

1986 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA: CRUISE 9

(PROVISIONAL: Not to be quoted without prior reference to the author)

STAFF:

D S Woodhead	Part (a)
P J Kershaw)
D J Swift)
S J Malcolm)
I A Huggins) Whole cruise
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M B Lovett	Part (b)
A K Young	Part (c)

DURATION:

Part (a) 3 November-20 November
Part (b) 3 November-11 November
Part (c) 11 November-23 November

LOCALITY:

Irish Sea

AIMS:

1. To investigate the horizontal and vertical distributions of macrofauna and meiofauna in the sediments of the Irish Sea using Reineck and Kaston cores and the towed, sledge-mounted TV camera. To collect specimens of Callianassa subterranea for laboratory studies of bioturbation.
2. To investigate the physico-chemical conditions in sediment pore waters and how these affect the behaviour of radionuclides.
3. To collect water and sediment samples to investigate the rates of scavenging of the natural radionuclides Th-234 and Pb-210.
4. To collect water, suspended load, sediment and fish for C-14 analysis.
5. To measure the concentrations and chemical speciation of the transuranic radionuclides in the seawater at the outfall.
6. To measure currents and suspended load over a tidal cycle at two anchored stations.
7. To make CTD sections as time allows.
8. To recover seven current meter moorings.
9. To sample plaice and dabs off Sellafield and in Dundrum Bay for fish disease studies.

NARRATIVE

CIROLANA sailed from Lowestoft at 0920h, 3 November 1986 and made an uneventful

south-about passage to the Irish Sea, arriving off Sellafield at 1500h, 5 November. Work on the programme commenced immediately with the deployment of the sledge-mounted TV camera to test its utility for determining the distributions of burrows in the muddy sediments off Sellafield. The equipment was found to be unsuitable due to a combination of two factors: (i) the very high suspended sediment load in the area; and (ii) the inability of CIROLANA to tow at a sufficiently low speed to prevent the disturbance of the very soft sediment from further decreasing the visibility. After two additional tests over firmer ground and at anchor, this part of the programme was abandoned.

The fishing programme off Sellafield for the fish diseases study commenced on Thursday 6 November. While the catch was being examined, Reineck cores were taken for the investigation of pore water radiochemistry. On 7 November only one trawl haul could be obtained before high winds ended the possibility of coring for the day. Shelter was obtained in Ramsey Bay. Both fishing and coring were possible on 8 November and the samples were processed while dodging in freshening winds during the afternoon. Southwesterly winds from force 8-10 prevented any sampling on 9-10 November and the period was spent anchored in Ramsey Bay. The programme of fishing and coring was continued on 11 November and the change of scientific staff was successfully completed during the late afternoon. Weather conditions allowed the programme of work to continue for the remainder of the week. The first attempt at a current meter recovery (Station "R") on 12 November was unsuccessful when the buoy mooring wire parted. The morning of 13 November was lost to weather but during the afternoon the current meter rigs and stations "M", "R" and "S" were recovered although the latter was without the bottom meter. On 14 November a CTD section was made between St Bees Head and the Isle of Man and water and sediment samples were obtained for Thorium analyses. The current meter at Station "P" was also successfully recovered as was that at "Q" the following day. On 15 November the sampling of water and sediment for Thorium analyses was completed off Sellafield. Strong winds prevented any coring work on 16 November but a large water sample was processed for Carbon-14 analysis while dodging. Because of the possibility of continuing strong south westerly winds the entire programme of fishing at the control site was completed on 17 November in the relative shelter of Dundrum Bay. On the following day sixteen Reineck cores were taken in the sandy mud off Sellafield to obtain specimens of Callianassa subterranea to be used in experimental studies of bioturbation in the laboratory. During the afternoon the weather to the north of the Isle of Man moderated sufficiently to allow a CTD section to be made to Burrow Head. The weather moderated to calm conditions on 19 November allowing the vessel to anchor and make observations of currents, salinity, temperature and suspended load over a complete tidal cycle. The opportunity was also taken to use the Craib corer to obtain undisturbed samples of surface sediment and the immediately overlying water.

