RV Prince Madog 29/10 cruise report
NOC Coastal Observatory cruise 71
10 – 13 August 2010

1. CRUISE OBJECTIVES

1.1 At site A, 53° 32′ N, 3° 21.8′ W (CTD station 1)

To recover:

a) A sea bed frame containing a 600 kHz RDI ADCP (measuring mean current profile, pressures and directional waves), SeaBird SBE 16*plus* (with pumped conductivity sensor), digiquartz pressure sensor, a SeaPoint turbidity sensor with wiper, a SeaBird SBE 16*plus* with an Aanderra oxygen Optode, and an FSI CTD.

b) CEFAS SmartBuoy in a single point mooring. Attached to the mooring wire are SeaBird MicroCat temperature, conductivity loggers at 5 m and 10 m below the surface and temperature miniloggers at 7.5 m and 15 m below the surface. Plus a new WetLabs ACS unit and Wetlabs fluorometer on a frame at 5m.

c) CEFAS Waverider buoy

To deploy:

a) A sea bed frame containing a 600 kHz RDI ADCP (measuring mean current profile, pressures and directional waves), SeaBird SBE 16*plus* (with pumped conductivity sensor), digiquartz pressure sensor, a SeaPoint turbidity sensor with wiper and SeaBird SBE 16*plus* with an Aanderra oxygen Optode.

b) CEFAS SmartBuoy in a single point mooring. Temperature mini-loggers are attached to the mooring wire at 7.5 m and 15 m below the surface and a SeaBird Microcat temperature and conductivity logger at 10m below the surface. A frame with a WetLabs ACS unit, Wetlabs fluorometer and SeaBird MicoCat is attached at 5m below the surface.

c) CEFAS Waverider Buoy

1.2 At 'new' site B, 53° 32.3′ N, 3° 38.4′ W (CTD station 20)

To recover:

a) A sea bed frame for a 600 kHz RDI ADCP measuring mean current profile, pressures and directional waves, a SeaBird SBE 16*plus* (with pumped conductivity sensor), digiquartz pressure sensor and a SeaPoint turbidity sensor (fitted with a wiper).

b) A CEFAS SmartBuoy in a single point mooring. Attached to the mooring wire are SeaBird MicroCat temperature, conductivity loggers at 5 m and 10 m below the

surface and temperature miniloggers at 7.5 m, 15 m and 20 m below the surface.

To deploy

a) A sea bed frame for a 600 kHz RDI ADCP measuring mean current profile, pressures and directional waves, a SeaBird SBE 16*plus* (with pumped conductivity sensor), digiquartz pressure sensor and a SeaPoint turbidity sensor (fitted with a wiper).

b) A CEFAS SmartBuoy in a single point mooring. Attached to the mooring wire are SeaBird MicroCat temperature, conductivity loggers at 5 m and 10 m below the surface and temperature miniloggers at 7.5 m, 15 m and 20 m below the surface.

1.3 CTD and LISST survey

- To conduct a CTD survey including LISST measurements at 34 sites every five nautical miles covering the eastern Irish Sea to determine the effects of the rivers Dee, Mersey and Ribble on Liverpool Bay. The survey covers the area from the coast of North Wales to a line extending westwards from Blackpool, and from the Lancashire coast to a line extending northwards from Great Ormes Head.

- To obtain calibration samples for salinity, transmittance and suspended sediment at selected stations.

- To obtain near surface and bed water samples for nutrient (nitrate, phosphate, silicate), suspended sediment and chlorophyll-a determination. NOC Liverpool has supplied filtering equipment and filters for determining concentrations of suspended sediment and chlorophyll-*a*.

- To obtain surface samples for a Defra pH/Alkalinity study by David Hydes (NOC, at Southampton).

1.4 Other activities

- *Sea bed sediment analysis.* To collect sediment samples at each CTD site with a Day grab for Andy Plater (University of Liverpool) and Ken Pye (Royal Holloway College).

