

Prince Madog cruise 18/05
POL Coastal Observatory cruise 26
10 – 13 May 2005

1. Objectives

1. Site A. At 53° 32' N 3° 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 (waves ADCP) to measure the mean current profile, pressures and directional waves. A Sea-Bird SBE 16*plus* with pumped conductivity sensor, digiquartz pressure sensor and two SeaPoint turbidity sensors were fitted to the frame.
- b) A CEFAS SmartBuoy in a single point mooring with a Sea-Bird MicroCAT temperature, conductivity logger at 5m below the surface and an Aanderaa temperature and conductivity logger at 10 m below the surface.

To deploy

- c) A sea bed frame for a 600 kHz ADCP (waves ADCP) to measure the mean current profile, pressures and directional waves. A Sea-Bird SBE 16*plus* with pumped conductivity sensor, digiquartz pressure sensor and a SeaPoint turbidity sensor was fitted to the frame.
- d) A CEFAS SmartBuoy in a single point mooring with a Sea-Bird MicroCAT temperature, conductivity logger at 5m below the surface and an Aanderaa temperature and conductivity logger at 10 m below the surface.

2. Site B. At 53°27' N 3° 38.6' W (site 21, second site, B)

To deploy

- e) A sea bed frame for a 600 kHz ADCP (waves ADCP) to measure the mean current profile, pressures and directional waves. A Sea-Bird SBE 16*plus* with pumped conductivity sensor, digiquartz pressure sensor and SeaPoint turbidity sensor were fitted to the frame.
- f) A CEFAS SmartBuoy in a single point mooring with a Sea-Bird MicroCAT temperature, conductivity logger at 5m below the surface and an Aanderaa temperature and conductivity logger at 10 m below the surface.

To recover

- g) A sea bed frame for a 600 kHz ADCP (waves ADCP) to measure the mean current profile, pressures and directional waves. A Sea-Bird SBE 16*plus* with pumped conductivity sensor, digiquartz pressure sensor and a SeaPoint turbidity sensor were fitted to the frame.
- h) A marking toroid in a single point mooring with a Sea-Bird MicroCAT temperature, conductivity logger at 3m below the surface.

3. At 53° 27' N 3° 30.2' W (site 12)

To trace and recover

- i) A sea bed frame for a 600 kHz ADCP (Dee ADCP) to measure the mean current profile, pressures and directional waves. A Sea-Bird SBE 16*plus* with pumped conductivity sensor, digiquartz pressure sensor and SeaPoint turbidity sensor. Deployed as part of the Dee experiment.

4. To conduct a CTD / LISST survey of 35 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 salinity, transmittance, suspended sediment and for chlorophyll at selected stations. To obtain near surface and bed water samples for nutrient and suspended sediment determination.
5. To collect 10 vertical net hauls at the mooring site.

2.1 Scientific personnel

Phil Knight (Principal)
Mike Burke
Mike Smithson
John Kenny
Chris Balfour
Andy Lane
Marc Childs (CEFAS)
Dave Pearce (CEFAS)
Anne Hammerstein (School of Ocean Sciences)

2.2 Ship's officers and crew

John Morris (Master)
Nick Davis (Chief Officer)
Neil Holmes (Chief Engineer)
L. R. Black (Second Engineer)
Phil Jones (Bosun)
Rob. Munn (A.B.)
J. Andy. Renton (A.B.)
T. Gordon (Cook)

3. Narrative (times in GMT)

The SmartBuoy toroid, anchor chain clumps, two sea-bed frames and instrumentation were loaded onto RV Prince Madog on the afternoon of 10 May 2005

RV Prince Madog left Menai Bridge at 07:30 on the 11 May 2005. Recording of surface sampling and the ship's ADCP were started at 09:02, near Puffin Island. Mooring site A was reached at 11:41 and a CTD profile recorded (Site 1/ CTD 1) (no water bottle samples taken). Winds were light, less than 10 knots and variable in direction. The waves ADCP was pinged at 12:07 and on board by 12:14. The replacement waves ADCP was deployed at 12:40. The old waverider marker ball was spotted and it was decided to try and recover the part of the mooring still left in position after the wave buoy had come adrift earlier in the year. The chain and anchor were all aboard by 12:50. The wave buoy that replaced this mooring was sited and still on position.

