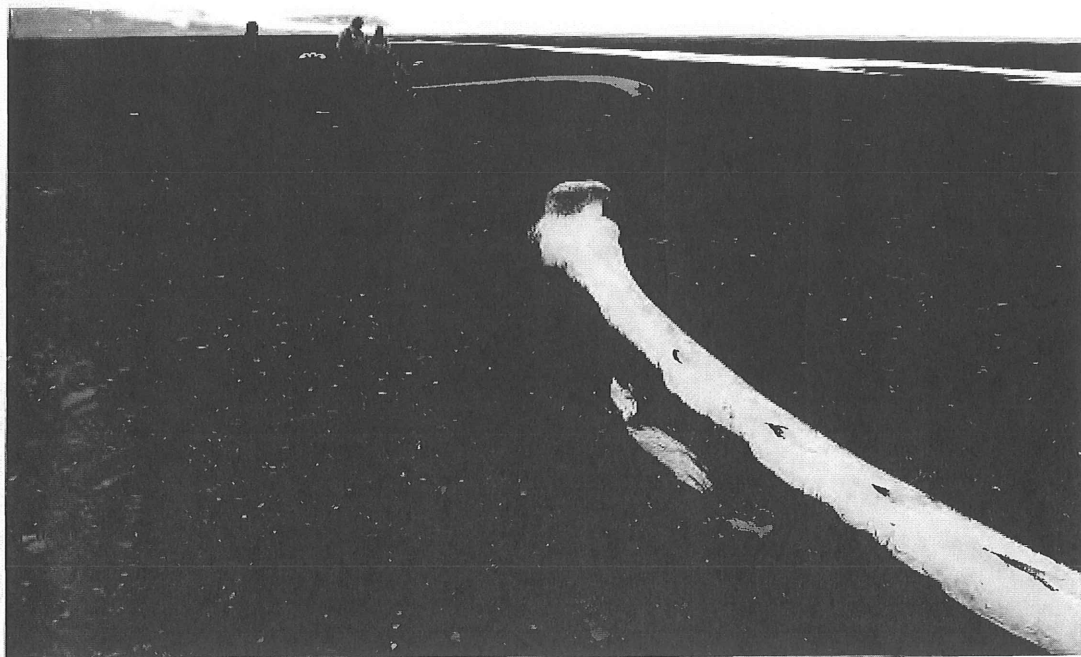


▲ Resten van walrusjacht bij Kapp Lee op Edgeøya. Overal liggen de schedels, waar de tanden bruut vanaf zijn gekapt.

voordelen: de houten palen vergaan heel langzaam. Je kunt er nu nog aan zien hoe de hut was gebouwd: als een klassieke blokhut. Ook nemen we vandaag bodemmonsters. Dat doen we op zo'n honderd plekken in de vallei, op een nauwkeurig uitgemeten grid. 'Het fosfaatgehalte in de bodem', zo vertelt Kruse, 'verraadt of er op die plek organische resten hebben gelegen. Slachtafval, etensresten, uitwerpselen. Ook die kennis helpt om te ontdekken hoe de jagers te werk gingen.' Intussen zijn we behoorlijk koud geworden. We lunchen daarom in de beschutting van een van de houten hutjes aan het strand. Waarschijnlijk dateert het al uit 1904. We zitten op de houten vloer en praten over de Pomoren. 'Ze kwamen uit het Witte Zeegebied', vertelt Kruse. 'Daar hadden ze al veel ervaring opgedaan met het jagen op zeezoogdieren. Ze trokken begin 18^e eeuw naar Spitsbergen in opdracht van Tsaar Peter de Grote. Die had zich tijdens zijn bezoeken aan Nederland laten inspireren door de succesverhalen over walvisvaart. Dat wilde hij ook, zo'n industrie in het noorden.' De walvisvaart, daar bleken de Russen niet zo goed in. Maar ze hadden wel veel succes met walrussen, ijsberen en poolvossen.