- *Trace metal analysis*. To collect samples for trace metal analysis (for in-situ and laboratory analysis) for Pascal Salaun (University of Liverpool)

- *Zooplankton net hauls:* To collect 10 vertical zooplankton net hauls for CEFAS at Site A

2. CRUISE PARTICIPANTS

Scientific personnel
Jo Hopkins (Principal, NOC)
Chris Balfour (NOC)
Terry Doyle (NOC)
Emlyn Jones (NOC)
Andy Lane (NOC)
Anne Forbes-Brook (Bangor University)
Dave Pearce (CEFAS)
Neil Needham (CEFAS)
Kris Gibbon-Walsh (University of Liverpool)
Geoff Shannon (NOC)

Ship's officers and crew
Steve Duckworth (Master)
David Shaw (Chief Officer)
Les Black (Chief Engineer)
Meikle MacKay (2nd Engineer)
David Leigh (AB)
Gary Barnes (AB)
Phil Jones (Bosun)
Colin Hughes (Cook)

3. CRUISE NARRATIVE (all times in GMT)

The RV Prince Madog arrived at Vittoria Wharf, Birkenhead at 11:00 on 10/09/2010. Loading was completed between 11:30 and 13:30.

The Prince Madog left her berth at 22:00 and was clear of the lock and into the Mersey by 22:30. At 22:52 the ships ADCP and underway Enviro systems were switched on. The Madog waited until first light near the Liverpool Bar Light to begin mooring work. At 05:09 on the 11/08/10 the CEFAS Waverider buoy was released at site A. The old Waverider was recovered at 05:43. Wind speeds during this time were 7-8 $m.s^{-1}$ from 250°.

A pre-mooring deployment CTD was conducted at 06:14 and calibration samples taken by CEFAS. The ADCP frame at site A was recovered at 06:59 and a new frame deployed at 07:11. Wind speeds during this time had increased to 10-11$m.s^{-1}$, turning more northerly (279°).

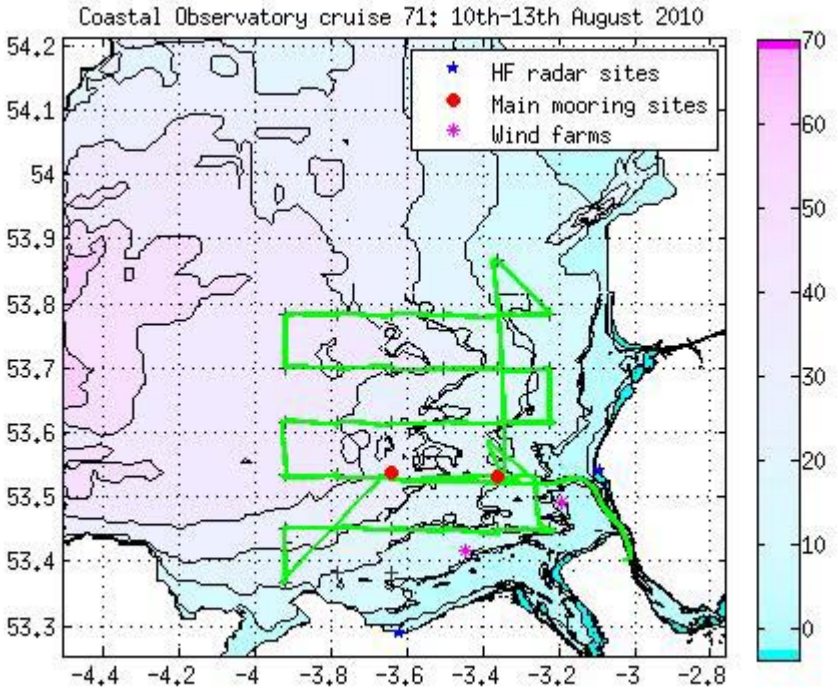
The new SmartBuoy at site A was released at 07:55. Recovery of the old buoy was made difficult by increasing tidal currents and winds blowing the ship off the buoy. It was eventually bought on deck at 08:42 on the third recovery attempt. At 09:06 a post deployment CTD was recorded and water samples taken. No zooplankton net hauls were carried out due to increasingly heavy swell.

