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A Small Investigation at Norse Site Ø38

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Report # 2004-3

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Report to
Emil Rosing
Director,
National Museum of Greenland
Nuuk

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Introduction

In the summer of 2003, we began a project to examine the stable isotope signatures of plants growing on ancient Norse fields in Greenland (Permit NKA 51.20.03–05). First tests were undertaken in the Qorlortup Itinnera area near Qassiarsuk, south Greenland. These studies involved collecting living plant specimens and taking 2.5 cm diameter soil cores from directly under the plants. On August 5, after completing our planned fieldwork, we visited Ø38 (FM-nr 533) to determine whether that farm would be a possible candidate for future research, as the description given by Guldager *et al.*, (2002) suggested that a well defined infield may still be present at the site.

As seen in Figure 1, the site Ø38 is situated on a high, flat terrace approximately 1.2 km northeast of the mouth of the river that flows through the valley to the west. (The site is accurately described and located in Guldager *et al.*, 2002) The front (southwestern) edge of the terrace is formed by a deep ravine with a small creek which drains into the river. Most of the building ruins are situated on slopes to the north and east of the terrace. As seen to the lower left in Figure 2, the single ruin on the terrace itself is a large complex that may have contained both a dwelling and a barn/byre (Guldager *et al.*, 2002).

Figure 1. Ø38 as seen from the west.

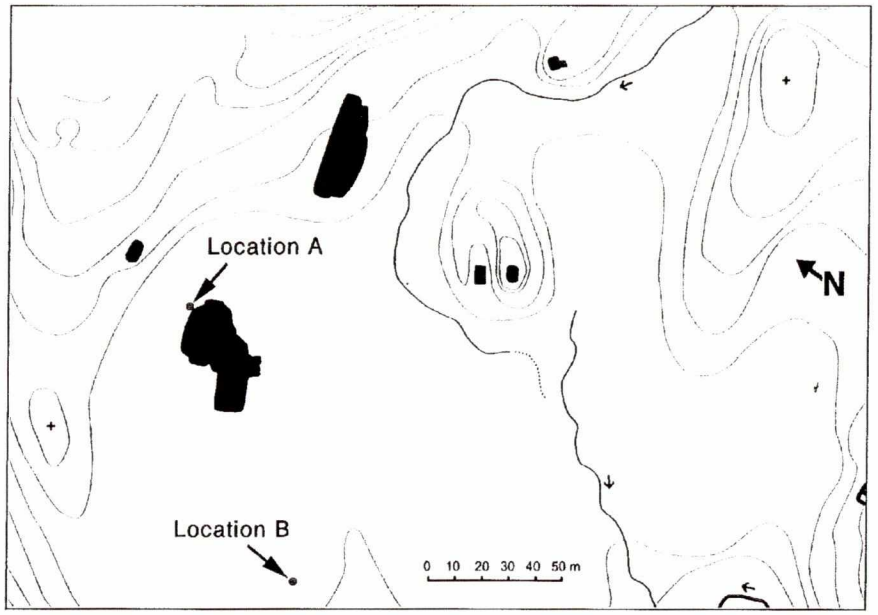


Figure 2. Plan view of the site Ø38, adapted from Guldager *et al.* (2002).

On arriving at the site, we saw immediately that the entire terrace surrounding the building ruins had been newly plowed to a depth of a few cm, presumably by local sheep farmers for hay production (Figure 3). We believe that this plowed area corresponds very closely to that of the ancient Norse infield. The plowing was clearly recent, as the machinery was still in the field. (This conclusion was subsequently confirmed by discussions at the nearby settlement Tasiusaq, where we learned that the plowing had taken place about three weeks earlier.)

Figure 3. Overview of Ø38, showing the remains of the house/byre complex surrounded by the newly plowed field. R.G. Commisso is standing at Location A.