On the morning of 20 November the ship's rescue boat was run into Port St Mary to collect the buoy washed ashore from Station "V". Dragging operations were carried out at Station "V" and one meter was recovered. In the afternoon similar operations to recover the two moorings laid at station "Y" were unsuccessful. D Woodhead was put ashore in Holyhead in the early evening.

CIROLANA commenced the homeward journey in the early evening of 20 November, collecting a water sample off Lands End, and docked in Lowestoft at 0041h, 23 November 1986. Despite interruptions because of bad weather all the cruise objectives were attempted and for the most part completed successfully.

RESULTS

1. At each of three stations in the northeast Irish Sea seven Reineck cores and five Kaston cores have been sieved to determine the vertical distributions of macrofauna and meiofauna in the sediment. From the Kaston cores 5cm thick

horizontal slices have been taken at different depths below the sediment surface and X-rayed for evidence of burrowing activity. As noted above; the sledge-mounted TV camera proved unsuitable for its intended purpose and this part of the programme was abandoned. Approximately 20 specimens of Callianassa subterranea were collected from Reineck cores and placed on sandy mud substrates in tanks of running seawater. All the animals burrowed into the sediment and appear to have adapted to their new environment.

2. At each of the three sites pore water was extracted from horizontally sub-sampled Reineck cores and depth data for profiles of ferrous ion, manganous ion, pH, Eh and dissolved gases (O₂ and CO₂) have been collected. A start has also been made on the analysis of the pore water samples for dissolved humic acids and denitrification rate. At the site closest to the Sellafield outfall samples of porewater are in the process of being analysed for the chemical speciation of Pu and Am, and the total Pu and Am concentrations are being determined in 3 ultrafiltered samples. The selective leaching of iron, manganese and the transuranic elements from sediments is being examined under anoxic and oxidising conditions.
3. Samples of water and sediment have been collected at eight stations and partially processed for the determination of uranium, Th-234, Pb-210 and Ra-226.
4. Samples of water, suspended load, sediment and plaice (muscle, liver, bone, gut and gut contents) have been collected at three stations for C-14 analyses.
5. A large sample of surface seawater obtained close to the outfall was split into duplicate fractions and has been partially processed to determine the concentrations and chemical speciation of the transuranic radionuclides.
6. Because of the very windy conditions only one anchored station could be attempted. CTD profiles, current velocity and direction, and suspended load profiles were determined over a complete tidal cycle.
7. Two CTD sections, between the Isle of Man, and St Bees Head and Burrow Head respectively, were made.
8. Four current meter moorings (M,P,Q and S) were recovered by hooking the buoy. The bottom meter was missing from "S". Both meters were recovered by dragging at "R" but at "V" one was missing and the buoy was collected from Port St. Mary. No meters were recovered by dragging for the 2 moorings at "Y". A total of 10 meters was recovered and 6 lost.
9. Seven trawl hauls were made off Sellafield and five in Dundrum Bay to obtain samples of Plaice and Dabs to determine the incidence of fish diseases. The results may be summarised as follows:

SITE/ SPECIES	TOTAL NO. OF FISH	% INCIDENCE OF		
		LYMPHOCYSTIS	ULCERS	FIN ROT
Sellafield				
Plaice	370	3.5	0.5	0.5
Dab	298	2.0	3.7	0.7
Dundrum Bay				
Plaice	402	6.0	0.3	4.2
Dab	390	11.5	8.7	2.3

In addition epidermal hyperplasias were observed in the Dundrum Bay samples but

not those from Sellafield. Samples of liver, spleen, kidney and gill were taken from 25 individuals of each species at each site for histological examination.

D S Woodhead
(Scientist in Charge)

Date 23 November 1986

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DISTRIBUTION

Basic list+

Staff on cruise