Prince Madog cruise 25/03
26, 27 June 2003
POL Coastal Observatory cruise 9
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, pressures and directional waves. A pressure recorder, a transmissometer / conductivity / temperature logger and a SeaBird MicroCat are fitted to the frame.
b) A CEFAS SmartBuoy in a single point mooring with an Aanderaa temperature and conductivity logger at 10 m below the surface.

To deploy
c) A sea bed frame for a 600 kHz ADCP to measure the mean current profile, pressures and directional waves. A pressure recorder, a transmissometer / conductivity / temperature logger and a SeaBird MicroCat are also fitted to the frame.
d) A CEFAS SmartBuoy in a single point mooring with an Aanderaa temperature and conductivity logger at 10 m below the surface.

2. To conduct a CTD / LISST 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. To obtain calibration samples for suspended sediment at all stations and for chlorophyll at selected stations.

2.1 Scientific personnel
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2.2 Ship's officers and crew
S. Duckworth (Master)
A.D. Price (Chief Officer)
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3. Narrative (times in GMT)

The SmartBuoy was assembled at the Vittoria Dock store on the afternoon of 25 June 2003 and loaded by crane straight onto RV Prince Madog in the evening. The ADCP frame which had been recovered earlier was set up on the afterdeck.

RV Prince Madog left Birkenhead docks at 06:00 on 26 June. Recording of surface sampling and the ship's ADCP were switched on at 07:20, near Formby Coastguard Station, section 6 – no wind speed or direction data were recorded since the sensor was broken. The sea was calm with weak winds from the east.

The mooring site, 53º 32′ N 3º 21.8′ W, was reached at 08:30 and a CTD (cast 50) recorded. The first acoustic release on the ADCP frame was fired at 08:50, sending a positive response. However the frame did not surface, giving rise to fears, later shown to be without foundation, that the spooler problem had still not been solved. The ship manoeuvred closer to the site and the second release was fired at 09:12; this time the frame surfaced immediately. The ADCP was on the deck by 09:22 and its ballast weight by 09:30. There was no fouling on either. Only one pyro release had fired. The first acoustic release and cables were checked and found to be in order, so a faulty pyro is suspected. This will be checked back at POL. The transmissometer was removed from the frame, serviced and fitted to the next frame for immediate redeployment.

The SmartBuoy was deployed between 10:15 and 10:23 and the ADCP at 10:37. The preceding SmartBuoy was recovered between11:10 and 11:21 - the recovery was made slightly more difficult by the stray line being tangled under the buoy. The buoy and instruments were covered in a thin layer of slime. When the instruments were being disassembled it transpired that the water sampler had not worked – the first bag was full and the rest empty.

The CTD survey commenced at 11.35, in order 1, 11, 10, 2 – 9, 13 – 17, 28 – 30, 27, 18, 19, 26, 31, 32, 25, 20, 22, 23, 34. The reasoning was that sites 33, 24, 21, 12, and 11 had been visited on the way into Birkenhead, between 12:34 and 15:26 on 25 June, and also the forecast for 27 June was for the wind to increase, so the offshore sites were visited first. Site 11 was repeated so that CEFAS could take water sample measurements. The CTD survey finished at 08:14, logging of surface monitoring and the ship's ADCP were switched off at 08:54, by Puffin Island, and RV Prince Madog docked at 09:54.

The area was in general stratified in temperature, extensively by up to 2ºC and by up to 3.5ºC, and salinity, by up to 1. Temperatures were in the range 12.9 – 17.6ºC, the warmest closest to the English coast and salinities from 32.0 to 34.1.

All the cruise objectives, mooring and CTD, were achieved in excellent weather conditions.

4. Moorings (times in GMT)

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

a) Mean ADCP 600 kHz RDI 2390; battery case 0250.
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).
Beam co-ordinates - speeds, correlation, echo intensity, % good.
Sound velocity calculated from temperature, depth and salinity of 32.
Fitted with a pressure sensor and 2 x 256 Mb memory; hourly wave recording enabled.
Clock reset at 15:03 on 25 May; ADCP delayed start at 06:00 on 26 May; last reading at 15:00 26 June, 2003.

Aanderaa pressure recorder BPR 1357 / DSU 9103: 10 minute sampling. Clock reset at 14:40 on 25 May; started at 14:50 on 25 May; first scan at 14:50:50 on 25 May; last reading at 21:40:51 on 26 June, 2003; 23442 words. The clock was 10 s slow.

25 cm Sea-Tech Transmissometer, ST556, recording in Aanderaa logger (RCM7 11814 / DSU 9107) fitted with temperature (low range) and conductivity sensors: 10 minute sampling. Clock reset at 15:30 on 25 May; started at 15:40 on 25 May. Air readings at 07:40 – 08:00 on 26 May; blocked path readings at 08:10 – 08:40 on 26 May; CTD calibration sample 11:10 26 May. Last reading at 09:40 on 26 June, 2003; 27636 words. The clock was 47 s slow.

SeaBird MicroCat temperature, conductivity recorder (37IM29828-2081 – ID02). The reference depth was set to 25 m. Clock reset at 16:00 on 25 May.
Pre-deployment calibration: 10 second sampling started at 10:45 on 26 May for CTD 1.
10 minute sampling started at 12:00 on 26 May; stopped at 17:04:37 on 26 June, 2003; 4495 records; clock correct.
Post deployment calibration: 10 second sampling started at 19:55:00 on 26 June for cast 63 (station 14).

