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MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
FISHERIES LABORATORY, LOWESTOFT, SUFFOLK, ENGLAND
1981 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA: CRUISE 6

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

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DURATION:

1708 h 3 June-1515 h 30 June

All times Greenwich Mean Time

LOCALITY:

North-east Atlantic

AIMS:

1. To recover the 8 mooring current meter array at the Continental Slope, SW Approaches.

2. To recover and relay the full-depth NEADS-6 mooring at 52°30'N 17°45'W.

3. To survey midwater nepheloid layers along the Porcupine Bank Slope using CTD, nephelometer, transmissometer, HIAC.

4. To lay and recover a short-term mooring of thermistors and current meters (high frequency near bottom sampling) at the slope erosion site identified on CIROLANA 6/80 at Porcupine Bank.

5. To establish a working shipboard system for bulk radiochemical sampling (Gerard Barrels) at sites to be decided and with limited sampling for ^{228}Ra ^{226}Ra ^{228}Th and ^{14}C.

6. To lay up to 8 upper bottom current meter moorings to the SW of Rockall Bank and from the flanks of the mid Atlantic Ridge to the Porcupine Abyssal Plain.

7. To deploy abyssal fish traps where convenient.

8. To make continuous surface chlorophyll and nutrient measurements (via autoanalyser) with emphasis on the Slope Region.

9. To attempt to sample mackerel post larvae via neuston net on both the outward and inward crossings of the Celtic Sea and Slope.

10. To recover the Nab Tower c/m mooring for AEP 2.

11. To take XBT profiles at hourly intervals along selected legs of the cruise track.

12. To take surface Cs samples where required for Mr Jefferies.

NARRATIVE:

CIROLANA sailed from Grimsby at 1708 h 3 June and proceeded to her working area on the Continental Slope of the Celtic Sea. Surface Cs sampling began in the Southern Bight, half-hour neuston tows at 20 mi intervals began at 7°W and on-line chlorophylla, nitrate and HIAC began 50 mi from the Slope.

At 0750 h 6 June CIROLANA began the recovery of the 8-mooring slope c/m array set the previous June, with varying success. By 2000 h 9 June, four of the moorings had been recovered (Nos. 80-02, 80-05, 80-06, 80-08), three were missing, providing no response to the interrogation frequency despite an extensive search of each area (Nos. 80-03, 80-07, 80-09), and one gave a clear response to interrogation and cut commands but refused to rise (80-04). During the period of these attempts two fish trap deployments were made and a grid of neuston stations was worked along the Slope during the hours of darkness. Winds >40 kts and heavy swell forced the ship to dodge during periods of 7 and 8 June.

From 0640 h 10 June an attempt was made to lasso mooring 80-04 in 2870 m water depth by laying a 900 lb anchor weight and creeper close to its a/r signal and circling it twice with 5,000 m + multiplait. Weather conditions were marginal for this attempt however and at 1147 the rope came tight and parted. After searching unsuccessfully for the floating rope until 1450 h, a navigation warning was issued and the ship continued north towards the NEADS-6 c/m mooring. On passage, neuston hauls and on-line fluorometry/chemistry/HIAC were made in the vicinity of the Slope, and surface Cs sampling was completed at 15°W. By 1926 h 14 June, (despite interruption by heavy wind and swell conditions on 12th), the NEADS 6 mooring had been recovered (upper floatation and top c/m missing) and replaced with a conventional upper-bottom rig, a third fish trap deployment had been completed and the CTD, hydro and Gerard Barrel wires had been streamed and stretched back onto their winches.

CIROLANA then ran east to the Porcupine Bank working area. By 0724 h 15 June a short (50 m) array of current meters and thermistors were laid at the "Slope erosion site" identified the previous June, with instruments set for short term high-frequency sampling (1 min sampling for c/m's; 2 min for thermistors). The in situ radium collector (Mn coated fibres packed into a 30 l Niskin) was then tested by suspending the bottle in the near-bottom layer for 3 h and obtaining conventional 30 l samples for ^{226}Ra for comparison.

On completion of these tests at 1130 h CIROLANA began the survey of near-bottom and midwater neph plumes based on a grid of 25 closely-spaced stations along the west slope of Porcupine Bank, using CTD, Sea Mar Tec nephelometer, 1 m Zaneveld transmissometer and with discrete sampling via 1.8 and 30 l Niskins. Particle size distributions were analysed via HIAC both before and after insonifying in an ultrasonic bath, sediment concentrations and SEM samples were obtained by filtering bulk samples through 0.22 µ Nuclepore filters and intercomparisons between the nephelometer and transmissometer were made via successive dips on a cross-slope profile of 5 stations. Neuston hauls were made each night along the Porcupine slope, a core sample was taken from the Slope erosion site and the first trial of the Gerard-Ewing samplers was made via a cast to the bottom in 670 m with wire-load monitored and recorded continuously from the 10-ton load shackle. The short term c/m and thermistor array was also recovered on 18 June after 3d. deployment. The mooring had been trawled out of position and a portion of each record (but no important gear) was lost as a result.

