CRUISE REPORT 05/00

CONTENTS:

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R.V. Prince Madog:

S. Duckworth	Captain
A. Price	First Mate
A. Williams	Chief Engineer
H. Owen	Second Engineer
P. Jones	Bosun
T. Roberts	Able Seaman
P.D. Williams	Able Seaman/Steward

Time Breakdown:

Sailed from Milford Haven	09.15	03.05.00
Arrived at first station	14.02	03.05.00
Left last station	12.45	04.05.00
Arrived at Par (Cornwall)	07.00	05.05.00

1. Abstract

The eleventh (final) in the series of cruises supporting the NERC funded 'Holocene palaeoceanography of shelf seas: long-term (103-104 years) seasonal stratification', the objectives of this cruise were to again sample at those sites in the Celtic Sea identified during the reconnaissance cruise, 7/98. The shipek grab-sampler and multicorer were deployed at 7 sites, with sediment successfully cored at all stations. CTD data was also collected through the water column and bottom water samples obtained at all sites. The suitability of the sediments for multicoring was determined by examination of the contents of the shipek grab-sample. The longest multicore at each station was subsampled for foraminifera. A second core was sampled for foraminifera, organic carbon and grain size at the surface. The top 0-0.5 cm was sampled in a third and fourth core where possible for benthic foraminifera and dinoflagellates (F. Marret). The grab sediment was sampled for dinoflagellate and geochemistry for Fabienne Marret. Pore water analysis was performed at Stations 9 and 7 by S. Papadimitruou. A plankton net was deployed at all stations for dinoflagellates analysis in the surface waters.

2. Introduction

a. Scientific aims of project

This cruise was run as part of a NERC funded project entitled 'Holocene palaeoceanography of shelf seas: long-term (10^3 - 10^4 years) seasonal stratification

dynamics. The aim of this project is to generate a record of environmental change relating to development of seasonally stratified water in the Celtic Sea during the Holocene.

b. Specific cruise objectives

The aim of this cruise was to collect a set of ‘during stratification', set of multicores from the sites already identified during cruise 7/98. These sites are to be examined for changes in the seasonal vertical distribution of benthic foraminifera and for seasonal variability in the environmental conditions at each site. Additional aims were to collect samples from the seabed at these sites for dinoflagellate, grain size and organic carbon, pore water analysis and surface water sampling.

c. Narrative of cruise

The R.V. Prince Madog sailed from Menai Bridge at 09.15 on 03.05.00 in calm conditions. The first site, site 9, was reached at 14.02 (03.05.00) and the CTD was the first instrument deployed. The attached rosette water sampler fired successfully and a bottom water sample taken (Bottle No. 215). The CTD successfully collected temperature, salinity and oxygen data from throughout the watercolumn. The grab sampler was deployed and the sample returned confirming the suitability of sediment at this site for coring. One sediment sample was taken from the grab sampler for dinoflagellates (F. Marret). Multicorer was deployed twice, retrieving three cores at each deployment, one of which was used by F. Marret for dinoflagellate analysis and one for pore water analysis by S. Papadimitruou. A plankton net was cast to retrieve surface water for dinoflagellate analysis (F. Marret).

The second site, site 8, was reached by 01.10 (04.05.00). The CTD was successfully deployed. A plankton net was cast to retrieve surface water for dinoflagellate analysis (F. Marret). Grab sampler was deployed three times and a sample taken on the third occassion. The multicorer was deployed twice and retrieved two cores. The longest core was sampled at 0.5 cm then 1 cm intervals down to 14.5 cm for foraminiferal analysis. A second core was sampled at the surface for foraminifera, grain size and organic carbon. The top 0-0.5 cm of a third was sampled for benthic foraminifera and a fourth core sampled for dinoflagellates. The foraminiferal samples were stained using rose Bengal and stored in ethanol while the dinoflagellate samples were simply kept cool. The grain size samples were untreated and the organic carbon samples were frozen.

Sampling was carried out in this way at all sites, 9, 8, 3, 4, 5, 7, and 6 in that order, with the following differences:

- dinoflagellate samples were taken in (Core 3) core tops 0-0.5 cm at sites 9, 8, 4, and 7.They were not retrieved at Sites 3, 5 and 6.

- foraminifera samples were taken in core tops 0-0.5 cm at site 9 (Core 4). Samples were not retrieved at sites 8, 3, 4, 5, 7 and 6.

- Two grab samples were taken for dinoflagellate and geochemical analysis at sites 3, 4 5, 7 and 6. Two samples were taken to guarantee that enough sediment was available in the possible absence of a Core 3 or 4.

The foraminifera cores (Core 1) were all sampled to the same depths i.e. 0 - 20.5 cm, except at site 8 (up to 14.5 cm).

Core 1
Sites 9, 3, 4, 5, 7 and 6 sampled 0-20.5 cm
Site 8 0-14.5 cm.

Core 2
Sites 9, 8, 3, 4, 5, 7 and 6 sampled 0-0.5cm (1/2 Foraminifera, 1/4 Organic Carbon, 1/4 Grain size).

Core 3
Sites 9, 8, 4 and 7 - for dinoflagellates
Site 5 – for pore water analysis.
Site 3 and 6 - no core.