While this meant that the field was unsuitable for our future studies, the extensive sub-surface exposure provided us with an unique opportunity to examine what lay immediately beneath the surface of an ancient Norse infield. Two questions were of specific interest:

1) Our study of Norse fields involves taking small soil cores. While we had found nothing of archaeological interest in those we had already taken at other sites, this might have been simply a matter of chance. Here, we had the entire field exposed and could test the question: Is this process likely to disturb anything archaeologically significant?

2) Based on his work at GUS, C. Schweger (1998) has suggested that the Norse may have fertilized their infields through the spreading of midden deposits. Norse middens contain a great amount of household debris (e.g., bone) which would be seen as such if spread onto the fields. Could we see any evidence for this?

We then walked several random transects across the newly-exposed area to see if we could find any cultural material which might be impacted by soil coring or which would provide evidence for fertilization.

Survey Outcome

We identified only two small areas containing surface scatters of bone fragments. The first, at Location A was immediately to the north of the main building as shown in Figures 2, 3, and 4. It lay about 1–2 m from the plow zone border and about 4–5 m from the building ruin. The bone fragments were distributed over an area approximately 2 x 5 m in dimension. It seems that the

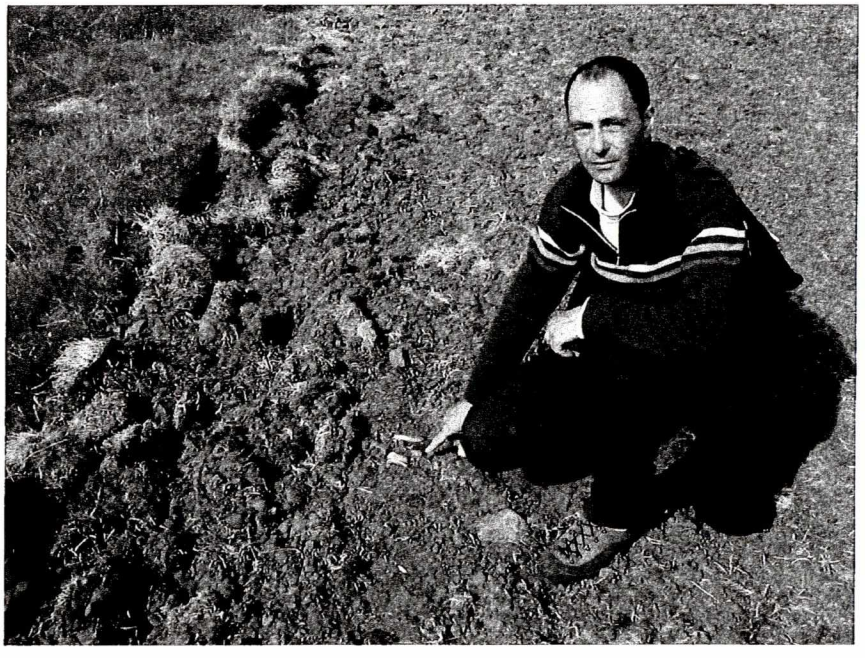


Figure 4. Location A, showing some of the bones.

plow caught the edge of the midden surrounding the main ruin complex. While we had no permit to work at this site, the decision was taken to collect these scattered fragments as they would not survive in their newly-exposed condition. Below, we discuss the information that has since been obtained from this collection. The fragments themselves are included as part of this report.

The second scatter of bone fragments was discovered approximately 90 m south-southwest of the house/byre complex (Location B, Figure 2) about 10 m from the edge of the terrace. Here, several small, burnt bone fragments were distributed over a 1 x 1 m area. An example is shown in Figure 5. None were collected.

While the visual survey of the plowed area was not exhaustive, a large portion of the infield was

Figure 5. A sample of the burnt bone fragments found in the plowed field of Location B.

covered. Only one small area (Location B) containing cultural material was found in the field, and so we can conclude that soil coring would not have disturbed anything of archaeological interest if it had been undertaken on this field before it was plowed. Next, it does not appear that midden deposits were extensively used as fertilizer at this site.

