Prince Madog cruise 24/02
25, 26 September 2002
POL Coastal Observatory cruise 2
REPORT

1. Objectives

1. At 53º 32´ N 3º 21.8´ W, half a mile west of the Mersey Bar Light Vessel –

To recover
a) A sea bed frame for a 600 kHz ADCP to measure the mean current profile and pressures. A pressure recorder and a transmissometer / conductivity / temperature logger are also fitted to the frame.
b) A sea bed frame for a 600 kHz ADCP to measure fast sample current profiles and pressures in 10 minute bursts every hour.
c) A single point mooring marked by a toroid buoy with temperature and conductivity loggers at 2, 5 and 10 m below the surface.

To deploy
d) A sea bed frame for a 600 kHz ADCP to measure the mean current profile and pressures. A pressure recorder, a transmissometer / conductivity / temperature logger and a SeaBird MicroCat are also fitted to the frame.
e) A single point mooring marked by a toroid buoy with temperature and conductivity loggers at 2, 5 and 10 m below the surface.

2. To conduct a CTD survey of 34 stations every 5 miles covering the eastern Irish Sea between the North Wales coast and Blackpool and the Lancashire coast and the Great Orme, to determine the effects of the rivers Dee, Mersey and Ribble on Liverpool Bay.

2. Scientific personnel

M.J. Howarth
J.D Humphery
M.J. Smithson
J.P. Pugh
E. Jones
C. Griffiths (DML)
A. Hammerstein (School of Ocean Sciences)

3. Narrative (times in GMT)

The mooring, sea-bed frame and instrumentation were loaded onto RV Prince Madog on the afternoon of 24 September, the toroid being floated round at high water. The instruments and pyros were fitted onto the frame on the afterdeck.

RV Prince Madog left Menai Bridge at 08.30 on 25 September. Recording of surface sampling was switched on at 09.23, near Puffin Island, section 6. The ship's ADCP was also switched on but failed to work. The mooring site, 53º 32´ N 3º 21.8´ W, was reached at 11.45 - details of the moored instrumentation and of the positions are given in Section 4 and Tables 1 and 2. The toroid was visible and all four acoustics (two on each frame) responded.

A CTD profile was first recorded to calibrate the recording transmissometer. At 12.23 recovery of the mean ADCP was attempted by firing first one and then the second release. The ADCP, however, did not appear. The first release for the fast sample ADCP was fired at 12.45 and again the ADCP did not appear immediately. However, to some relief, it was sighted surfacing after 15 minutes. The frame and ballast weight were recovered by 13.10. The frame was covered in a hairy growth but showed no sign of having been buried in the sediment. The ADCP was removed and taken into the laboratory; however we were not able to communicate with it – there was no response to the break command. The ADCP was opened the next day and its memory card removed; thankfully it contained the right amount of data.

Sweeping for the mean ADCP now commenced, with a loop of wire the width of the stern. After several passes the ADCP could be seen on the echo sounder and tension came on the wire once but was lost. At the next pass, at 15.00, tension again came on the wire and was maintained whilst the loop was closed by releasing a shackle down the wire. It transpired that the stray line had been caught. By 15.20 the ADCP frame and ballast weight had been recovered. Inspection showed that both releases had fired but the frame had not surfaced because the spooler had jammed. This frame was also covered in a hairy growth.

The mooring was now recovered, between 16.00 and 16.15 and prepared for redeployment whilst data were downloaded from the mean ADCP – the latter took about 2 hours. Since the mooring hardware (toroid, chain, anchor) was in good condition it was re-used, after re-seizing the shackles. One Aanderaa was redeployed, after its dsu had been replaced, together with two new Aanderaas (one fitted with the case recovered from the transmissometer on the ADCP frame).

The mean ADCP was redeployed at 19.07 (fitted to a new frame with a new transmissometer, pressure recorder and a SeaBird MicroCat temperature, conductivity sensor).

A shortened CTD survey, see section 5 and Table 3, was now carried out, starting with a CTD at the mooring site followed by profiles at sites 10, 2, 3 and 4. Because of the length of time the crew had been involved in mooring work, RV Prince Madog anchored at site 4 between 23.00 and 05.00 on 25 September. The survey continued in a moderate sea (wind speeds up to 16 m s^{-1} from the north-west had been recorded during the night), with visits to sites 5 - 9, 11 - 14, 19, 26 - 23 and 34. In contrast to the first cruise, at the beginning of August, the water column was generally well mixed. The spatial distribution of surface temperature was also more uniform than on the first cruise, in the range 15.9º to 16.6ºC, whereas the range of surface salinities was the same – 30.7 to 33.8. The water temperature again exceeded the air temperature. (Note all these values are uncalibrated.) The survey finished at 16.10 and surface sampling was switched off at 16.43. RV Prince Madog docked at 17.43 at Menai Bridge.