The Madog then headed north to station 5 to start the CTD survey. The grid was sampled from east-west/west-east (Stations 5, 4, 6, 16, 17, 28, 29, 30….etc). North-westerly winds (force 4-5, at times 6) persisted to blow throughout the day (11/08/2010) and into the night, generating a heavy swell as the grid was being completed. The planned mooring recovery at 08:00 on the 12/08/10 was postponed until the evening in the hope that conditions would be more favorable later in the day. The grid was continued through Stations 20, 13, 9, 35, 10….. The survey was stopped after sampling at Station 34 and at 16:10 on 12/08/10 the Madog headed back to Site B (Station 20) to assess the possibility of mooring recovery. Wind speeds at this time were 10-11$m.s^{-1}$ from 316°.

A pre-deployment CTD cast was recorded at 18:05 at Site B. The ADCP frame was released at 16:17. The canister containing the rope was lost during recovery. Not all the rope had streamed out when the instrument frame was released from the lander and became tangled. The canister was most likely lost overboard as the rope was cut. The line to the lander also got wrapped around the rudder which took nearly 25 minutes to free. The frame was eventually on deck at 18:45. The new frame was deployed at 19:00.

Wind and wave conditions (1m+) were not suitable for recovery of the SmartBuoy. The Prince Madog therefore headed back towards the Mersey and entered the lock at Birkenhead at 22:00. The ships ADCP and Enviro systems were switched off at 21:38 on 12/08/2010. The Prince Madog was tied up at Vittoria docks at 23:00. Unloading was completed between 07:00 and 08:00 on 13/08/10.

Given the conditions (persistent north-westerly winds and heavy swell) the cruise was successful. With the exception of two stations (22 and 23), a full set of CTD casts and samples were collected. Both the ADCP and SmartBuoy at Site A, and the ADCP frame at Site B were serviced. Only recovery and redeployment of the SmartBuoy at Site B and zooplankton net hauls at Site A were not possible.



Coastal Observatory Cruise #71 track

4. MOORINGS

4.1 Recovered Instrumentation

Site A: Bedframe

Waves ADCP 600 kHz RDI S/N 12239: Memory 1.5GB
Mode 1: 100 pings every 10 minutes 35 × 1 m bins (2.65–36.65 m above the bed)
Beam coordinates – speeds, correlation, echo intensity, % good
Sound velocity calculated from temperature, depth and salinity of 32.
Clock set at 10:00:00 on 06/07/2010: delayed start at 06:00:00 on 07/07/2010
Stopped logging at 08:20:10 on 13/08/10
File size = 175740988 bytes
Clock drift = + 4 seconds

SeaBird SBE 16plus S/N 4596
Mounted on base of frame with pumped conductivity sensor and SeaPoint turbidity sensor (S/N 10471) taped to roll bar setup for 0–125 FTU range and fitted with wiper.
Sample interval 600 s; digiquartz integration time 40 s, range 400; pump 0.5 s, 1 s delay.
Clock set at 10:22:00 on 06/07/2010: delayed start at 06:00:00 on 07/07/2010
Stopped logging at 09:45:20 on 17/08/10
File sizes = 5926 samples
Clock drift = +7 seconds

SeaBird SBE 16plus S/N 4741 (RS232) with Aanderaa Optode (S/N 675)
Sample interval 600 s.
Clock set at 10:41:00 on 06/07/2010: delayed start at 06:00:00 on 07/07/2010
Stopped logging at 10:21:50 on 17/08/10
File size = 5930 samples
Clock drift = +3 seconds

FSI CTD S/N 2195
Clock set at 10:54:15 on 6/7/2010. Delayed start at 06:00:00 on 7/7/2010
Interval time = 10 seconds; Record time 40 seconds;
Sample rate = 4Hz; Average sample 40 seconds.
Stopped logging at 10:50:10 on 17/08/10
File size = 219558 bytes
Clock drift = +2 seconds

The frame was fitted with a fizz link, a spooler with 50 m of rope for recovery of the ballast weight and two Benthos releases:
S/N 70358 (Rx=11.0 kHz, Tx=12.0 kHz, RC=A)
S/N 72382 (Rx=10.0 kHz, Tx=12.0 kHz, RC=A)

Site A: SmartBuoy mooring

SeaBird MicroCat temperature and conductivity recorder S/N 5433 (or 5438?)
(**Unclear from engineer log whether this is 5433 or 5438. S/N 5435 was reported in the previous cruise report **)
Mounted at 5 m below the surface.
Start times not noted for the above serial number.
Stopped logging at 19:15:00 on 11/08/10
File size = 5120 samples
Clock drift = +4 seconds

