

## CRUISE REPORT 03/00

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M. Furze	University of Wales, Bangor

### **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 Menai Bridge	12.00	13.03.00
Arrived at first station	20.40	13.03.00
Left last station	19.40	14.03.00
Arrived at Menai Bridge	13.45	15.03.00

## **1. Abstract**

The ninth in the series of cruises supporting the NERC funded 'Holocene palaeoceanography of shelf seas: long-term ( $10^3$ - $10^4$  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. Marrett). The grab sediment was sampled by Fabienne Marrett for dinoflagellates and Mark Furze for Mollusca.

## **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 'pre-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, molluscan, grain size and organic carbon.

### **c. Narrative of cruise**

The R.V. Prince Madog sailed from Menai Bridge at 12.00 on 13.03.00 in moderate sea conditions. The first site, site 9, was reached at 20.40 (13.03.00) and the CTD was the first instrument deployed. The attached rosette water sampler fired successfully and a bottom water sample taken (Bottle No. 9). 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. Marrett) and one for molluscan analysis by Mark Furze. Multicorer was deployed once, retrieving four cores in total, one of which was used by F. Marrett for dinoflagellate analysis.

The second site, site 8, was reached by 07.43 (14.03.00). The CTD was successfully deployed. Grab sampler was deployed once and a sample taken. The multicorer was deployed twice and returned one and four cores respectively. The longest core was sampled at 0.5 cm then 1 cm intervals down to 20.5 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, 6, 7, 5, 4, and 3, in that order, with the following differences:

- the grab sampler was deployed twice at sites 6, 5 and and samples retrieved the second time.
- dinoflagellate samples were taken in core tops 0-0.5 at sites 9, 8, 6, 5, 4, and 3. At site 3, foraminifera were taken from 0-0.5 cm (50%) and dinoflagellates (50%) in Core 3. In addition, at site 4 two 0-0.5 cm samples (Cores 4 & 5) were taken for dinoflagellates analysis.

The foraminifera cores (Core 1) were all sampled to the same depths i.e. 0 - 20.5 cm.

*Core 1*

Sites 9, 8, 6, 7, 5, 4, and 3 sampled 0-20.5 cm

*Core 2*

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

*Core 3*

Sites 9, 8, 4, 3 - for foraminifera.

Sites 6, 5, 4, 3 - for dinoflagellates.

Site 7 - no core.

*Core 4*

Sites 9, 8, 4 - for dinoflagellates.

*Core 5*

St. 8, 4 - for dinoflagellates.

The ship arrived back at Menai Bridge at 13.45 on the 15.03.00.

### **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 cm<sup>3</sup> volume of both manganese sulphate and alkaline sodium iodide was delivered by pipette to the sample.

### **4. Sediment collection**

A shipek grab was carried on board to collect surface samples. These samples were stored for dinoflagellate analysis and one sample at site 9 for molluscs. 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 grain size and the other quarter for organic analyses. The latter sample was frozen. Where possible Cores 3 and 4 0-0.5 cm were obtained for foraminifera and/or dinoflagellates analyses.

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

## **5. Equipment problems**

A plastic core collar (placed around core tube on multicorer) sheared and was lost whilst the multicorer was overboard. As a result only three core tubes could be used from site 6 through to site 3. A spare collar was not available, it is hoped that a replacement and spares will be available on future cruises.

A brass core cutter was lost at site 3 on retrieving the multicorer.

## 6. Station log

Station no.	Sampling	Date	Time	Latitude	Longitude	Depth	Comment
Site 9	CTD	13.03.00	20.45	52 44.93	04 27.92	30	
	Grab		20.56	52 44.99	04 27.70	29	
	MultiC		21.02	52 45.02	04 27.58	29	4 cores
Site 8	CTD	14.03.00	07.46	51 30.45	05 49.88	89	
	Grab		08.04	51 30.55	05 49.95	89	
	MultiC		08.12	51 30.44	05 49.74	89	1 core
	MultiC		08.25	51 30.46	05 49.75	89	4 cores
Site 6	CTD		10.13	51 15.20	05 53.93	93	
	Grab		10.25	51 15.12	05 53.65	93	No sedt
	Grab		10.36	51 15.09	05 54.05	93	
	MultiC		10.44	51 15.04	05 53.88	93	No cores
	MultiC		10.56	51 15.10	05 53.84	93	3 cores
Site 7	CTD		11.57	51 17.80	06 04.01	101	
	Grab		12.12	51 17.72	06 03.78	101	
	MultiC		12.22	51 17.67	06 03.61	101	2 cores
Site 5	CTD		13.13	51 13.00	06 09.39	104	
	Grab		13.25	51 13.05	06 09.29	103	No sedt
	Grab		13.34	51.13.00	06 09.26	104	
	MultiC		13.42	51 12.97	06 09.22	103	3 cores
Site 4	CTD		15.39	51 21.95	06 30.18	86	
	Grab		15.50	51 21.98	06 30.07	86	No sedt
	Grab		15.58	51 21.96	06 30.00	86	
	Multi C		16.04	51 21.95	06 29.93	86	No cores
	MultiC		16.13	51 21.93	06 29.85	86	2 cores
	MultiC		16.24	51 21.89	06 29.80	86	3 cores
Site 3	CTD		18.47	51 38.19	06 12.43	100	
	Grab		18.58	51 38.05	06 12.34	101	
	MultiC		19.06	51 37.92	06 12.29	101	1 core
	MultiC		19.17	51 38.04	06 12.48	100	No cores
	MultiC		19.28	51 37.87	06 12.37	100	2 cores