Achter Russische deuren

Aankankelijk had de Tsaar een monopoliesysteem ingesteld, maar later was het 'free



for all' en schoten de vangstaantallen omhoog, vertelt Dresscher. Zij onderzoekt de Pomorentijd niet alleen in het veld, maar ook aan de hand van oude handelsverslagen. 'Dagboeken lieten de Pomoren niet na, maar uit de archieven kun je toch vrij veel informatie halen.' Maar veel van die informatie ligt achter Russische deuren, ontoegankelijk voor buitenstaanders. Jammer, vindt Kruse, want dat maakt het lastig om te achterhalen hoeveel dieren er in de Pomorentijd werden gevangen. 'Juist daarom is ons type archeologie zo belangrijk. Ik noem het historische ecologie.'

Die benadering is in de jaren 1980 al toegepast door Groningse archeologen, onder leiding van Louwrens Hacquebord, nu emeritus hoogleraar. Hij leidde de beroemde opgravingen van de walvisvaartnederzetting Smeerenburg, aan de noordwestkant van Spitsbergen. Hacquebord en zijn collega's combineerden veldgegevens – botten, resten van traanovens – met uitgebreid archiefonderzoek. Zijn conclusies logen er niet om: de Europeanen vingden tussen 1610 en 1800 minstens 122.000 walvissen. Niet verwonderlijk dat soorten als noordkaper en Groenlandse walvis daar nog steeds niet van hersteld zijn.

Dergelijke berekeningen wil Kruse ook op de Pomorentijd loslaten. 'Je kunt nu wel zeggen: het gaat nog steeds slecht met de

walrussen', zegt ze, 'maar dan moet je eerst weten hoe de situatie oorspronkelijk was.'

De spanning stijgt

Na de lunch gaan we weer stug door met monsters nemen. Om de beurt rennen we rondjes om warm te blijven. De mist is opgetrokken, maar inmiddels drijft het pakjes in hoog tempo onze baai in. Naarmate de uren verstrijken, begint het ons zorgen te baren. 'Ons schip is te ver weg voor radiocontact. Kruse probeert de satelliettelefoon, maar tevergeefs. Er zit niets anders op dan door te werken. Ook wel mooi, zegt Kruse, dat de natuur weer even laat weten wie er hier de baas is.

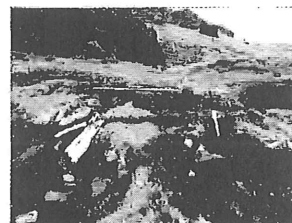
Na twaalf uur werken zijn we verkleumd en vinden we het mooi geweest. We besluiten de kachel aan te maken in het houten hutje, en sprokkelen wat afgedankt timmerhout. Dat zijn geen archeologische resten, lacht Kruse, want ze zijn van na de Tweede Wereldoorlog. Al gauw stijgt de temperatuur in de hut van vier naar tien graden: een luxe! Om tien uur verschijnt ons schip aan de horizon; een uur later bereikt het de baai. En het ploegt gewoon door het ijs heen. Blijkbaar ligt het ijs nu verder van de kust dan vanmiddag. Gelukkig maar. We hadden hier best de nacht kunnen doorbrengen, met pinda's en chocola, maar een warme douche aan boord is nu wel zo prettig. ◀

CROWDFUNDING VOOR REDDINGS-ACTIE OP JAN MAYEN

Middenin het vierkant tussen Spitsbergen, Noord-Noorwegen, IJsland en Oost-Groenland ligt het vulkaaneiland Jan Mayen. Ook daar was in de 17^e eeuw een Nederlandse walvisvaardersnederzetting. Maar die is nog nauwelijks archeologisch onderzocht. 'Die hele site dreigt nu letterlijk in de golven te verdwijnen', vertelt onderzoekster Frigga Kruse.

'De kust brokkelt steeds sneller af, en de houten balken steken al naar buiten. Bij een flinke storm kan het zo gebeurd zijn.' Kruse probeert daarom nu een reddingsactie te organiseren. Met een groepje archeologen wil ze de nederzetting opgraven voor het te laat is. De grootste uitdaging: naar Jan Mayen reizen. Reguliere scheepvaart of vluchten zijn er niet. 'Ik hoop dat we kunnen meevaren met een toeristenschip', zegt ze, 'in de zomer van 2016 of desnoods 2017. Maar dat kost erg veel geld.'