AC-S S/N 059 (Data Logger S/N 119) at 5m below surface measuring multispectral absorption and attenuation
Stopped logging on 12/08/2010
Clock drift = -2 seconds

Wetlabs fluorometer S/N 1514 at 5m below the surface
Stopped logging on 12/08/2010
Clock drift = -35 seconds

SeaBird MicroCat temperature and conductivity recorder S/N 5790
Mounted at 10 m below the surface.
Clock set at 12:03:30 on 06/07/2010: delayed start at 06:00:00 on 07/07/2010
Stopped logging at 10:34:30 on 17/08/10
File size = 5932 samples
Clock drift = +9 seconds

Mini-logger (StarOddi) S/N 2836
Mounted at 7.5 m below the surface. Set to record at 600s intervals.
Delayed start at 06:00:00 on 07/07/2010.
Stopped logging at 13:18:10
File size = 5948 samples
Clock drift = +6 seconds

Mini-logger (StarOddi) S/N 2838
Mounted at 15 m below the surface. Set to record at 600s intervals.
Delayed start at 06:00:00 on 07/07/2010.
Stopped logging at 13:28:10 on 17/08/10
File size = 5950 samples
Clock drift = +7 seconds

The CEFAS SmartBuoy is fitted with sensors for conductivity, temperature and optical back scatter at 1 m below surface, light sensors at 1 m and 2 m below the surface, a fluorometer (SeaPoint), oxygen sensor (Aanderaa Optode), an in-situ NAS2E nutrient analyzer and a water sampler which obtains samples every fourth day for laboratory analysis (ToxN and silicate) and every eighth day (phytoplankton species, composition and abundance). The conductivity, temperature, optical back scatter and light data are transmitted back to CEFAS via Orbcomm satellite.

The single point mooring was composed 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: Bedframe

Waves ADCP 600 kHz RDI S/N 5807: Memory 1GB.
Mode 1: 100 pings every 10 minutes.
45 × 1 m bins (2.65–46.65 m above the bed, WN45).
Beam coordinates – speeds, correlation, echo intensity, % good.
Sound velocity calculated from temperature, depth and salinity of 32.
Clock reset at 10:07:00 on 06/07/2010: delayed start at 06:00:00 on 07/07/2010.
Stopped logging at 08:26:30 on 13/08/10
File size = 176809388 bytes
Clock drift = + 33 seconds

SeaBird SBE 16plus S/N 4737 (RS485)
Mounted on base of frame with pumped conductivity sensor and SeaPoint turbidity sensor (S/N 10537) taped to roll bar; setup for 0–125 FTU range and fitted with wiper.
Sample interval 600 s; digiquartz integration time 40 s, range 400; pump 0.5 s, 1 s delay
Clock reset at 10:31:00 on 06/07/2010: delayed start at 06:00:00 on 07/07/2010
Stopped logging at 10:09:30 on 17/08/10
File sizes = 5927 samples
Clock drift = +3 seconds

The frame was fitted with a fizz link, a spooler with 50 m of rope for recovery of the ballast weight and two Benthos releases:
S/N 70356 (Rx=10.5 kHz, Tx=12.0 kHz, RC=D)
S/N 71922 (Rx=11.5 kHz, Tx=12.0 kHz, RC=A)

Site B: SmartBuoy mooring

SmartBuoy B was not recovered on this cruise. All instrumentation remains in the water.

Table 1. Recovered mooring positions and times.