At 13:19 the Smart buoy was deployed, closer to the Bar Light vessel. At 13:25 the previous Smart buoy was recovered. After the mooring work, at 13:52 another CTD (Site 1/CTD 2) was carried out at the mooring site. This was followed by four zoo plankton vertical net trawls at the same location for 30 minutes starting at 14:22.

The CTD survey then started at 15:47 on 11 May 2005, going round sites 10, 35, 2 – 9, 11 – 21 (see Figure 1, showing track and CTD locations) and Table 3. Calibrations of the Seabird 16+ were carried out at site 14 (CTD 16) for Seabird serial number 4737.

During, 12 May 2005, starting at 07:42 the waves ADCP mooring at site B was recovered. At 08:10 the replacement was ADCP mooring was deployed. The Smart Buoy at site B was deployed at 08:23. At 08:30 the marker buoy, containing a Seabird instrument was recovered.

After the mooring work, at 08:46 another CTD (Site 21/CTD 24) was carried out at the mooring site. This was followed by a search for a lost ADCP mooring deployed near to site 12. After a number of failed attempts to communicate with the lost ADCP a connection was made. Two of the positions listed below show the distance between listed position and the lost ADCP.

Last two positions found for ADCP at site 12 was

- (1) 53° 26.440' N 3° 30.243' W (20-30m)
- (2) 53° 26.441' N 3° 30.307' W (184m)

The CTD survey was resumed at 13:28 to allow for a shift change, with sites 22-24. At 16:00 at site 12, the ADCP acoustic releases were fired but the ADCP did not come to the surface. An attempt was made to drag which was unsuccessful.

An additional CTD was carried out at site 25 at 20:18. Calibrations of the Seabird 16+ were carried out at site 25 (CTD 28) for Seabird serial number 4797. CTD's were then stopped due to bad weather and the CTD line snatching on deployment. The RV Prince Madog headed for shelter in Colwyn Bay and set anchor until the morning of the 13 May.

Water samples were obtained from near surface and near bed bottles for nutrient analysis by David Hydes at SOC (see Table 4) and for suspended sediment determination. The Temperatures ranged between 9.5 and 11.9°C and salinities between 30.2 to 32.9 (see Table 4). Surface sampling and the ship mounted ADCP were switched off at 23:23 on 12 May 2005, restarted again at 04:12 on 13 May 2005 and stopped at 04:48 on 13 May 2005. RV Prince Madog was alongside at Menai Bridge at 08:00.

All the cruise objectives were accomplished except that not all the CTD stations were visited due to bad weather towards the end of the cruise. The ADCP at site 12 was found, but was not recovered.