Daarom start Kruse binnenkort een crowdfundingactie. Wilt u dit werk steunen? Heel graag! Als u een mailtje stuurt naar nhbeintema@planet.nl, dan krijgt u een seintje zodra de actie begint.



▲ De balken van een 17^e-eeuws Nederlands walvisvaardershuis steken uit een afbrokkelend stuk kust op Jan Mayen. FOTO: FRIGGA KRUSE.

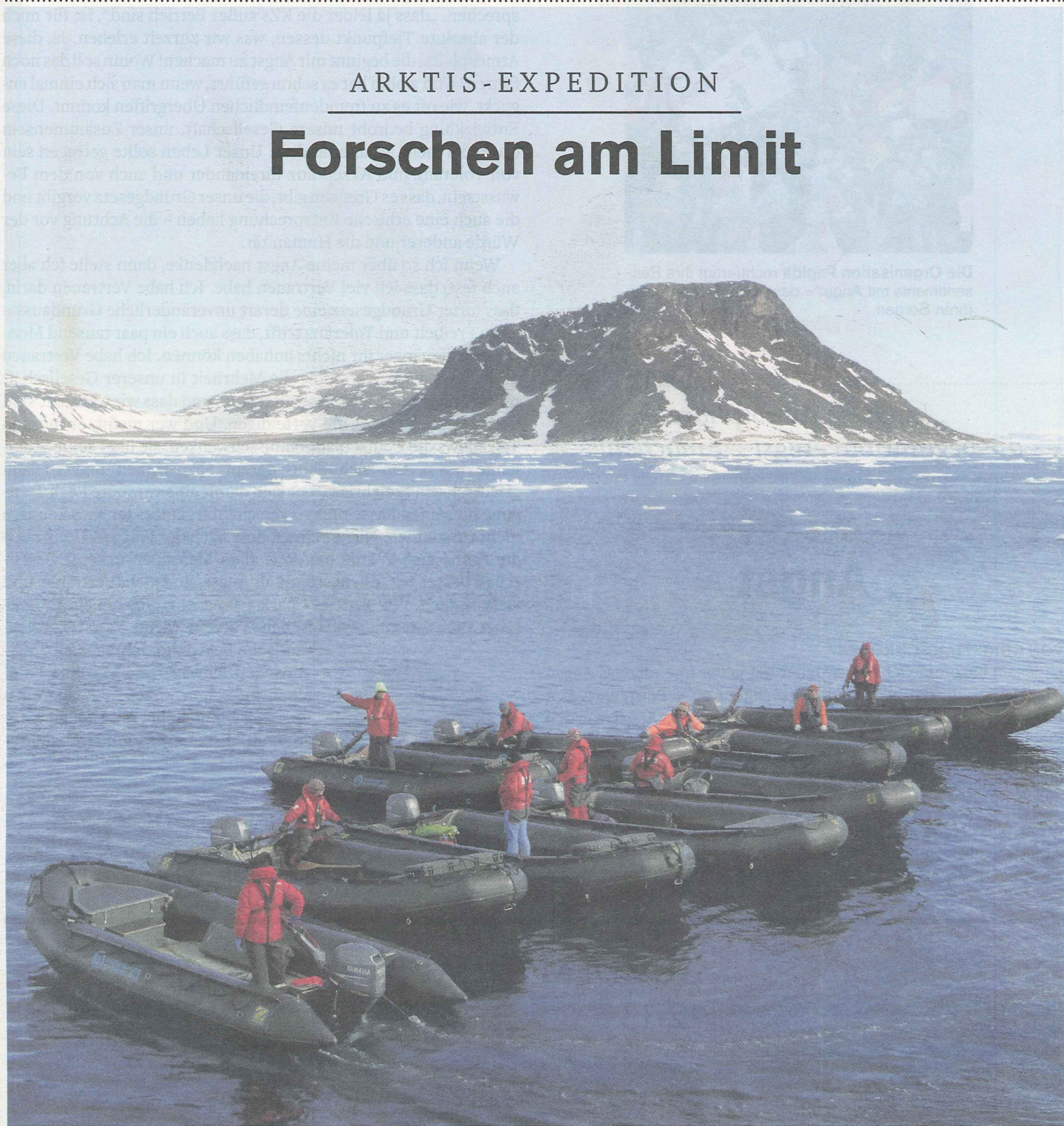
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AUSGABE 44 SONNABEND, 31. OKTOBER 2015

ARKTIS-EXPEDITION

Forschen am Limit



WISSEN

Die Umweltgefahr
im Kosmetikschrank

INTERVIEW

Johannes B. Kerner
und die Lust am Kochen

EXTRA

Tarot: Teufelszeug
oder altes Wissen?