The bones collected

The eleven small bone fragments which were collected close to the house complex were later identified in the field by Jeppe Møhl (Zoological Museum, University of Copenhagen) who we subsequently met in Greenland. As he did this without access to a reference collection, these identifications should be verified if there is a critical need for certainty.

Table 1 gives a short description of the fragments, the labels subsequently assigned to them in the SFU Archaeometry lab and the species identifications.

Table 1. Bone Samples.

SFU ID	Species	Description
Ø38–1	*Bos taurus*	Humerus?
Ø38–2	perhaps cow	
Ø38–3	sheep or goat	tooth
Ø38–4	walrus	tooth
Ø38–5 to Ø38–11	seal, likely either harp or hooded	

It is interesting to note in Table 1 that even these few fragmented bone specimens provide an overview of Norse subsistence. The cattle, a sheep or goat, and some seals indicate what was eaten; the walrus tooth is a likely example of commerce seen even in this small inland farm. Walrus were not common in the Østerbygd, and so this is presumably a remnant of the hunting that took place in the Nordsetr to obtain walrus tusk and hide for international trade.

Since the sample Ø38–1 was certainly that of a cow, the decision was taken to obtain a radiocarbon date on it. Even though the bone was not found in stratigraphic context, the measurement will provide a definitive date for the existence of this domestic animal.

Sample Preparation and Collagen Extraction Results

The sample (Ø38–1) was dark brown on the surface but light brown just a few millimetres beneath. The surface of the bone was milled away using a low speed rotary tool fitted with a carbide bur and the hard, lustrous underlying material was sampled with a carbide twist drill. The resultant drillings were curled and lustrous which are characteristics indicative of bone containing well-preserved collagen.

About 60 mg of the sample was subjected to our standard collagen extraction procedure for extraction of high molecular weight, insoluble collagen from bone. This procedure begins with a soak in weak acid to remove autochthonous bone mineral and any post-depositional mineralization. The insoluble proteinaceous remnants are rendered soluble in very weak acid by shaking at a modest temperature for several hours. The resultant solution is then ultra-filtered and freeze-dried to isolate and concentrate the high molecular-weight protein.

The >30 kD extract yield was typical of that obtained from bone that is very well preserved (see Table 2). The extract itself was of excellent quality with the same white, sponge-like appearance that is characteristic of well-preserved collagen.

Table 2: Collagen Extraction Results

SFU ID	mg Bone	mg Collagen Extract	% Yield
Ø38–1	61.82	8.38	13.6

A portion of the extract (3.0 mg) was transferred to a clean quartz tube with about 50 mg of cupric oxide (CuO) and a few milligrams of silver powder. The tubes were evacuated, flame-sealed and then combusted at 900°C for three hours. The resulting CO_2 was cryogenically distilled in a vacuum line to remove any water vapour and non-condensible gases. These purified CO_2 samples were submitted to the Center for Accelerator Mass Spectrometry (CAMS) at the Lawrence Livermore National Laboratory for AMS measurement (see Appendix 1 for the detailed CAMS Report).

The remainder of the extract (that was not combusted) was submitted to the IRMS Laboratory in the Department of Earth and Ocean Sciences at UBC for stable isotope measurement. The results are summarized in Table 3.

Table 3: AMS and Stable Isotope Results

SFU ID	CAMS #	C conc. (%)	N conc. (%)	C/N ratio	$\delta^{13}C$ (‰ vPDB)	^{14}C Age (BP)
Ø38–1	102799	44.5	16.0	2.78	-19.9	715±35

The sample preparation proceeded uneventfully and the resulting material used for measurement was as expected for well-preserved collagen. The C and N concentrations, and the C/N ratios are as expected for well-preserved collagen. Furthermore, the $\delta^{13}C$ value is as expected. These results indicate that the date obtained here is reliable and that it satisfies the requirements for a "conventional radiocarbon age".

This measurement was calibrated using the on-line computer programme CALIB (http://radiocarbon.pa.qub.ac.uk/calib/), as provided by the laboratories at which most of the basic calibration data was obtained. This procedure is straight-forward for a terrestrial herbivore, and the detailed results are given in Appendix 2. Those interested in statistical manipulation of the data will find all the information needed for such an exercise there.

