Scapa Flow Landscape Partnership
Report 25th August 2011

Scapa Flow Landscape Project – Submerged Landscape

S Dawson[1] & CR Wickham-Jones[2]

Work Report: August 2011

Introduction

The entrance to Scapa Flow provides an opportunity to investigate environmental conditions associated with a rising sea level during the Holocene time frame. Key sites on Hoy (Mill Bay) and South Ronaldsay (Dam of Hoxa) with preserved organic deposits allow this palaeoenvironmental reconstruction.

Cores were collected in September 2010, and the following 12 months have involved detailed laboratory analyses. Sediments have been sub-sampled for particle size analysis, Loss on Ignition (LOI) and prepared for microfossil analysis. Laboratory analyses was undertaken to allow the reconstruction of the environment of deposition of the deposits in the two localities shown below and give an indication of the sea level changes that have occurred at the site during the mid to late Holocene. This will add to a growing body of palaeoenvironmental data related to sea level changes across Orkney to produce a sea level curve for the area.

Fig.1. Scapa Flow showing coring sites

[1] Department of Geography, University of Dundee
s.dawson@dundee.ac.uk
[2] Department of Archaeology, University of Aberdeen
c.wickham-jones@abdn.ac.uk

Field Results

Site 1. Mill Bay, Hoy, Orkney

Fig. 2. Mill Bay, Hoy showing location of intertidal peat.

The presence of organic sediments within intertidal areas is noted for many areas around Orkney and reflects a time when the relative sea level was lower than present. Organic sediments in Hoy have never been studied. Highly compacted, laterally extensive organic deposits underlie the present beach at the head of Mill Bay. The peats are rich in plant macrofossils comprising large fragments of Alder (*Alnus*) and Birch (*Betula*) wood. This reflects a time when the area was more extensively tree covered, and probably relates to the middle Holocene time-frame.

Microfossil Analyses:
A comprehensive analysis of a set of cores from low to high water mark was undertaken.

Fig. 3. Extracting cores with the terrier rig at Mill Bay

Samples were concentrated on the stratigraphic boundaries where clastic material comprising sands and silts are replaced by increasing organic sediments. Diatoms (microscopic algae) preserved within the sediments allow an assessment of the mode of deposition in Mill Bay. The sands and silts are predominantly marine and brackish in composition. These species are typically found in the sands of the present day intertidal areas and represent conditions around the low tide mark.

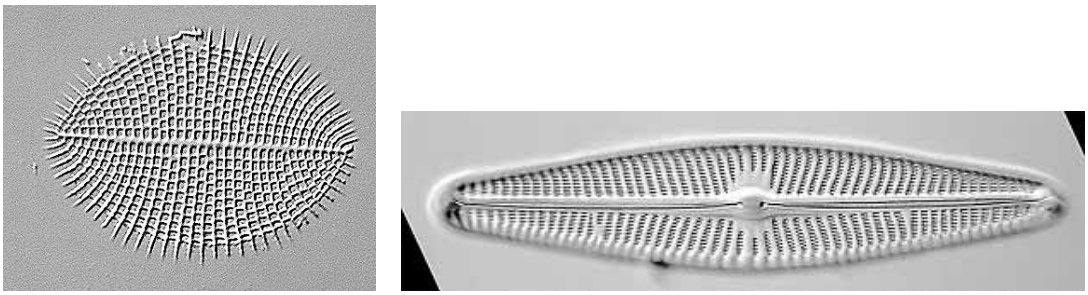

Fig.4. Cocconeis Scutellum and Navicula peregrina (marine-brackish) diatoms characteristic of the sand and silt deposits underlying the organic unit in Mill Bay.

Where the sediments grade to become more organic, the diatoms become increasingly represented by brackish-fresh and freshwater forms. This indicated a reduction in marine influence at the site. Clastic sediments occur in situ overlying the peats in limited localities across the bay, but nevertheless, samples at the mid-water mark exhibit a return to more brackish and marine conditions and the inundation of the peats as sea level rose to present levels.