STORY

Schnee im August

Die Schleswig-Holsteinerin Frigga Kruse ist Polarforscherin und Reiseführerin für die Arktis. Ein ungewöhnliches Leben zwischen norddeutscher Dorfidylle, Eisschollen und dem Rest der Welt.



VON JULIA VOIGT

Frigga Kruse ist schon als kleines Mädchen anders. Mit Puppen spielen, hübsche Kleidchen anziehen und sich von Mama Zöpfe flechten lassen, nein, damit kann sie so gar nichts anfangen. Sie will raus, hinein in die Wälder, auf die Wiesen und Felder, die es in ihrem kleinen Heimatort Mörel reichlich gibt. Das kleine Dorf mit nicht mal 240 Einwohnern liegt etwa 20 Kilometer westlich von Neumünster und bietet noch unberührte Natur.

Die Haare lässt sich Frigga Kruse auf ein Minimum schneiden, und bis heute hat die

Schleswig-Holsteinerin ihren Igelschnitt behalten. Einen Friseur brauchte sie dafür noch nie. Frigga Kruse ist völlig schnörkellos und ungeschminkt geblieben. „An mir verdient die Wirtschaft nichts“, sagt sie. Ihre Jeans hat sie von ihrer Schwester geerbt und ihre Arbeitskleidung bekommt sie meist gestellt.

Der Vater ist Schiffsbauingenieur, muss ständig verreisen und die Familie verbringt viel Zeit im Ausland. Eine Station ist Papua-Neuguinea, und die Tochter macht dort auch ihr Abitur. Immer wieder wird sie mit ihrer deutschen Herkunft konfrontiert.

„Schließlich waren wir die deutsche Minderheit. Doch damals waren ich und meine zwei Geschwister in einem Alter, in dem wir kaum selbst wussten, wer wir waren.“ Die Mitschüler und Freunde stellen oft Fragen: „Wie ist es, mit deiner Geschichte zu leben? Wie verstehst du andere Kulturen und wie sieht es denn bei deiner Oma aus?“ Doch Frigga Kruse lernt damit umzugehen. „Meistens war es einfach nur Neugier“, vermutet sie. „Es sind die Kurzsichtigen, die dumme Kommentare machen.“

Während ihre Schwester Gesa Kriminologie in England und ihr Bruder Niels „ir-

gendwas mit IT“ in Kanada studieren, setzt sich Frigga Kruse in den Kopf, Meeresforscherin zu werden. Dass ausgerechnet die kalte Arktis ihr Hauptthema werden sollte und sie sogar als Reiseführerin für Touristen angeheuert wird, hätte sie sich damals noch nicht vorstellen können.

Sie schreibt sich an einer Uni in Schottland ein und belegt die Fächer Archäologie und Geologie. Die Auswahl ist eher zufällig. „Es gibt in England einen zentralen Katalog, in dem jede Uni und jedes Fach aufgelistet sind. Ich habe diesen Daumenkino-mäßig durchgeblättert und bin an diesen Fächern hängen geblieben, ohne zu wissen, was das eigentlich ist. Das war wie ein Rubbellos und das Beste, was mir passieren konnte“, erinnert sich die 37-Jährige und fügt mit einem Lächeln hinzu: „Ich weiß, tote Menschen und Gesteine, das ist jetzt nicht gerade supersozial.“ Sie ist ehrgeizig und der Satz „Da muss noch mehr sein“ ist fest in ihrem Kopf eingebrannt. „Für die Geologie interessieren sich die wenigsten Menschen“, stellt Frigga Kruse immer wieder fest. Sie allerdings schon. „Bei uns im Möreler Wald steht ein Schalenstein. Als ich klein war, wollte man mir erzählen, dass das ein Opferstein der Wikinger ist. Da dachte ich mir, das kann nicht sein, ich sehe hier nirgends Wasser für Wikingerboote.“ Später wird sie ihre Diplomarbeit über Schalensteine in Schleswig-Holstein schreiben. „Und die kam richtig gut an“, erzählt sie mit ein wenig Stolz in der Stimme.