Here, we conclude with the general statement that this animal lived in the last half of the 13th century, probably between about 1270 and 1300 AD. However, as there is a reversal in the

calibration curve at this radiocarbon concentration, there remains a possibility that the cow was alive within a very short timespan at about 1375 AD. If for some reason it ever became necessary to distinguish between these two possibilities, there is sufficient remaining bone for many more measures.

References

Schweger, C.E. "Geoarchaeology of the GUS site: A preliminary framework." *Man, Culture and Environment in Ancient Greenland*. Eds. Jette Arneborg and Hans Christian Gulløv. Danish Polar Centre and Danish National Museum, Copenhagen: 1998. 14–18.

Guldager, Ole, Steffen Stummann Hansen, and Simon Gleie. *Medieval Farmsteads in Greenland: The Brattahild region 1999-2000*. Danish Polar Centre Publication 9. Danish Polar Centre, Copenhagen, 2002.

Acknowledgements

We thank Jeppe Møhl for identifying the bone fragments and for hospitality at Igaliku Kujalleq and Georg Nyegaard for discussions concerning the site.

Appendix 1: CAMS Report

CENTER FOR ACCELERATOR MASS SPECTROMETRY
Lawrence Livermore National Laboratory
^{14}C results

Submitter: SFU/Brown Date: December 15, 2003

CAMS #	Sample Name	$\delta^{13}C$	fraction Modern	±	$\Delta^{14}C$	±	^{14}C age	±
102799	Ø38–1	-19.9	0.9146	0.0036	-85.4	3.6	715	35

1) The quoted age is in radiocarbon years using the Libby half life of 5568 years and following the conventions of Stuiver and Polach (Radiocarbon, v. 19, p.355, 1977).

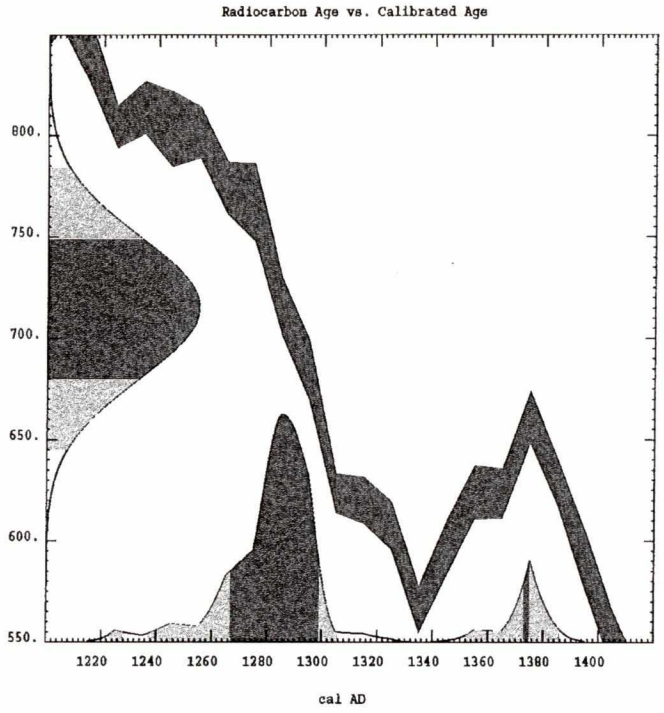
2) Radiocarbon concentration is given as fraction Modern, $\Delta^{14}C$, and conventional radiocarbon age.

3) Sample preparation backgrounds have been subtracted, based on measurements of samples of ^{14}C-free bone.

Appendix 2: Detailed Calibration Results

RADIOCARBON CALIBRATION PROGRAM* CALIB REV4.4.2

*To be used in conjunction with: Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215-230.