	Latitude (N)	Longitude (W)	Depth (m)	Date	Time (GMT)
ADCP frame (Site A)	53° 31.980	3° 21.366	19.4	11/08/2010	06:59
SmartBuoy (Site A)	53° 32.043	3° 21.400	23.3	11/08/2010	08:42
Waverider (Site A)	53° 32.097	3° 21.241	18.6	11/08/2010	05:43
ADCP frame (Site B)	53° 32.370	3° 38.459	32.3	12/08/2010	18:45
SmartBuoy (Site B)	-	-	-	-	-

n.b. SmartBuoy at site B not recovered

4.2 Deployed Instruemtation

Site A: Bedframe

Waves ADCP 600 kHz RDI S/N 5806: Memory 1GB
Mode 1: 100 pings every 10 minutes 35 × 1 m bins (2.65–36.65 m above the bed, WN035)
Beam coordinates – speeds, correlation, echo intensity, % good
Sound velocity calculated from temperature, depth and salinity of 32.
Clock set at 08:16:00 on 10/08/2010 : delayed start at 06:00:00 on 11/08/2010

SeaBird SBE 16plus S/N 4738
Mounted on base of frame with pumped conductivity sensor and SeaPoint turbidity sensor (S/N 10538) taped to roll bar setup for 0–125 FTU range and fitted with wiper.
Sample interval 600 s; digiquartz integration time 40 s, range 400; pump 0.5 s, 1 s delay.
Clock set at 08:49:00 on 10/08/2010: delayed start at 06:00:00 on 11/08/2010.

SeaBird SBE 16plus S/N 4490 (RS232) with Aanderaa Optode (S/N 674)
Sample interval 600 s.
Clock set at 09:17:00 on 10/08/2010: delayed start at 06:00:00 on 11/08/2010

The frame was fitted with a fizz link, a spooler with 50 m of rope for recovery of the ballast weight and two Benthos releases:
S/N 72381 (Rx=11.0 kHz, Tx=12.0 kHz, RC=B)
S/N 69676 (Rx=11.5 kHz, Tx=12.0 kHz, RC=C)

Site A: SmartBuoy Mooring

SeaBird MicroCat temperature and conductivity recorder S/N 5792
Mounted at 5 m below the surface (on frame with ACS and flourometer)
Clock set at 15:38:00 on 09/08/10
Delayed start at 06:00:00 on 11/08/2010

AC-S S/N 60 at 5m below surface measuring multispectral absorption and attenuation (DH4 data logger S/N 140)– attached WetLabs fluorometer S/N 1513
Clock set at 16:38:00 on 09/08/10
Delayed start at 06:00:00 on 11/08/2010

SeaBird MicroCat temperature and conductivity recorder S/N 5434
Mounted at 10 m below the surface.
Clock set at 10:28:00 on 10/08/10: delayed start at 06:00:00 on 11/08/2010

Mini-logger (StarOddi) S/N 2841
Mounted at 7.5 m below the surface. Set to record at 600s intervals.
Delayed start at 06:00:00 on 11/08/2010

Mini-logger (StarOddi) S/N 2842
Mounted at 15 m below the surface. Set to record at 600s intervals.
Delayed start at 06:00:00 on 11/08/2010

The CEFAS SmartBuoy is fitted with sensors for conductivity, temperature and optical back scatter at 1 m below surface, light sensors at 1 m and 2 m below the surface, a fluorometer

(SeaPoint), oxygen sensor (Aanderaa Optode), an in-situ NAS2E nutrient analyzer and a water sampler which obtains samples every fourth day for laboratory analysis (ToxN and silicate) and every eighth day (phytoplankton species, composition and abundance). The conductivity, temperature, optical back scatter and light data are transmitted back to CEFAS via Orbcomm satellite.

The single point mooring was composed 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: Bedframe

Waves ADCP 600 kHz RDI S/N 2390: Memory 1.5GB.
Mode 1: 100 pings every 10 minutes.
45 × 1 m bins (2.65–46.65 m above the bed, WN045).
Beam coordinates – speeds, correlation, echo intensity, % good.
Sound velocity calculated from temperature, depth and salinity of 32.
Clock reset at 08:28:00 on 10/08/2010: delayed start at 06:00:00 on 11/08/2010

SeaBird SBE 16plus S/N 4736 (RS485)
Mounted on base of frame with pumped conductivity sensor and SeaPoint turbidity sensor (S/N 10320) taped to roll bar; setup for 0–125 FTU range and fitted with wiper.
Sample interval 600 s; digiquartz integration time 40 s, range 400; pump 0.5 s, 1 s delay
Clock reset at 09:02:00 on 10/08/2010: delayed start at 06:00:00 on 11/08/2010.