Ihre Magisterarbeit macht sie in forensischer Archäologie. „Besonders in Russland habe ich deswegen viel geforscht und erlebt. Das Thema Grabschändung ging mir damals besonders nahe.“

Zwölf Jahre verbringt sie in Großbritannien und wechselt von Nord bis nach Süd öfter ihre Adresse. Doch immer wieder zieht es sie in ihre Heimat zurück und in ihr Elternhaus, eine alte Schmiede mit vielen Zimmern und großem Garten. „Trotz allem Herumschwirren in der Welt fühle ich mich als Schleswig-Holsteinerin. Meine Wurzeln sind hier, und irgendwann möchte ich auch wieder zurückkehren und am liebsten in einem Freilichtmuseum wohnen.“

Irgendwann liest sie in einer Fachzeitschrift eine Stellenausschreibung: Für Feldarbeiten auf Spitzbergen, eine norwegische Inselgruppe im Nordatlantik und Arktischen Ozean, werden Wissenschaftler gesucht. Frigga Kruse wird hellhörig. Sie bewirbt sich und wird angenommen. Ihr Thema trägt den Titel „400 Jahre Ausbeutungsgeschichte auf Spitzbergen“. Was hat der Mensch damals gemacht? Welche Spuren haben der Walfang, die Walrossjagd, der Bergbau und der Pelzhandel hinterlassen und vor allem: Welcher Druck lastet deswegen bis heute auf den Ökosystemen? Doch



Bis zu 14 Stunden pro Tag waren die Teams mit Forschungsarbeit beschäftigt.

KRUSE (4)



Frigga Kruse in voller Montur. Das Gewehr ist wegen der Eisbären Pflicht. STEURER

Frigga Kruse will nicht darüber urteilen, nur feststellen und dokumentieren. „Ich bin nicht da, um abzustempeln, dann wäre ich eine schlechte Archäologin. Die Gesellschaft brauchte eben Öle und Fette, da gibt es starke Parallelen zu heute.“ Für sie ist es immer wieder der gleiche Teufelskreis: „Die Menschen möchten etwas haben und unsere Geschichte zeigt, dass wir uns das nicht nachhaltig beschaffen. Vieles wiederholt sich, die Frage ist, ob wir diesen Kreis unterbrechen können.“

Warum in der Stellenausschreibung stand „Muss körperlich fit sein und mit einer Waffe umgehen können“ hat die Schleswig-Holsteinerin schnell verstanden. „Wir

mussten auf Spitzbergen in Zelten schlafen und Eisbären können ständig irgendwo in der Nähe sein.“ So hat sie auf ihren Erkundungstouren vorschriftsmäßig ein Gewehr dabei, hat es bisher aber nur „zum Üben“ genutzt. Mulmig ist ihr noch nie gewesen. „Einmal haben wir einen schlafenden Eisbären geweckt, das war schon einen Moment lang kritisch. Wir hatten ihn für einen Schneeberg gehalten. Aber der Eisbär hat sich zum Glück nicht für uns interessiert“, erzählt die Polarforscherin.

Zurzeit lebt und arbeitet sie im niederländischen Groningen, hier hat sie nach einer Arbeitszeit von fünfeinhalb Jahren auch ihre Doktorarbeit abgegeben und sie als Buch unter dem Titel „Frozen Assets“ herausgebracht. Die Arbeit bekommt die höchste niederländische Auszeichnung. „Es ist eine Art Katalog geworden, der die Ausbeutung der Insel durch Großbritannien dokumentiert und beleuchtet. Ich versuche, die Vergangenheit anzuwenden. Es geht hier auch um Weltpolitik, den britischen Bergbau und vor allem um die Menschen dahinter.“