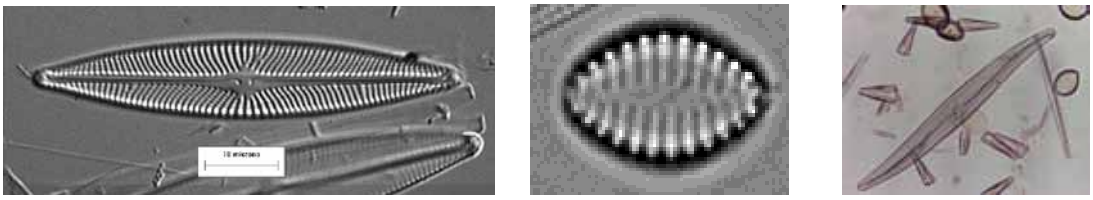

Fig.5. *Navicula radiosa, Fragilaria construens* and *Gyrosigma* sp.typical fresh-brackish and fresh water species found in abundance in the organic units in Mill Bay.

Dating:
Radiocarbon dates taken from the basal contact with the underlying sands and silts which demonstrate a graded transition will provide information as to the period at which peat growth started and when it ceased. The transition with the underlying silts and sands will allow an assessment of the mode and time of deposition in relation to the encroachment of marine conditions at the site as the peat was inundated and sea levels reached present.

Dates have been submitted to Beta Analytic and are due in September 2011. Following date acquisition an assessment of the relative sea level changes will be undertaken. This will then be placed in the wider context of Orkney and northern Scotland and will allow a more accurate relative sea level curve to be constructed than hitherto exists.

Site 2: Dam of Hoxa, South Ronaldsay

Fig. 6. Location of the Dam of Hoxa

The site at Dam of Hoxa is an Oyce site with a barrier beach beyond which lie a series of small lochans. Sediments comprise up to 1 m of organic material/lake gyttjas which are underlain by extensive deposits of grey sands and silts. The area was once more extensively connected to marine waters. Historical information relating to the presence of a buried forest on the south side of the peninsula (Constantine pers com) attest to a time during the Holocene when the sea was lower than present. It was not possible to sample the buried forest deposits during the fieldwork phase as they are only exposed at extreme low tide.

Microfossil Analysis:
Analysis of a core located on the periphery of the smallest lochan allows the reconstruction of the mode of deposition of the sediments found infilling the lochan. The upper lake sediments have a freshwater diatom flora. The underlying sands and silts are composed of brackish and brackish-marine diatoms. The microfossil analysis demonstrates the isolation of the site from direct marine influence. This is a similar flora to that exposed on the present day intertidal sands to seaward of the study site. The area around Dam of Hoxa would have been a more extensive marine embayment than exists at the present day.

Dating:
Samples have been prepared and submitted for dating analysis to Beta Analytic and are due in September 2011. The dates will allow an assessment of the time in the mid-late Holocene when sea reached present and allowed the development of the Oyce and the return of fresh-brackish conditions to the site and its eventual isolation from marine influence. Based on multiple-dated locations elsewhere in Orkney, it is likely that this will date to c 4000 years ago.

Fig.7 Coring

Archaeology

Based on previous research around Orkney, as well as the present information, the likely reconstruction of Scapa Flow at two time slices: Early Mesolithic and Early Neolithic, are given below.

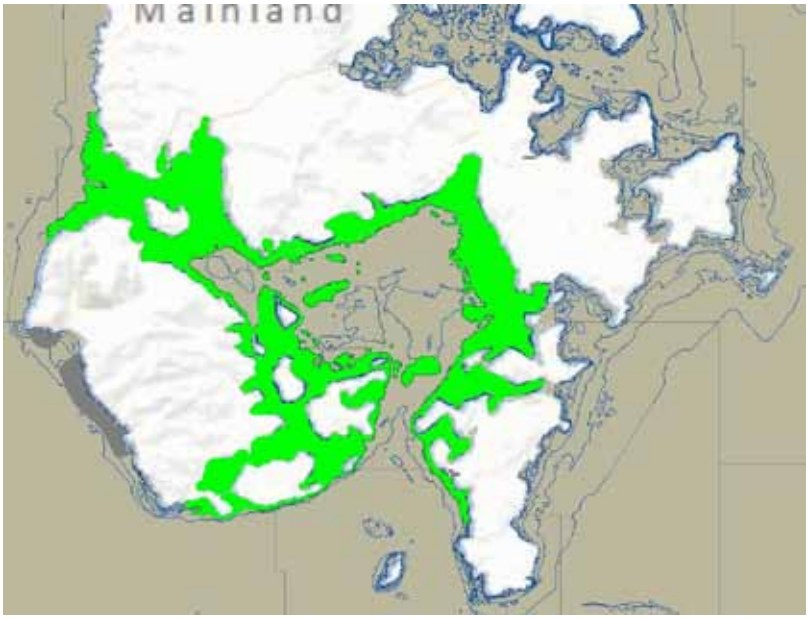

Fig. 8. Hypothetical reconstruction of Scapa Flow at the start of the Early Holocene, when people first arrived in Orkney.