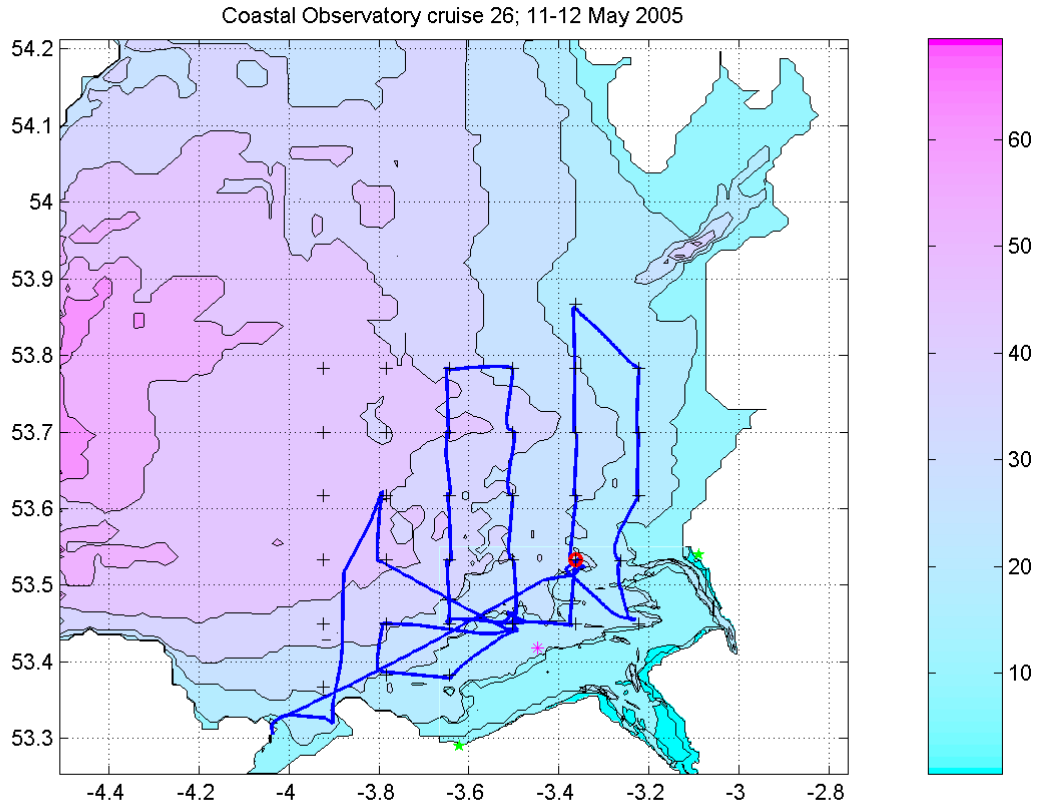


Figure 1. Cruise track

4. Moorings (times in GMT)

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

Site A

a) Waves ADCP 600 kHz RDI 2391. New batteries.

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 512 Mbyte PCMCIA memory; hourly wave recording enabled.

Clock reset at 14:57 on 4 April 2005; delayed start 06:00:00 on 5 April 2005. Started on time. Stopped at 22:06 GMT on 11 May 2005.

Sea-Bird 16plus S/N 4737 (ID=#02) on base of frame with pumped conductivity sensor underneath. Two SeaPoint turbidity sensors: S/N 10489 taped to roll bar and S/N 10486 in CTD clamp.

Sample interval 600 s; diquartz integration time 40 s

1 s delay before sampling, pump on for 0.5 s before sampling.

Clock set at 17:06:15 on 4 April 2005; delayed start at 12:00:00 on 5 April 2005.

Clock is correct. Stopped at 12:17:30 on 12 May 2005. Sample No. 5253. Reset for calibration dip. 2 min sampling, start 01:20:00 12 May 2005 (CTD16 Station 14, in water 01:30 on bottom 01:36 to 01:46 12 May 2005). Stopped 02:06:00 on 12 May 2005.

The frame D1 was fitted with two Benthos releases 70358 – Rx 11.0 kHz, Tx 12.0 kHz enable C, release D and 69679 – Rx 11.5 kHz, Tx 12.0 kHz, enable C, release D both with a fizz link, and a spooler with 200m of rope for recovery of the ballast weight.

b) SmartBuoy Mooring.

Sea-Bird MicroCAT temperature, conductivity and pressure recorder Serial Number 2506 (ID=#03) at 5 m below the surface. 10 minute samples.

Clock set at 18:09:00 on 4 April 2005. Delayed start 10:00:00 on 05 April 2005.

Stopped at 22:11:00 on 11 May 2005. Clock is 9s fast. Sample number 5258. Download ok.

Aanderaa current meter RCM7 9959 / DSU 8123 without fin at 10 m below the surface to log temperature (low temperature setting) and conductivity: 10 minute samples.

Started at 17:44:00 on 4 April 2005.