Ø38-1
CAMS-102799
Sample Description: bone collagen
Radiocarbon Age BP 715 ± 35
Calibration data set: intcal98.14c (Stuiver et al., 1998a)

% area enclosed	cal AD age ranges	relative area under probability distribution
68.3 (1 sigma)	cal AD 1268–1299	0.986
	1374–1376	0.014
95.4 (2 sigma)	cal AD 1224–1229	0.006
	1238–1307	0.854
	1354–1387	0.140

References for calibration dataset:
Stuiver, M., Reimer, P.J., Bard, E., Beck, J.W., Burr, G.S., Hughen, K.A., Kromer, B., McCormac, F.G., v.d. Plicht, J., and Spurk, M. (1998a), *Radiocarbon* 40:1041–1083.

Comments:
* This standard deviation (error) includes a lab error multiplier.
** 1 sigma = square root of (sample std. dev.^2 + curve std. dev.^2)
** 2 sigma = 2 x square root of (sample std. dev.^2 + curve std. dev.^2) where ^2 = quantity squared.

Nuuk den 26. april 2004
Journalnr.: 50.51

Til
Zoological Museum
Vertebrate Department
att. : Knud Rosenlund
Universitetsparken 15
2100 København Ø

Liste over sendt undersøgelsesmateriale :
SFU ID : Ø 38 – 9 seal
SFU ID : Ø 38 – 4 walrus tooth
Ø 38 - 3 sheep/goat tooth
SFU ID : Ø38 - 6 seal
SFU ID : Ø38 - 10 seal
SFU ID : Ø38 - 1 cow, perhaps humerus
SFU ID : Ø38 - 7 seal
SFU ID : Ø38 - 8 seal
Ø38 - 2 large – perhaps cow
SFU ID : Ø38 - 11 seal
SFU ID : Ø38 - 5 seal

Med venlig hilsen
Grønlands Nationalmuseet & Arkiv
3900 Nuuk
c/o Boks 145
Hans- Egedesvej 8
Tlf..: +299 322611
Fax.: +299 322622

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Tidligere nr.

Tidligere litt. ref.
En prøve er udboret af Bos taurus, humerusfragment (Ø34-1) af Erle Nelson kort efter at knoglen var fundet.

Tidligere til anden brug

Afståelse

Foto

Konservering

Vedlagte kilder
Nelson, Commisso & Takahashi: A Small Investigation at Norse Site Ø34. Report 2004-3 Archaeometry Laboratory, Simon Fraser University.

Diverse

Zoologisk Museums
kvartærzoologiske samlinger

Z.M.K.
25/2004

Fremmed nr.
KNK 50.51

Lokalitet
Østerbygden, Ø 38, Qorlortup Itinnera

Sogn
Narssaq kommune

UTM

Herred

Kortblad

Amt før 1970
Grønland

Amt efter 1970

Fundet opbevares
Indgået, står i kældergangen

Indkommet
4.5.2004

Udgravet
5.8.2003

Navne - adresser
Indsamlet af Erle Nelson og R. G. Commisso, Simon Fraser University, Canada.
Indsendt af Grønlands Nationalmuseum og Arkiv.

Fundforhold
Knoglematerialet opsamlet på overfladen af nypløjet jord, ganske tæt ved en nordbogård. Denne pløjning, udført i juli 2003, er den første pløjning på stedet.

Datering
C-14: 715 +- 35 BP (CAMS 102799)

Sagens behandling
Knoglematerialet, som blev indsamlet af Nelson og Commisso den 5.8.2003, blev foreløbig bestemt af Jeppe Møhl, som de to findere traf i Sydgrønland samme sommer. Erle Nelson udborede en prøve af okseknoglen, betegnet Ø38-1, til AMS 14C-datering. Knoglematerialet blev herefter sendt til Grønlands Nationalmuseum og Arkiv.
Den 26.4.2004 videresendte G.N.o.A. materialet til Z.M., hvor det blev registreret og indført 4.5.2004 (en dag, hvor Erle Nelson netop var på besøg her).

Arter
Odobenus rosmarus
Phocidae
Bos taurus
Capra hircus/Ovis aries