Sea Level change and the Prehistory of Orkney.

Interim Report 2006

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Introduction

Orkney is well known for its archaeology which comprises well preserved monuments, tombs and houses from the earliest farmers to the present day. The best known sites are World Heritage sites dating to the Neolithic (Downes et al 2005) which attract visitors from around the world and provide a focus for archaeological research (illus 1). There is another, unrecognised, side to Orkney archaeology, however, which has yet to be studied. This comprises the submerged landscape of the prehistoric world which existed at the end of the last Ice Age. Orkney was settled by hunter-gatherers some 10,000 years ago, but due to rising sea levels throughout this period most of the evidence for this now lies underwater (CF work done in Caithness, Dawson and Smith 1997). Orkney is one of the few places in Scotland where this submerged landscape exists, it offers amazing potential for learning about the past yet today it is un-studied and at increasing threat from developments such as those relating to renewable energy, local transport needs, and sediment extraction.

Illustration 1: Aerial view of the World Heritage area at the junction of the lochs of Stenness and Harray showing one of the areas targeted for research in 2006.

Illustration 2: GIS reconstruction of exposed land around Orkney c. 10,000 BP (after Richard Bates)

Although evidence from mainland Scotland suggests lower sea levels around Orkney during the last 10,000 years (illus 2), there has been no detailed systematic research to quantify this. The initial step for the project is thus to reconstruct the former position of the sea and the evolution of the coastal landscape at different time-slices for this period. This will allow an examination of likely prehistoric settlement patterns in the former coastal area. Existing sedimentation data can then be used to predict likely areas of archaeological survival.

Aim

The aim of the project is to document the submerged evidence for the earliest settlement of Orkney before it disappears, through erosion and human disturbance such as exploitation of the seabed, and to use it as a tool to learn about our early past. The period under study was a time of dynamic climate change including sea level rise. The increased preservation levels that may be expected from submerged sites such as these mean that unusual archaeological detail may be expected (Flemming 2004). This should provide increased information relating to the context and background of the World Heritage sites of Orkney and the early settlement of northern Scotland in general. The results of this work will be of significance not only to our knowledge of our past, but also of the present and, hopefully, of likely future trends. It will provide an important management tool for the future.

Illustration 3: Loch-coring and sediment collection in 2006

Fieldwork

Fieldwork in 2006 comprised the preliminary examination of selected Lochs around the Orkney coastline to determine the potential to preserve sufficient sedimentation within the lochs to justify any further investigative work. The loch bed around the shores of the Loch of Stenness was examined using an inflatable boat and outboard to traverse the loch and check the sediment thicknesses and best locality for extraction of larger cores. Cores were taken around Voy, Loch of Stenness and within Echna Loch, Burray in April 2006 (illus 3 &4).

Illustration 4: Field study areas in 2006 (taken from Google Earth).

Analysis

Laboratory work on the samples will take place over the winter 2006-7 (cf methods used by Dawson in Caithness, Dawson & Smith 1997). Loch of Stenness is the largest brackish lagoon in the UK and occurs at c.1m Ordnance Datum (OD) and is between 2-3m deep (although selected areas are up to 5m deep). The sediments within the loch are 2-3 m in thickness. Several half metre long cores were extracted using a Russian closed coring system, which allows an undisturbed sediment core to be taken. An initial inspection of the sediments noted an abundance of marine-brackish shells including *Mytilus edulis* (the common mussel) and other brackish bivalves in the uppermost sediments within the cores. These are incorporated throughout black-grey sandy silts. Underlying the silts is a sequence of organic deposits with fresh-brackish shells including *Hydrobia ulvae* and *Mya arenaria* throughout. An initial scan of the sediments under high power microscope confirms the presence of diatoms (microscopic algae) within the sediments (illus 5). The upper sands and silts are characterised by brackish and marine diatom species and the underlying organic sediments have brackish and freshwater species. The interface between the two characteristics is suitable for radiocarbon dating the transition from a freshwater marsh/loch environment to the initial inundation of the basin by more brackish and marine conditions.

Illustration 5: sediments from Loch of Stenness

Echna Loch, Burray is a small loch enclosed by an ayre on the eastern coastline of Burray (illus 6). The loch is up to 3 m deep and sediments are between 1 and 2 m thick. Organic lake sediments are located at the top of the cores and are underlain by grey silty sands. Freshwater shells occur within the organic sediments and include Hydrobia species. The silty sands at the base of the organic sediments are characterised by brackish marine shells and diatoms. Radiocarbon dating of the transition from marine to freshwater sediments will allow the reconstruction of the basin when it was connected to the sea and the emplacement of the present ayre which led to the development of the fresh-brackish loch seen today.

Illustration 6: Echna loch, view from the N

Discussion

Detailed microfossil anaysis of the cores will take place over the winter of 2006/7 to determine the location within the cores of the transition from a fresh-brackish to marine –brackish environment. Samples from the identified transitions will be sent for radiocarbon analysis. The dated locations will provide the chronology for the inundation of the Stenness basin and critical information regarding the time during the Holocene when a marine connection was made especially in relation to the World Heritage sites. At Echna Loch, Burray, further microfossil and stratigraphic analyses will allow the dating of the closure of the basin and the emplacment of the ayres, thus determining when during the past the Echna basin was an arm of the sea. The potential to reconstruct a relative sea level change curve for Orkney has been realised and the methodology proven and thus the application of the sea level curve will allow the placement of the archaeological sites in their environmental context.

Preliminary findings of the coring program in Loch of Stenness and Echna Loch, Burray, were presented in September 2006 as part of the Scottish Archaeology Week program at the Orkney Science Festival. The findings were also presented in Sanday in September 2006, and as part of the York Seminar Series in October 2006.

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