Stopped at 01:21:30 on 12 May 2005. Clock 44 seconds slow.

The CEFAS SmartBuoy is fitted with two surface CTDS, light sensors at 1 and 2 m below the surface, a water sampler which obtains water samples once per day for laboratory nutrient (nitrate, nitrite, phosphate) determination and an in situ NAS2E nutrient analyser. The CTD and light data are transmitted back to CEFAS via Orbcomm.

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

Site B

a) Waves ADCP 600 kHz RDI 3644. New batteries.

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 512 Mbyte PCMCIA memory; hourly wave recording enabled.

Clock reset at 14:20 on 4 April 2005; delayed start 06:00:00 on 5 April 2005. Started on time.

Stopped at 09:07 on 12 May 2005.

Sea-Bird 16*plus* S/N 4597 on base of frame with pumped conductivity sensor underneath.

SeaPoint turbidity sensor: S/N 10471 taped to roll bar.

Sample interval 600 s; diquartz integration time 40 s

1 s delay before sampling, pump on for 0.5 s before sampling.

Clock set at 17:20 on 4 April 2005; delayed start at 10:00:00 on 5 April 2005.

Stopped at 11:02:35 on 12 May 2005.

The frame D5 was fitted with two Benthos releases 71919 – Rx 10.5 kHz, Tx 11.0 kHz enable B, release C and 72378 – Rx 10.5 kHz, Tx 11.0 kHz, enable B, release B both with a fizz link, and a spooler with 200m of rope for recovery of the ballast weight

b) Marker Buoy with Sea-Bird MicroCAT temperature and conductivity recorder (2081 – ID=#02) at 3 m below the surface. 10 minute samples. Reference pressure 25 db. Clock set at 17:58:40 on 4 April 2005. Delayed start 10:00:00 on 05 April 2005. Clock 2 seconds fast. Stopped at 12:45:30. Sample number 5345.

Table 1. Recovered mooring positions and times.

	<u>Latitude</u> (N)	<u>Longitude</u> (W)	<u>Water</u> <u>Depth</u> (m)	<u>Recovery</u> <u>Time</u>	<u>Date</u>
Wave ADCP (Site A)	53° 32.030'	3° 21.565'	27.0	12:07	11/05/05
Smart Buoy (Site A)	53° 31.987'	3° 21.833'	26.9	13:25	11/05/05
Wave ADCP (Site B)	53° 27.248'	3° 38.718'	24.4	07:42	12/05/05
Marker buoy (Site B)	53° 27.134'	3° 38.612'	23.7	08:30	12/05/05

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

Site A

a) Waves ADCP 600 kHz RDI 5806

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 1 Gbyte PCMCIA memory; hourly wave recording enabled.

Clock reset at 14:31:15 on 10 May 2005; delayed start 07:00:00 on 11 May 2005. Started on time.

Sea-Bird 16*plus* S/N 4738 on base of frame with pumped conductivity sensor underneath.

SeaPoint turbidity sensor: S/N 10490 taped to roll bar.

Sample interval 600 s; diquartz integration time 40 s

1 s delay before sampling, pump on for 0.5 s before sampling.

Clock set at 14:32:00 on 10 May 2005; delayed start at 11:00:00 on 11 May 2005.

The frame D2 was fitted with two Benthos releases 70355 – Rx 10.0 kHz, Tx 12.0 kHz enable C, release D and one with unknown serial number – Rx 11.5 kHz, Tx 12.0 kHz, enable F, release D both with a fizz link, and a spooler with 200m of rope for recovery of the ballast weight.

b) SmartBuoy Mooring.

Sea-Bird MicroCAT temperature, conductivity and pressure recorder Serial number 2010 (ID=#01) at 5 m below the surface. 10 minute samples.

Clock set at 16:35:40 on 10 May 2005. Delayed start 11:00:00 on 11 May 2005.