The frame, D2, was fitted with two Benthos releases, 8A, 7A, and a spooler with 200 m of rope for recovery of the ballast weight.

b) SmartBuoy mooring. Aanderaa current meter RCM7 9631 / DSU 8118 without fin at 10 m below the surface to log temperature (low range) and conductivity: 10 minute samples.
Clock reset at 15:17 on 25 May; started at 15:20 on 25 May; last reading at 21:10:19 on 26 June, 2003; 28062 words. The clock was 63 s slow.

The single point mooring was composed mainly of ½" long link chain, marked by a 1.8 m diameter toroid and anchored by a 0.5 tonne clump of scrap chain.

Table 1. Recovered mooring positions and times, in 2003.

	Latitude (N)	Longitude (W)	Water Depth (m)	Deployment Time	Deployment Date	Water Depth (m)	Recovery Time	Recovery Date
SmartBuoy	53º 32.406´	3º 22.469´	19.6	15:50	26/05	23.5	11.15	26/06
Mean ADCP	53º 32.229´	3º 22.004´	20	14:27	26/05	26	09.12	26/06

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

a) Mean ADCP 600 kHz RDI 3644.
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).
Beam co-ordinates - speeds, correlation, echo intensity, % good.

Sound velocity calculated from temperature, depth and salinity of 32.
Fitted with a pressure sensor and 2 x 512 Mb memory (CF1); hourly wave recording enabled.
Clock set at 15:30 on 23 June; delayed start at 08:00 on 25 June, 2003.

Aanderaa pressure recorder BPR 445 / DSU 8117: 10 minute sampling. Clock reset at 19:46 on 23 June; started at 19:50 on 23 June; first scan at 19:50:46 on 23 June, 2003.

25 cm Sea-Tech Transmissometer, ST556, recording in Aanderaa logger (RCM7 11814 / DSU 3994) fitted with temperature and conductivity sensors: 10 minute sampling. Clock reset at 12:48 on 25 June; started at 10:10 on 26 June, 2003.

SeaBird MicroCat temperature, conductivity, pressure recorder (37IM29828-2506 – ID03). The clock was reset at 07:30 on 24 June.
Pre-deployment calibration: 10 second sampling started at 08:00:00 on 24 June for CTD cast 22 (off Holyhead).
10 minute sampling started at 12:00 on 26 June, 2003.

The frame, D1, was fitted with two Benthos releases, 4B, 4A, and a spooler with 200 m of rope for recovery of the ballast weight.

b) SmartBuoy mooring. Aanderaa current meter RCM7 9959 / DSU 1310 without fin at 10 m below the surface to log temperature (low range) and conductivity: 10 minute samples. Clock reset at 09:52 on 24 June; started at 10:20 on 24 June, 2003.

The single point mooring was composed mainly of ½" long link chain, marked by a 1.8 m diameter toroid and anchored by a 0.5 tonne clump of scrap chain.

Table 2. Deployed mooring positions and times, in 2003.

	Latitude (N)	Longitude (W)	Water Depth (m)	Deployment Time	Date
SmartBuoy	53º 32.287′	3º 22.272′	25	10:23	26/06/03
Mean ADCP	53º 32.167′	3º 21.944′	25	10:37	26/06/03
(Wave Buoy	53º 32.151′	3º 21:356′	20.5	15:46	26/05/03)

5. CTD

The Sea-Bird 911 CTD recorded temperature, conductivity, transmittance and fluorescence at 24 Hz and was fitted with an altimeter. Up to three water bottles were fired near the bed and one or two near the surface. Near bed and near surface water samples were filtered for suspended sediment determination by the School of Ocean Sciences. The other near bed bottle was used for reversing thermometer readings and a water sample for salinity determination back at the School of Ocean Sciences. Water samples from the second near surface bottle were filtered for chlorophyll and suspended sediment determination at CEFAS, and some filtrate was preserved with mercuric chloride for nutrient determination. A LISST-25 particle sizer was fitted to the CTD and its data logged on the Sea-Bird data logging system. 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	Chlorophyll & nutrients
1	53º 32′	3º 21.8′	yes	yes
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	yes
6	53º 47′	3º 21.8′	yes	yes
7	53º 42′	3º 21.8′	yes	yes
8	53º 37′	3º 21.8′	yes	yes
9	53º 32′	3º 21.8′	yes	yes
10	53º 27′	3º 13.4′	yes	
11	53º 27′	3º 21.8′	yes	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′	yes	
16	53º 47′	3º 30.2′	yes	
17	53º 47′	3º 38.6′	yes	
18	53º 42′	3º 38.6′	yes	
19	53º 37′	3º 38.6′	yes	
20	53º 32′	3º 38.6′	yes	
21	53º 27′	3º 38.6′	yes	
22	53º 23′	3º 38.6′	yes	
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′	yes	
28	53º 47′	3º 47.0′	yes	
29	53º 47′	3º 55.4′	yes	
30	53º 42	3º 55.4′	yes	
31	53º 37′	3º 55.4′	yes	
32	53º 32′	3º 55.4′	yes	
33	53º 27′	3º 55.4′	yes	
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 07:20 on 26 June, at 53° 28.167' N 3° 03.271' W, until 08:54 on 27 June at 53° 18.899' N 4° 02.315' W. No wind speed and direction data were recorded as the sensor was broken. Copies of the data were taken off the ship as an Excel file, along with a copy of the ship's navigation data.

The ship was fitted with a 300 kHz ADCP set to record 25 x 2m bins, the bin nearest the surface was at 5.1 m depth, every 30 seconds with 28 pings / ensemble.

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