The frame was fitted with a fizz link, a spooler with 50 m of rope for recovery of the ballast weight and two Benthos releases:
S/N 72863 (Rx=13.5 kHz, Tx=12.0 kHz, RC=A)
S/N 71919 (Rx=10.5 kHz, Tx=12.0 kHz, RC=C)

Site B: SmartBuoy

SmartBuoy B was not serviced on this cruise. The following instrumentation remains in the water from the previous deployment on 08/07/2010 (Cruise # 70).

SeaBird MicroCat temperature and conductivity recorder S/N 2506
Mounted at 5 m below the surface
Clock set at 11:56:30 on 06/07/2010: delayed start at 06:00:00 on 07/07/2010.

SeaBird MicroCat temperature and conductivity recorder S/N 5791
Mounted at 10 m below the surface
Clock set at 12:08:00 on 06/07/2010: delayed start at 06:00:00 on 07/07/2010.

Mini-logger (StarOddi) S/N 2840 mounted at 7.5 m below the surface
Set to record at 600 s intervals
Delayed start at 06:00:00 on 07/07/2010

Mini-logger (StarOddi) S/N 2848 mounted at 15 m below the surface
Set to record at 600 s intervals
Delayed start at 06:00:00 on 07/07/2010

Mini-logger (StarOddi) S/N 2851 mounted at 20 m below the surface
Set to record at 600 s intervals
Delayed start at 06:00:00 on 07/07/2010

The CEFAS SmartBuoy is fitted with sensors for conductivity, temperature and optical back scatter and a fluorometer at 1 m below surface. 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.

(All instruments that were setup and not deployed were stopped on the 17/08/10)

Table 2. Deployed mooring positions and times.

	Latitude (N)	Longitude (W)	Depth (m)	Date	Time (GMT)
ADCP frame (Site A)	53° 32.008	3° 21.481	19.8	11/08/2010	07:11
SmartBuoy (Site A)	53° 31.988	3° 21.683	21.3	11/08/2010	07:55
Waverider (Site A)	53° 32.020	3° 21.190	21.9	11/08/2010	05:09
ADCP frame (Site B)	53° 32.371	3° 38.465	32.0	12/08/2010	19:00
SmartBuoy (Site B)	-	-	-	-	-

n.b. A new SmartBuoy at site B was not deployed

5. CTD

The SeaBird 911 CTD recorded downwelling PAR light levels, temperature, conductivity, oxygen concentration, transmittance and fluorescence at 24 Hz. The frame was fitted with an altimeter. The CTD temperature data was checked against a SeaBird SBE35 precision thermometer. A Satlantic SUNA nitrate analyzer was fitted to the CTD underneath the frame and its data logged by the SeaBird data logging. A LISST-100X particle sizer with internal logging was also attached to the CTD frame.

Water samples were taken by Anne Forbes-Brook (Bangor University) near the sea bed (3m above bottom) for calibration of the CTD salinity. Water samples were taken from the near surface (1 m) and near bed (3 m above bottom) to determine: suspended sediment load (filtered), chlorophyll-a concentration (filtered), nutrients (nitrate, phosphate, silicate), and ammonia oxidation/nitrification rates. Near surface (1m) samples were also taken for alkalinity (Defra) and for CEFAS calibration (chlorophyll, suspended sediment load, nutrients, salinity). A bottle at 7m was fired for trace metal analysis.

The bottle positions on the rosette were

Near bed:

Bottle 3 – nutrients
Bottle 4 – SPM/chlorophyll
Bottle 5 – Cefas

Near surface:

Bottle 8 – Trace metals (at approx 7m from surface)
Bottle 9 – SPM
Bottle 10 – nutrients and pH;
Bottle 11,12 – Cefas

6. SURFACE SAMPLING

The intake of the surface sampling system is located about 3 m below the water line of RV Prince Madog. The parameters recorded every minute by the WS Oceans system are: date, transmittance, hull temperature (°C), barometric pressure (mbar), fluorescence, oxygen concentration, turbidity, salinity, conductivity and water temperature (°C). A met package measures and records barometric pressure (mbar), solar radiation (W m^{-2}), PAR (photosynthetically active radiation, µmol m^{-2} s^{-1}), air temperature (°C), relative humidity, relative wind speed (m s^{-1}), relative wind direction (°) with zero indicating wind on the bow, minimum air temperature (°C), maximum air temperature (°C) and wind gust (m s^{-1}).