Aanderaa current meter RCM7 11814 / DSU 8122 without fin at 10 m below the surface to log temperature (low temperature setting) and conductivity: 10 minute samples.

Clock set at 17:06:00 on 10 May 2005. Started at 17:10:00 on 10 May 2005.

The CEFAS SmartBuoy is fitted with two surface CTDS, light sensors at 1 and 2 m below the surface, a water sampler which obtains water samples once per day for laboratory nutrient

(nitrate, nitrite, phosphate) determination and an in situ NAS2E nutrient analyser. The CTD and light data are transmitted back to CEFAS via Orbcomm.

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

Site B

c) Site B. Waves ADCP 600 kHz RDI 5803. Battery case 3070.

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 1Gbyte PCMCIA memory; hourly wave recording enabled.

Clock reset at 14:57:00 on 10 May 2005; delayed start 07:00:00 on 11 May 2005. Started on time.

Sea-Bird 16*plus* S/N 4736 on base of frame with pumped conductivity sensor underneath.

SeaPoint turbidity sensor: S/N 10320 taped to roll bar.

Sample interval 600 s; diquartz integration time 40 s

1 s delay before sampling, pump on for 0.5 s before sampling.

Clock set at 14:12:00 on 10 May 2005; delayed start at 11:00:00 on 11 May 2005.

The frame D6 was fitted with two Benthos releases 70354 – Rx 13.0 kHz, Tx 12.0 kHz enable C, release D and and one with unknown serial number – Rx 10.5 kHz, Tx 11.0 kHz, enable D, release B both with a fizz link, and a spooler with 200m of rope for recovery of the ballast weight

d) SmartBuoy Mooring.

Sea-Bird MicroCAT temperature, conductivity and pressure recorder, Serial number 2991, at 5 m below the surface. 10 minute samples.

Clock set at 08:00:00 on 11 May 2005. Delayed start 11:00:00 on 11 May 2005.

Aanderaa current meter RCM7 9631 / DSU 8117 without fin at 10 m below the surface to log temperature (low temperature setting) and conductivity: 10 minute samples.

Started at 17:10:00 on 10 May 2005.

The CEFAS SmartBuoy is fitted with two surface CTDS, light sensors at 1 and 2 m below the surface, a water sampler which obtains water samples once per day for laboratory nutrient (nitrate, nitrite, phosphate) determination and an in situ NAS2E nutrient analyser. The CTD and light data are transmitted back to CEFAS via Orbcomm.

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

Table 2. Deployed mooring positions and times.

<u>Latitude</u> (N)	<u>Longitude</u> (W)	<u>Water</u> <u>Depth</u> (m)	<u>Deployed</u> <u>Time</u>	<u>Date</u>
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Wave ADCP (Site A)	53° 32.031'	3° 21.551'	26.9	12:40	11/05/05
Smart Buoy (Site A)	53° 31.999'	3° 21.373'	26.9	13:19	11/05/05
Wave ADCP (Site B)	53° 27.251'	3° 38.698'	24.1	08:11	12/05/05
Smart Buoy (Site B)	53° 27.134'	3° 38.482'	22.4	08:25	12/05/05

5. CTD

The Sea-Bird 911 CTD recorded downwelling PAR light levels (CEFAS light sensor), temperature, conductivity, transmittance, oxygen and fluorescence at 24 Hz. The frame was fitted with an altimeter, which was not totally reliable, so that measurements were taken to within an estimated 3 m above the bed. Two water bottles were fired near bed and two near the surface, when needed. One of the near bed bottles was fitted with two electronic thermometers to check the CTD temperature data. Water samples were taken from this bottle for calibration of the CTD salinity data. (At the CEFAS stations, see below, this bottle was fired near the surface). Water samples were taken from the near surface and near bed bottles and frozen for nutrient analysis by SOC (nitrate, phosphate, silicate), and also were filtered to determine suspended sediment load and calibrate the CTD transmissometer, by the School of Ocean Sciences. Water samples from the second near surface bottle from stations 1, 5 – 9 and 11 were filtered for chlorophyll and suspended sediment determination and some filtrate was preserved with mercuric chloride for nutrient determination by CEFAS. A LISST-25 particle sizer was fitted to the CTD and its data logged on the Sea-Bird data logging system. A LISST-100 particle sizer with internal logging was also attached to the CTD frame and its data periodically downloaded for analysis by SOS. Copies of the Sea-Bird binary files were taken off for processing and calibration at BODC / POL.