All the mooring objectives were accomplished and 20 out of 34 CTD sites visited.

4. Moorings (times in GMT)

4.1 The set up of the recovered instruments was as follows:

a) Mean 600 kHz ADCP, 2391
Mode 1: 100 pings every 10 minutes (velocity standard deviation 0.007 m s^{-1}).
35 x 1 m bins (2.65 – 36.65 m above the bed).
Earth co-ordinates - speeds, correlation, echo intensity, % good.
Sound velocity calculated from temperature, depth and salinity of 32.
Fitted with a pressure sensor.
Delayed start 07:00 on 7 August 2002. Last scan 16:10 on 25 September 2002. The clock was 2 minutes 12 seconds fast (and had jumped by an hour).

Aanderaa pressure recorder BPR 445: 10 minute sampling, started 14.20 on 6 August and stopped at 09:00:36 on 11 October 2002.

25 cm Sea-Tech Transmissometer, ST637, recording in Aanderaa logger (RCM 11817) fitted with temperature and conductivity sensors: 10 minute sampling, started at 14.10 on 6 August, stopped at 17:20:18 on 25 September 2002.

The frame, D1, was fitted with two Benthos releases, 1B, 7A, and a spooler for recovery of the ballast weight. Although both releases were successfully fired starting at 12.23 on 25 September the frame did not surface. The frame was recovered by sweeping by 15.20 – the spooler had jammed. The frame was completely covered in a hairy growth.

b) Fast sample 600 kHz ADCP, 2390, with 512 MBytes of memory.
Mode 12: 8 subpings per second for 10 minutes every hour (velocity standard deviation 0.025 m s^{-1}).
30 x 1 m bins (2.64 – 31.64 m above the bed).
Beam coordinates – along beam speeds, echo intensity.
Fixed speed of sound 1500 m s^{-1}.
Fitted with a pressure sensor.
Delayed start 07.00 on 7 August 2002. The ADCP clock recorded the last scan was at 14:16:39:01 on 25 September 2002, although no confirmation was received from the ADCP. At 13:30 on 1 October the ADCP clock was 2 minutes 10 seconds fast.

The frame, D4, was fitted with two Benthos releases, 2B, 3A, and a spooler for recovery of the ballast weight. The frame took 15 minutes to surface and was completely covered in a hairy growth.

c) Mooring. Three Aanderaa current meters without fins to log temperature and conductivity: 10 minute samples.

		Start time	Stop time	Sensor depth (m)
Top	RCM8 10526	15:40 6 August	07:30:10 26 Sept	2
Middle	RCM7 9631	16:20 6 August	08:00:11 26 Sept	5
Bottom	RCM7 9959	15:40 6 August	17:30:18 25 Sept	10

The top logger was covered in a brown slime.

The single point mooring was composed of ½" long link chain, marked by a 1.8 m diameter toroid and anchored by ½ tonne clump of scrap chain.

Table 1. Recovered mooring positions and times.

	Latitude (N)	Longitude (W)	Water Depth (m)	Deployment Time	Deployment Date	Water Depth (m)	Recovery Time	Recovery Date
Mooring	53º 31.966′	3º 22.187′	26	12:10	07/08	28	16:00	25/09/02
Mean ADCP	53º 31.971′	3º 22.038′	25	12:48	07/08	28	12:23	25/09/02
Fast sample ADCP	53º 31.931′	3º 21.902′	24	13:25	07/08	29	12:45	25/09/02

4.2 The set up of the deployed instruments was as follows:

d) Mean 600 kHz ADCP, 2391
Mode 1: 100 pings every 10 minutes (velocity standard deviation 0.007 m s^{-1}).
35 x 1 m bins (2.65 – 36.65 m above the bed).
Earth co-ordinates - speeds, correlation, echo intensity, % good.
Sound velocity calculated from temperature, depth and salinity of 32.
Fitted with a pressure sensor.
Started at 18:40 on 25 September 2002.

Aanderaa pressure recorder BPR 444: 10 minute sampling, started 14:50 on 24 September.

25 cm Sea-Tech Transmissometer, ST557, recording in Aanderaa logger (RCM 11818) fitted with temperature and conductivity sensors: 10 minute sampling, started at 15:30 on 24 September.