The ship was fitted with a 300 kHz ADCP set to record current velocity 25 × 2 m bins (bin nearest the surface at 5.1 m depth), every 30 s with 29 pings per ensemble.

Underway data and ship's ADCP data were recorded between 22:52 on 10/08/2010 and 21:38 on 12/08/2010.

Acknowledgements

The assistance of the master, officers and crew of the RV Prince Madog and all scientists is appreciated in ensuring the success of this cruise.

Table 3. Nominal CTD positions, stations visited and samples taken

Station	Latitude (N)	Longitude (W)	Trace metals	Sediments & chl-a	Nutrients top+bot	Grab #	CEFAS	pH
1(A)&9	53° 32.0′	3° 21.8′	No	Yes	Yes	1 & 25	Yes	Yes
2	53° 37.0′	3° 13.4′	No	Yes	Yes	15	Yes	Yes
3	53° 42.0′	3° 13.4′	No	Yes	Yes	14	No	Yes
4	53° 47.0′	3° 13.4′	No	Yes	Yes	3	No	Yes
5	53° 52.0′	3° 21.8′	Yes	Yes	Yes	2	Yes	Yes
6	53° 47.0′	3° 21.8′	No	Yes	Yes	4	No	Yes
7	53° 42.0′	3° 21.8′	No	Yes	Yes	13	Yes	Yes
8	53° 37.0′	3° 21.8′	No	Yes	Yes	16	No	Yes
10	53° 27.0′	3° 13.4′	No	Yes	Yes	27	Yes	Yes
11	53° 27.0′	3° 21.8′	No	Yes	Yes	28	No	Yes
12	53° 27.0′	3° 30.2′	Yes	Yes	Yes	29	No	Yes
13	53° 32.0′	3° 30.2′	No	Yes	Yes	24	No	Yes
14	53° 37.0′	3° 30.2′	Yes	Yes	Yes	17	No	Yes
15	53° 42.0′	3° 30.2′	No	Yes	Yes	12	No	Yes
16	53° 47.0′	3° 30.2′	No	Yes	Yes	5	No	Yes
17	53° 47.0′	3° 38.6′	No	Yes	Yes	6	Yes	Yes
18	53° 42.0′	3° 38.6′	No	Yes	Yes	11	No	Yes
19	53° 37.0′	3° 38.6′	Yes	Yes	Yes	18	Yes	Yes
20(B)*	53° 32.3′	3° 38.4′	No	Yes	Yes	23	Yes	Yes
21*	53° 27.0′	3° 38.6′	No	Yes	Yes	30	Yes	Yes
22[a]	53° 23.7′	3° 38.6′	-	-	-	-	-	-
23[a]	53° 23.0′	3° 47.0′	-	-	-	-	-	-
24	53° 27.0′	3° 47.0′	No	Yes	Yes	31	No	Yes
25	53° 32.0′	3° 47.0′	No	Yes	Yes	22	No	Yes
26	53° 37.0′	3° 47.0′	No	Yes	Yes	19	No	Yes
27	53° 42.0′	3° 47.0′	Yes	Yes	Yes	10	No	Yes
28	53° 47.0′	3° 47.0′	No	Yes	Yes	7	No	Yes
29	53° 47.0′	3° 55.4′	Yes	Yes	Yes	8	No	Yes
30	53° 42.0′	3° 55.4′	Yes	Yes	Yes	9	No	Yes
31	53° 37.0′	3° 55.4′	No	Yes	Yes	20	No	Yes
32	53° 32.0′	3° 55.4′	No	Yes	Yes	21	Yes	Yes
33	53° 27.0′	3° 55.4′	No	Yes	Yes	32	No	Yes
34	53° 22.0′	3° 55.4′	Yes	Yes	Yes	33	Yes	Yes
35	53° 32.0′	3° 15.9′	No	Yes	Yes	26	No	Yes

*Before cruise 66 (26/01/2010), Stn 21 was referred to as Site B and Stn 20 was at 53° 32.0′ N 3° 38.6′ W

[a] Stations 22 and 23 were not visited on this cruise