Table 4 contains surface and bottom parameters noted in science log book for each CTD dip. Bottle numbers within this table refer to the nutrient samples taken.

Table 3. Nominal CTD positions.

<u>Site</u>	<u>Latitude</u> (N)	<u>Longitude</u> (W)	<u>Visited on</u> <u>this cruise</u>	<u>Chlorophyll</u> <u>& nutrients</u>	<u>Suspended</u> <u>Sediments/</u> <u>nutrients</u>
1	53° 32'	3° 21.8'	yes	yes	yes
2	53° 37'	3° 13.4'	yes		yes
3	53° 42'	3° 13.4'	yes		yes
4	53° 47'	3° 13.4'	yes		yes
5	53° 52'	3° 21.8'	yes	yes	yes
6	53° 47'	3° 21.8'	yes	yes	yes
7	53° 42'	3° 21.8'	yes	yes	yes
8	53° 37'	3° 21.8'	yes	yes	yes
9	53° 32'	3° 21.8'	yes	yes	yes
10	53° 27'	3° 13.4'	yes		yes
11	53° 27'	3° 21.8'	yes	yes	yes
12	53° 27'	3° 30.2'	yes		yes
13	53° 32'	3° 30.2'	yes		yes
14	53° 37'	3° 30.2'	yes		yes

15	53° 42'	3° 30.2'	yes		yes
16	53° 47'	3° 30.2'	yes		yes
17	53° 47'	3° 38.6'	yes		yes
18	53° 42'	3° 38.6'	yes		yes
19	53° 37'	3° 38.6'	yes		yes
20	53° 32'	3° 38.6'	yes		yes
21	53° 27'	3° 38.6'	yes		yes
21b	53° 27'	3° 38.6'	yes	yes	yes
22	53° 23'	3° 38.6'	yes		yes
23	53° 23'	3° 47.0'	yes		yes
24	53° 27'	3° 47.0'	yes		yes
25	53° 32'	3° 47.0'	yes		yes
26	53° 37'	3° 47.0'	no		
27	53° 42'	3° 47.0'	no		
28	53° 47'	3° 47.0'	no		
29	53° 47'	3° 55.4'	no		
30	53° 42'	3° 55.4'	no		
31	53° 37'	3° 55.4'	no		
32	53° 32'	3° 55.4'	no		
33	53° 27'	3° 55.4'	no		
34	53° 22'	3° 55.4'	no		
35	53° 32'	3° 15.9'	yes		yes

Table 4. Surface and bottom parameters from CTD, noted in log book.

