

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
 FISHERIES LABORATORY, LOWESTOFT, SUFFOLK, ENGLAND

1985 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA: CRUISE 4

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

STAFF

D S Woodhead)	
P J Kershaw)	
I A Huggins)	whole cruise
D C Denoon)	
S Hoare (Oxford University))	
M B Lovett)	parts (a) and (c)
Miss L M Thurston)	part (c)
A K Young)	parts (b) and (c)
D J Swift)	part (a)
N Pearson)	
Ms G C Sills)	
M Edge)	parts (a) and (b)
D Elder)	
S Oldham)	Oxford University
W R Parker)	part (b)
C Waddup)	part (c)

DURATION

Part (a) 15 April-17 April
 Part (b) 17 April-29 April
 Part (c) 29 April-3 May

LOCALITY

Part (a) English Channel and Irish Sea
 Part (b) Irish Sea
 Part (c) Irish Sea and English Channel

AIMS

1. To collect water samples in the English Channel and Southern Irish Sea to be analysed for plutonium - 238/239/240 and americium-241. Duplicate samples will be collected on parts (a) and (c) of the cruise, at 11 stations, using both the ship's deck hose seawater supply and a project-specific pump-sampling system. Preliminary chemical processing will take place on board.
2. To investigate the relationship between current speed, suspended load and radionuclide transport in the near-bed region using moored, remote recording equipment (2 stations).
3. In the muddy sediments of the northeast Irish Sea:
 - (a) to measure in situ bulk density profiles using a nuclear densimeter;
 - (b) to obtain sediment samples for on-board and laboratory geotechnical analysis;

- (c) to investigate the process of corer action;
 - (d) to measure in situ pore water pressures on local and regional scales (4 stations).
4. To extend previous surveys of the distribution of benthic fauna (11 stations). To investigate the extent of deep bioturbation using a 3 m Kaston corer at 12 stations.
 5. To obtain sediment cores at the 12 standard stations to follow the long-term changes in the distributions of plutonium and americium radionuclides. At two of the stations multiple Kaston cores will be taken to investigate the within-core and between-core variability.
 6. To obtain Reineck core samples at 5 stations for the determination of "hot particle" depth profiles.
 7. To obtain surface and bottom water samples (Niskin bottles) and Reineck cores at 8 stations to investigate the behaviour and distribution of thorium-234.
 8. To collect water samples for caesium-134/137 analysis in the southern and western Irish Sea. Up to 25 samples to be collected as convenient on the way into and out of the Irish Sea.

NARRATIVE

CIROLANA sailed from Lowestoft at 0720h, 15 April 1985, and proceeded to the position of the near-bed rig 6½ miles southeast of Southwold. The pop-up buoy was found on the surface, but the divers inspected the equipment for entanglement before recovery was attempted. The equipment and the two marker buoys were recovered by mid-day, and the diving team and their equipment went ashore at Southwold. CIROLANA then proceeded southward on passage to the Irish Sea. Surface water samples were collected en route to be analysed for plutonium, americium and caesium radionuclides. CIROLANA arrived off Whitehaven on the evening of 17 April and made a change of scientific staff before commencing the main programme of work in the Northeast Irish Sea. During this period of twelve days two deployments of the near-bed rig were made, together with six deployments of the Oxford University differential piezometer equipment at four separate sites within the muddy sediments of the area. At each of the four piezometer stations in situ density profiles were measured, tests were made of the effects of different components of the coring equipment on the coring process and sediment samples were collected for geotechnical measurements both on board and in the laboratory.

Fifty-five Reineck box cores were collected and sieved to determine the distribution of the benthic macrofauna, and seven long Kaston cores were examined and sub-sampled to investigate the depth to which bioturbation occurs. In addition 12 Reineck and Kaston cores were sub-sampled for geochemical analysis.

At each of two of the standard archive coring sites three barrel cores and three Kaston cores were obtained and sub-sampled to determine the distribution of plutonium and americium in the seabed and to investigate the variability both within and between cores; no samples were taken from the remaining 12 standard sites.

A second staff change was made off Whitehaven on the evening of 29 April. To the north and west of the Isle of Man, a series of 8 stations was worked to obtain surface and bottom water, and sediment samples to be analysed for thorium-234.

CIRCLANA commenced the homeward journey, south-about, at mid-day, 30 April, collecting surface water samples for plutonium, americium and caesium analysis en route, before docking at Lowestoft at 0915 h, 3 May 1985. The weather was good throughout the cruise and all the objectives set out in the cruise programme were attempted.

RESULTS

1. Surface water samples have been collected at eight stations in the southern North Sea, English Channel and southern Irish Sea, and partially processed on board for the determination of the concentrations of plutonium-238/239/240 and americium-241.
2. The near-bed rig was successfully deployed and recovered twice in the northeast Irish Sea. Faulty batteries in one of the electronic control units resulted in fewer water samples being collected than intended but otherwise the equipment appears to have operated well. The data on current velocity and suspended load are stored on tape and await laboratory analysis.
3. (a) In situ density measurements of the sealed sediment have been made at four sites and analysed at three. These indicate a density increasing rapidly from the sediment surface downwards to about 400mm depth. This possibly suggests that there has been very little erosion at these sites.

(b) Twenty barrel, Kaston and Reineck core samples have been obtained for geotechnical measurements both on board and in the laboratory. Measurements of shear strength confirm last years finding of fairly high sensitivities, probably due to ageing. It is not possible at this stage to estimate the time-scales of ageing but it is unlikely that the sediment has been deposited recently.

(c) The programme of core recovery testing with the acoustic altimeter (34 stations) has confirmed that the presence of the core catcher in the barrel corer is detrimental to core entry and has also suggested that a blunt (50°) cutting shoe produces better entry than a sharp (10°) one.

(d) Six sets of in situ pore water pressure measurements have been obtained at four different sites. Preliminary analysis indicates that the pore pressures in the top metre of sediment are hydrostatic.
4. Fifty-five Reineck cores have been sieved to extend our previous observations of the distribution of benthic organisms. Maxmulleria lankesteri appears to occur less frequently in the muddy sediments near to St Bees Head than in those to the south, but the crustacean, Callianassa subterranea was almost universally present. Evidence from seven long Kaston cores indicates that burrowing activity extends down well beyond two metres.
5. Sediments cores were obtained from just two of the fourteen standard stations. This was partly due to a lack of time required to steam to all the stations but mainly due to a decision to investigate more fully the variability in radionuclide concentrations in multiple samples obtained by both barrel and Kaston corers and also to try out different sub-sampling methods for the Kaston cores.
6. Reineck cores were obtained at 5 sites and sub-samples are being returned to the laboratory for "hot particle" analysis.
7. Surface and bottom water and sediment samples were obtained at 8 stations and preliminary chemical processing to isolate the thorium-234 was completed on board.

8. Surface water samples were obtained at 10 stations for caesium 134/137 analysis in the laboratory.

D S Woodhead

10 May 1985

SEEN IN DRAFT: G Sinclair - Master
R C Newrick - Senior Fishing Mate

INITIALED: HWH

DISTRIBUTION:

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