SeaBird MicroCat temperature, conductivity recorder, fitted with a pressure sensor (37IM29828-2506): 10 minute sampling was started at 12:00 on 25 September.

The frame, D6, was fitted with two Benthos releases, 5A, 8A, and a spooler for recovery of the ballast weight.

e) Mooring. Three Aanderaa current meters without fins to log temperature and conductivity, fitted with 200 bar pressure sensors: 10 minute samples.

		Start time	Sensor depth (m)
Top	RCM7 11820	15:30 24 September	2
Middle	RCM7 9959	17.40 25 September	5
Bottom	RCM7 11814	14.50 24 September	10

The single point mooring was composed of ½" long link chain, marked by a 1.8 m diameter toroid and anchored by ½ tonne clump of scrap chain.

Table 2. Deployed mooring positions and times.

	Latitude (N)	Longitude (W)	Water Depth (m)	Deployment Time	Deployment Date
Mooring	53º 31.994′	3º 22.011′	21	18:40	25/09/02
Mean ADCP	53º 31.997′	3º 21.792′	21	19:07	25/09/02

5. CTD

The Sea-Bird 911 CTD recorded temperature, conductivity, transmittance and fluorescence at 24 Hz. Since the frame was fitted with an altimeter measurements were taken to within 2 m above the bed. One water bottle was fired near the bed, to obtain reversing thermometer readings and a water sample (on most profiles) for salinity determination back at the School of Ocean Sciences. Copies of the Sea-Bird binary files were taken off for processing at BODC / POL.

Table 3. Nominal CTD positions.

Site	Latitude (N)	Longitude (W)	Visited on this cruise
1	53º 32′	3º 21.8′	yes (twice)
2	53º 37′	3º 13.4′	yes
3	53º 42′	3º 13.4′	yes
4	53º 47′	3º 13.4′	yes
5	53º 52′	3º 21.8′	yes
6	53º 47′	3º 21.8′	yes
7	53º 42′	3º 21.8′	yes
8	53º 37′	3º 21.8′	yes
9	53º 32′	3º 21.8′	yes
10	53º 27′	3º 13.4′	yes
11	53º 27′	3º 21.8′	yes
12	53º 27′	3º 30.2′	yes
13	53º 32′	3º 30.2′	yes
14	53º 37′	3º 30.2′	yes
15	53º 42′	3º 30.2′	no
16	53º 47′	3º 30.2′	no
17	53º 47′	3º 38.6′	no
18	53º 42′	3º 38.6′	no
19	53º 37′	3º 38.6′	yes
20	53º 32′	3º 38.6′	no
21	53º 27′	3º 38.6′	no
22	53º 23′	3º 38.6′	no
23	53º 23′	3º 47.0′	yes
24	53º 27′	3º 47.0′	yes
25	53º 32′	3º 47.0′	yes
26	53º 37′	3º 47.0′	yes
27	53º 42′	3º 47.0′	no
28	53º 47′	3º 47.0′	no
29	53º 47′	3º 55.4′	no
30	53º 42	3º 55.4′	no
31	53º 37′	3º 55.4′	no
32	53º 32′	3º 55.4′	no
33	53º 27′	3º 55.4′	no
34	53º 22′	3º 55.4′	yes

6. Surface sampling

The intake for the surface sampling system is located underneath RV Prince Madog, at about 3 m below sea level. The parameters recorded every minute by the WS Oceans system are: Date, Solar Radiation (W m^{-2}), PAR (µmols / m^2s), Air Temperature (ºC), Relative Humidity, Relative Wind Speed (m s^{-1}), Relative Wind Direction (º) – zero indicates wind on the bow, Transmissance, Hull Temperature (ºC), Barometric Pressure (mbar), Fluorescence, Turbidity, Salinity, Minimum Air Temp (ºC), Maximum Air Temp (ºC), Wind Gust (m s^{-1}), GPS Time, Latitude, Longitude, Barometric Pressure Minimum (mbar), Barometric Pressure Maximum (mbar), Conductivity sensor water temperature (ºC).

Data were recorded from 09:23 on 25 September, at 53° 19.036' N 4° 02.282' W, until 16:43 on 26 September, at 53° 18.306' N, 4° 02.167' W. No data were recorded between 02:20 and 07:03 inclusive on 26 September. Copies of the data were taken off the ship as comma separated variable ASCII files.

Acknowledgements
The assistance of the Captain, Steve Duckworth, officers, bosun, Phil Jones, and crew contributed greatly to the success of the cruise.