Das Projekt auf Spitzbergen findet Frigga Kruse „hoch motivierend“. „Es ist spannend zu sehen, welche Veränderungen in den Ökosystemen herrschen. Ich möchte dazu beitragen, dass wir unsere Geschichte verstehen und dass wir aus ihr lernen.“ Was hätte man anders machen können und was kann man in Zukunft anders machen? Das sind für sie die entscheidenden Fragen. Dafür beleuchtet sie archäologische Quellen aus allen Ecken, wertet Tagebücher aus und steckt Quartiere ab, um ein klein wenig mehr über dieses Stück der Arktis zu erfahren. „Doch meine Karriere ist nicht mein Ein und Alles. Ich bereite mich selten gut vor und überhäufe mich auch nicht >>>

>>> mit überflüssigem Wissen.“ Egal wo sie gerade lebt, überall spielt sie in Rugby-Teams und engagiert sich aktiv für den Naturschutz. „Das hat auch System, denn meine Hobbys bauen schnell Brücken zu den Leuten“, sagt sie. Erst vor ein paar Wochen wurde sie außerdem noch niederländische Meisterin im Mähen mit der Sense. Die 37-Jährige spricht fließend Niederländisch und lernt jetzt nebenbei noch Norwegisch.

Ist ein Projekt beendet, muss sich Frigga Kruse wieder eine neue Arbeit suchen – irgendwo auf dieser Welt. Auch war sie einmal über eineinhalb Jahre arbeitslos. „Das ist das Unschöne an der Akademie, man arbeitet an den Projekten und steht danach auf der Straße.“

Ob sie bei so viel Bewegung in ihrem Leben überhaupt beständige Freundschaften aufbauen kann, beantwortet sie mit einem klaren Ja. „Es gibt Beziehungen, die lassen sich über die Lande und die Zeit hinweg halten. Es ist toll, auf der ganzen Welt Freunde zu haben.“ Heimatlos hat sie sich daher noch nie gefühlt.

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„Wir haben keine wasserfeste Kleidung mit, aber man läuft die Nässe dann schon irgendwann wieder raus.“

Frigga Kruse

.....
 Im Moment denkt sie über ein Lehramtsstudium in Kiel oder Hamburg nach. „Gerade habe ich wieder den großen Drang, in meinem Elternhaus zu wohnen.“

Frigga Kruse ist mittlerweile nicht nur Polarforscherin, sondern arbeitet auch als Reiseleiterin in der Arktis. Während die meisten Menschen den warmen Süden für ihren Urlaub ansteuern, konnte man in diesem Sommer für neun Tage und etwas über 5000 Euro Ferien in Eis und Schnee buchen. An die 55 Touristen und gut noch mal so viele Archäologen, Biologen, Meteorologen, Journalisten und Klimaforscher nahmen an der SEES Expedition nach Edgeoy auf Spitzbergen teil und überquerten mit einem Forschungsschiff den 80. Breitengrad. Warum man das freiwillig tut? „Es sind unglaubliche Landschaften und Bilder auf und um Spitzbergen. Viele wollen einfach einmal einen Eisbären in seiner Umgebung und die beeindruckende Mitternachtssonne sehen“, beantwortet die Reiseführerin. „Doch vor allem ist es der Wunsch, die Natur verstehen zu wollen und natürlich die Faszination, die von diesem Ort ausgeht.“ Frigga Kruse bezeichnet die Reisenden nicht gern als Touristen, sondern mehr als „Sponsoren“. Auch wenn die Niederländische Organisation für Wissenschaftliche



Hinterlassenschaften der Walrossjäger: Ein Schlachtfeld auf Spitzbergen.

Forschung (NWO) viel Geld für das Projekt auf Spitzbergen beisteuert, ließe sich die Reise ohne die Hilfe der Mitreisenden nicht finanzieren.

Frigga Kruse stellt kleine Gruppen zusammen, und wer denkt, er kann einfach mal Urlaub machen, hat nicht mir der robusten Deutschen gerechnet. Da die Tage in der Arktis lange hell sind, könne man auch lange arbeiten. Die eine Gruppe wird zum Moos sammeln abbestellt, andere wiederum rutschen den ganzen Tag auf ihren Knien über den Erdboden, um nach Knochen zu suchen und Erdproben zu nehmen. Einige laufen in diesen Tagen einen Marathon, um die Gegend mit Kameras zu erkunden.