Core 4
Site 9 - for foraminifera.
Site 7 – pore water analysis.
Sites 8, 3, 4, 5, and 6 – no core.
The ship arrived at Par (Cornwall) at 07.00 on the 05.05.00.

Core 5 and 6
Retrieved at Site 9 – Core 5 used for pore water analysis, Core 6 – disturbed – not used.

3. CTD Operations

The CTD, a Neil Brown system, was used to collect data on salinity, temperature and pressure. All the sensors appeared to work well. A total of 7 CTD casts were made.

The CTD system was fitted with a rosette water sampling system and this was triggered to collect at the deepest point of the drop, usually 10 m from the sea bed. The water collected was used for calibration of the CTD and for oxygen isotope and oxygen concentration measurements. The calibration bottles for the CTD were rinsed out in the collected water and then filled to the neck. The bottles for oxygen isotope measurements were filled using a piece of tubing inserted into the bottle right to the bottom. The bottle was allowed to fill from the bottom, while swirling the tube around to remove as many air bubbles as possible. The bottle was allowed to overfill until three times its capacity of water has passed through it then the tubing was slowly lifted out and the cap screwed on. This was carried out at each site and bottles were stored in the fridge. The oxygen concentration bottles were filled in the way described for oxygen isotopes. To fix the samples in preparation for, Winkler titration, to be carried out on land, a 1 cm3 volume of both manganese sulphate and alkaline sodium iodide was delivered by pipette to the sample. Bottom water samples were also collected for dinoflagellates from the CTD.

4. Sediment collection

A shipek grab was carried on board to collect surface samples. These samples were stored for dinoflagellate and geochemical analysis. They were also examined visually for grain size to determine whether the site was sufficiently fine grained to deploy the multicorer.

The multicorer system consists of four core tubes, core catchers and a hydraulic coring system mounted in a bell-shaped frame. After attaching the cores, catchers and additional weights and priming the system on deck, the core was winched overboard and dropped to the seabed where the cores slowly enter the sediment taking a relatively undisturbed core with a good sediment-water contact. Once the corer was back on deck the core catchers were removed and the cores bunged. The cores were taken out of their holds and placed in a cradle to await further sampling.

Of the returned cores the longest was sectioned at 1 cm intervals to the end of the core. Each circular section, as it was extracted, was stored in a 250 ml sampling bottle with an equal quantity of ethanol and approximately 10 - 20 ml of rose Bengal solution.

A second core from each site was sampled at the 0-0.5 cm interval. Half of the circular section was stored for foraminifera analysis, and one quarter for grainsize and the other quarter for organic carbon analyses. The latter sample was frozen. Where possible Cores 3 and 4 0-0.5 cm were obtained for foraminifera and/or dinoflagellates analyses. Pore water analysis was carried out on Core 4 and 5 where possible.

A plankton net was deployed at each site and surface water samples collected by F. Marret for dinoflagellates analysis.

5. Equipment problems

The grab sampler did not rotate properly at Site 8, except on the third attempt – this needs attention. A plastic core catcher was broken on return to the surface at Site 8, therefore the tube was removed. At Site 6 a thread sheared on the central column of the multicorer. The bakerlite plate on the second extruder (used for pore water analysis) was broken following too much pressure being applied as a result of a stiff bung.

6. Station log

Station no.	Sampling	Date	Time	Latitude	Longitude	Depth	Comment
Site 9	CTD	03.05.00	14.02	52 44.99	04 27.98	29	
	Grab		14.10	52 45.02	04 28.16	29	
	MultiC		14.19	52 44.99	04 28.26	28	3 cores
	MultiC		14.31	52 44.96	04 28.38	28	3 cores
Site 8	CTD	04.05.00	01.10	51 30.59	05 50.01	86	
	Grab		01.23	51 30.36	05 50.19	86	
	MultiC		01.40	51 30.00	05 50.38	86	0 cores
	MultiC		01.55	51 30.59	05 50.00	87	3 cores
Site 3	CTD		04.03	51 38.18	06 12.59	101	
	Grab		04.19	51 37.90	06 12.73	100	
	MultiC		04.26	51 37.79	06 12.79	100	3 cores
Site 4	CTD		06.52	51 21.86	06 30.11	89	
	Grab		07.00	51 21.88	06 30.11	89	0 sample
	Grab		07.05	51 21.89	06 30.11	89	
	MultiC		07.11	51 21.90	06 30.12	89	3 cores
Site 5	CTD		09.13	51 13.17	06 09.41	102	
	Grab		09.23	51 13.18	06 09.75	101	
	MultiC		09.31	51.13.18	06 10.00	100	1 core
	MultiC		09.43	51 13.19	06 09.91	100	2 cores
Site 7	CTD		10.40	51 17.85	06 04.21	99	
	Grab		10.50	51 17.79	06 04.60	98	
	Multi C		10.58	51 17.73	06 04.85	99	1 core
	MultiC		11.10	51 17.64	06 04.80	99	3 cores
Site 6	CTD		12.16	51 15.09	06 54.07	89	
	Grab		12.28	51 14.90	06 54.51	89	
	MultiC		12.37	51 14.93	06 54.37	89	2 cores