Lower relative sea-levels at the start of the Early Holocene meant that Scapa Flow comprised a large land locked bay with an outlet to the sea towards the south. In places a sharply indented coastline and numerous small islands presented ideal locations for Mesolithic settlement with sheltered boat landing spots and easy access to resource rich waters. The submergence of coastal areas with potential for archaeological sites is clear.

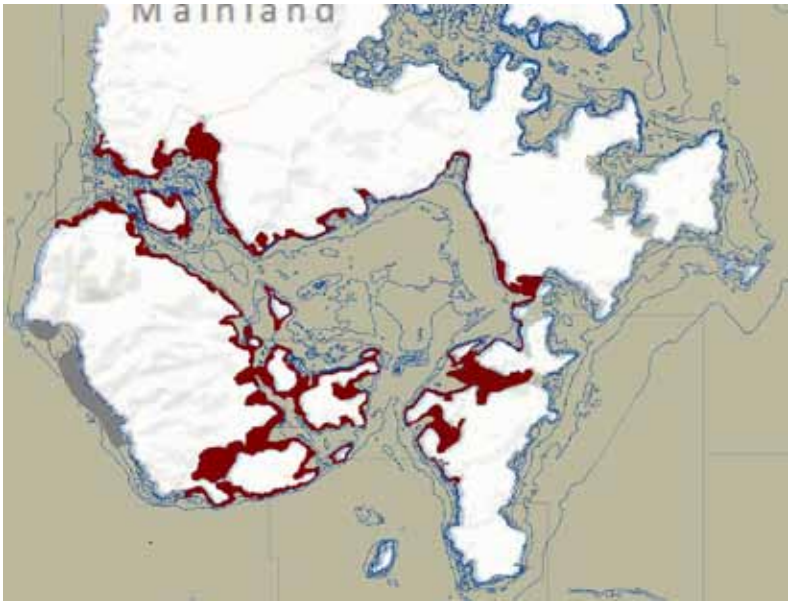

Fig. 9. Hypothetical reconstruction of Scapa Flow at the Start of the Neolithic

Rising relative sea-levels between the Mesolithic and Neolithic periods means that Scapa Flow has assumed a more familiar form with access to the open sea at both the south and west. Nevertheless, submerged areas still exist with the potential for early farming sites.

Lectures*:*

- Lecture, Mesolithic in Europe Conference 2010, September 2010, Santander, Spain. (300)
- Seminar, MASTS, Heriott Watt, Stromness, October 2011 (40)
- Lecture, Edinburgh University Student Archaeology Society, February 2011. (50)
- Seminar, Dundee University, March 2011 (25)
- Lecture, Sanday Soulka, May 2011 (50)
- Lecture, Spirit of Adventure, August 2011 (100)
- Lecture and associated workshop, Hoy Kirk, Sept 2011 Orkney Science Festival (60)
- Lecture, Cromarty Hall, St Margaret's Hope, S Ronaldsay, Sept 2011 Orkney Science Festival (40)

Work to finalise*:*

Completion of sediment microfossil diagrams and photomicrographs of the diatoms representative of the two study sites will lead into the provision of visual material to input to the interpretative exhibition and boards. Once the dates have been received, a revised sea level curve for the area will provide the context for changes seen across Scapa Flow during the mid-late Holocene.

Work in 2011-2 will focus on provision of text and illustrative material for display boards.

Acknowledgements

Barry & Sue Constantine
Jason McIlvenny
Mr & Mrs Dowie
Scapa Flow Landscape Partnership
Orkney International Science Festival
Richard & Martin

Sue Dawson
Caroline Wickham-Jones
s.dawson@dundee.ac.uk c.wickham-jones@mesolithic.co.uk