14 Stunden an der arktischen Luft, das ist selbst für Frigga Kruse noch eine Herausforderung. „Es ist schon anstrengend, doch die Luft ist unglaublich sauber und man atmet ganz anders durch. Es ist auf der Insel unheimlich still, es sein denn, man stößt auf eine Vogelkolonie, oder ein Walross taucht neben dem Boot auf, dann sind die Laute umso intensiver zu hören.“ Nur an einem Tag hat die Gruppe knappe 14 Grad Außentemperatur, ansonsten bewegt sich das Thermometer um den Gefrierpunkt.



Auch das muss mal sein: Durch kaltes Eiswasser zu laufen gehört zur Arktis-Expedition.

Stundenlang wird jeder Quadratmeter der Insel untersucht und wenn es sein muss, dann wadet man auch mal durch Eiswasser. „Wir haben keine wasserfeste Kleidung mit, aber man läuft die Nässe dann schon ir-

gendwann wieder raus“, sagt Frigga Kruse gelassen. Das Programm gestaltet sie flexibel und achtet darauf, dass ihre Schützlinge immer warm bleiben. Thermoskannen mit heißem Tee gehören in jeden Rucksack.

Ein Teil des Teams sucht Spuren der Pomoren. „Das waren russische Walrossjäger, die Mitte des 18. Jahrhunderts auf Spitzbergen gejagt haben“, erklärt Kruse. Die Schlachtfelder auf Spitzbergen erzählen heute noch ihre Geschichte. Massenweise Tierknochen schaffen reichlich Lehrmomente, und auch Überreste von Werkzeugen werden mit einem Metalldetektor aufgefunden gemacht. Ebenso können einige Proben mit Resten von Urin, Blut und Galle entnommen werden. „Jeder der hier ist, will auch etwas erreichen“, freut sich die Polarforscherin.

Trifft man auf einen Eisbären, gibt es strenge Verhaltensregeln, um die eigene Sicherheit nicht zu gefährden. Männlichen Walrossern kann man sich bis zu 30 Metern nähern, denn die haben die Ruhe weg und ignorieren meist die Zweibeiner. Sie dürfen sich nur nicht gestört fühlen. „So ein Walross hat unheimlich viel Zeit“, sagt Frigga Kruse und lacht. Ein Führer mit einem Gewehr und Leuchtpistole muss dennoch immer vor Ort sein. Selbst beim Toilettengang ist man nie ganz allein. „Es ist Wahnsinn, was wir alles in diesen Tagen gelernt haben. Die meisten sehen die Arktis jetzt mit ganz anderen Augen“, weiß die Forscherin.

Spitzbergen hat sie in nächster Zeit noch ein paar Mal auf ihrer To-Do-Liste stehen. Zum Beispiel bei verschiedenen Ausgrabungen. Vor allem die Latrinen und Misthaufen in den verlassen Dörfern will sie unter die Lupe nehmen. „Das sind wahre Fundgruben“, erklärt sie.

Trotz aller Routine und Erfahrung empfindet die Schleswig-Holsteinerin immer wieder Demut und Dankbarkeit. „Für mich ist es ein unheimliches Glück, nach Spitzbergen fahren zu dürfen. Daher möchte ich mein Wissen nach außen transportieren und vielleicht einen kleinen Teil dazu beitragen, dass wir lernen, bewusster mit unserer Umwelt umzugehen.“ ●



SEES archaeologists receive grant from the Svalbard Environmental Protection Fund

December 07, 2015

During the SEES expedition to Edgeøya in August 2015 (sees.nl), the GIA archaeologists Frigga Kruse and Sarah Dresscher and archaeology student Marthe Koeweiden investigated two Pomor sites. The Pomors were Russian walrus hunters from the White Sea region who visited the Arctic archipelago during the 18th and 19th century. At Dolerittneset and Kraussbukta, the team and their volunteers collected more than 700 soil samples to be tested for phosphate. Kruse and Dresscher think that the distribution of phosphate around the sites may provide information about Pomor activities such as animal slaughter and processing.

After the expedition had returned from Edgeøya, Kruse applied for funding to the Svalbard Environmental Protection Fund. Her application was successful (project no. 15/73), and the project now receives about 8000 Euro. The phosphate analysis is scheduled for the beginning of 2016.