With this phase of the programme successfully completed CIROLANA left Porcupine Bank at 2152 h 18 June and proceeded west to the current meter deployment sites on the eastern flanks of the Mid Atlantic Ridge, with XBT dips every hour on passage. On 19 June in calm conditions the first ^{14}C station was worked at the head of the Porcupine Abyssal Plain using all 5 samplers to obtain samples to 4000 m depth, and with wire load monitored as before. Following a full depth CTD/Transmissometer lowering which provided samples for ^{226}Ra analysis to the bottom (4605 m), the vessel continued to the mooring sites.

Between 1607 h 21 June and 2013 h 22 June, four upper-bottom moorings were laid along a west-east line from the Ridge to the margin of the abyssal plain (with a fourth fish trap recovery on 22 June). CIROLANA then paid an unscheduled visit to the NEA dumpsite where mooring 80-13 was recovered (23 June) before returning to the site of the o/m array on the Celtic Sea slope. Arriving 0515 h 25 June the rope used in the earlier attempt to "lasso" 80-04 was located and recovered, and a further attempt was made to grapple for the mooring without success from 0946 h-2135 h. After a final (unsuccessful) attempt to locate the other moorings which had earlier given no response to interrogation, CIROLANA worked a series of Neuston hauls from the shelf-break to the Western Channel, putting in to Falmouth on 27 June briefly to clear a fouled bow thruster. Neuston stations were continued at intervals to the Isle of Wight where the Nab Tower mooring was recovered by 0619 h 28 June. CIROLANA then sailed for Grimsby, docking at 1515 h 29 June.

RESULTS:

1. Six out of ten long-term moorings were recovered, the majority with full term records; these were processed through VECPLOT aboard ship. The 4 losses on the Slope provided few clues or precedents for this unacceptable loss rate. 3 sites simply gave no response on interrogation; we had met with this before in the loss of 2 moorings NE of the Azores but in the latter case the releases had been continuously deployed for 21 months and their steel had been given faulty heat treatment by the manufacturer. In the present case (and in response to the earlier losses) each release was fitted with a new release mechanism before deployment and had been deployed for 12 months. Deep fishing activity could explain the two losses at the top of the Slope but cannot account for the loss of 80-03 in deep water at the foot of the Slope. In the case of <u>all</u> of the releases recovered this cruise the steel bands securing the body of the release were heavily corroded and drilled-through by holes up to 1" diameter. We have never before seen any degree of corrosion in this component.

   Mooring 80-04 provided different symptoms and was one of <u>three</u> moorings which gave the correct "cut" response and failed initially to rise. In the case of the other two, the moorings "came free" subsequently while the ship remained nearby and were picked up. In these cases the two components of the release latch appear to have "welded" together through corrosion - again the first time we have encountered corrosion in this component, and on one site this was the 4th successive year of deployment. It is assumed that 80-04 suffered a more extreme case of "corrosion welding" in this component, and our attempts to lasso the mooring failed to dislodge it.

   In view of these uncertainties - centred on new forms of corrosion in the releases - the 1981 deployments were reduced in number and scale. The N-6 mooring was replaced with an upper-bottom type mooring rather than full-depth, the plans to lay 3 moorings south of Rockall Bank were abandoned and the 4 moorings laid on the Ridge are in a position to be recovered and relayed on cruise 9/81. To reduce the time loss in doing this mooring 80-13, scheduled for recovery in the autumn was recovered on this cruise.

2. The system for large-volume sampling worked well with only minor modifications necessary for handling the 300 L. samplers. With 4000 m of 12 and 13 mm wire out with 3 barrels in ideal conditions (flat calm with very little swell) the load shackle registered 3.2-3.3 tons with very little increase at the start of hauling (3.4 t). Recovery was kept very slow initially but was increased subsequently in response to the load shackle reading. ^{14}C samples were processed on board without problems and will be analysed at Harwell.

3. Midwater and near-bottom plumes were once again encountered on the Porcupine Slope. The CTD and its logging, processing and plotting routines worked virtually without a hitch and the nephelometer and transmissometer produced records which were stable in time (successive lowerings of the same instrument) and showed the same detailed features in the water column (successive lowerings of the different instruments). There is some suggestion of hysteresis in the Zaneveld record at abyssal depths. Use of the ultrasonic bath together with untreated HIAC processing showed the extent to which the larger particles in the suspended sediment size distribution are composed of flocculated material. HIAC results were logged and processed to provide rapid plots of particle volume and cummulative particle number against phi. A test lowering of the Gerard Barrels on the Slope provided samples for ^{226}Ra ^{228}Ra, while Niskin samples for ^{226}Ra were obtained along a profile of 5 stations.

4. The series of 49 neuston hauls showed mackerel larvae throughout the shelf but not on the Slope or further offshore. Larger post larvae to 35 mm were encountered on the top of Porcupine Bank and in the inner Celtic Sea.

5. A total of 7 Coryphanoides and a few amphipods were obtained from the 4 deployments of the abyssal fish trap.

6. A total of 97 alternating T-4 and T-7 XBT dips were made, restricted to those legs running to and from the mid Atlantic Ridge.

7. The Nab Tower c/m mooring was recovered intact. Analysis of the other short term mooring on Porcupine Bank shows that the rig was trawled out of place and damaged after only 1 day.

The coverage achieved for surface chlorophyll nutrients and Cs is described in the text above.

R R Dickson
14 July 1981

SEEN IN DRAFT: MJW Master
EWP Fishing Skipper

INITIALLED: HWH 6.7.81

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