<u>CTD</u> <u>no</u>	<u>Site</u>	<u>Nutrients</u>		<u>Nominal positions.</u>		<u>Water</u> <u>depth</u> <u>(m)</u>	<u>Surface</u>		<u>Bottom</u>	
		<u>Surf</u>	<u>Bed</u>	<u>Latitude</u> <u>(N)</u>	<u>Longitude</u> <u>(W)</u>		<u>Tem</u> <u>(deg)</u>	<u>Sal</u> <u>(PSU)</u>	<u>Tem</u> <u>(deg)</u>	<u>Sal</u> <u>(PSU)</u>
2	1	1	2	53° 32'	3° 21.8'	28	11.1	31.2	10.9	31.5
3	10	3	4	53° 27'	3° 13.4'	15	11.9	30.2	11.6	30.4
4	35	5	6	53° 31.9'	3° 15.9'	12	11.8	31.0	11.8	31.0
5	2	7	8	53° 37'	3° 13.4'	11	11.5	31.9	11.5	31.9
6	3	9	10	53° 42'	3° 13.4'	15	10.9	31.9	10.9	31.9
7	4	11	12	53° 47'	3° 13.4'	14	10.4	32.1	10.4	32.1
8	5	13	14	53° 52'	3° 21.8'	13	10.5	32.3	10.5	32.3
9	6	15	16	53° 47'	3° 21.8'	18	10.4	32.1	10.4	32.1
10	7	17	18	53° 42'	3° 21.8'	23	10.9	32.0	10.7	32.0
11	8	19	20	53° 37'	3° 21.8'	26	11.1	31.9	10.8	31.9
12	9	21	22	53° 32'	3° 21.8'	27	11.3	31.4	11.1	31.6
13	11	23	24	53° 27'	3° 21.8'	20	11.1	31.0	11.0	31.2
14	12	25	26	53° 27'	3° 30.2'	22	10.6	31.8	10.6	31.8
15	13	27	28	53° 32'	3° 30.2'	35	10.4	32.0	10.2	32.2
16	14	29	30	53° 37'	3° 30.2'	36	10.2	32.4	9.9	32.6
17	15	31	32	53° 42'	3° 30.2'	40	10.3	32.4	9.5	32.7
18	16	33	34	53° 47'	3° 30.2'	27	10.7	32.0	10.0	32.2
19	17	35	36	53° 47'	3° 38.6'	34	10.4	32.3	9.5	32.7
20	18	37	38	53° 42'	3° 38.6'	39	9.9	32.7	9.6	32.7
21	19	39	40	53° 37'	3° 38.6'	31	10.1	32.5	9.9	32.6
22	20	41	42	53° 32'	3° 38.6'	33	10.5	31.9	10.1	32.4

23	21	43	44	53° 27'	3° 38.6'	22	10.7	31.6	10.4	32.1
24	21b	45	46	53° 27'	3° 38.6'	24	10.8	31.6	10.2	32.3
25	22	47	48	53° 23'	3° 38.6'	16	11.1	32.0	10.9	32.0
26	23	49	50	53° 23'	3° 47.0'	24	10.8	32.5	10.4	32.5
27	24	51	52	53° 27'	3° 47.0'	33	10.6	32.8	9.9	32.9
28	25	53	54	53° 32'	3° 47.0'	41	10.6	32.6	9.8	32.9

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 ($\mu\text{mols / m}^2\text{s}$), Air Temperature ($^{\circ}\text{C}$), Relative Humidity, Relative Wind Speed (m s^{-1}), Relative Wind Direction ($^{\circ}$) – zero indicates wind on the bow, Transmittance, Hull Temperature ($^{\circ}\text{C}$), Barometric Pressure (mbar), Fluorescence, Turbidity, Salinity, Minimum Air Temp ($^{\circ}\text{C}$), Maximum Air Temp ($^{\circ}\text{C}$), Wind Gust (m s^{-1}), GPS Time, Latitude, Longitude, Barometric Pressure Minimum (mbar), Barometric Pressure Maximum (mbar), Conductivity sensor water temperature ($^{\circ}\text{C}$). Sea surface temperature, salinity and transmittance were calibrated against the CTD by BODC.

Data were recorded every minute from 09:02 on 11 May until 23:23 on 12 May 2005 starting at Puffin Island and stopping at Conwy Bay (To anchor). It was restarted at 04:12 on 13 May 2005 and stopped at Puffin Island at 04:48 on 13 May 2005. 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 29 pings / ensemble. Data were recorded from 09:02 on 11 May until 23:24 on 12 May 2005 starting at Puffin Island and stopping at Conwy Bay (To anchor) . It was restarted at 04:13 13 May 2005 and stopped at Puffin Island at 04:48 on 13 May 2005.

Acknowledgements

The assistance of the master, officers, and crew contributed greatly to the success and safety of the cruise.