

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

1983 RESEARCH VESSEL PROGRAMME

REPORT: R V CIROLANA: CRUISE 7

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

STAFF:

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DURATION:

Sailed 1836 GMT 29 June

Docked 1900 GMT 27 July

LOCALITY:

North-east Atlantic

AIMS:

1 To recover the Rockall Bank array of 5 current meter moorings plus the mooring in the gap between the mid Atlantic Ridge and the tail of Rockall Bank.

2 To relay the NEADS 6 mooring and to lay an east-west line of 9 moorings along approx 43-45 N to cover gaps between the Iberia and Porcupine Basins (all upper-bottom type).

3 To deploy and recover a short-term thermistor chain mooring for high-frequency sampling at the slope erosion zone on Porcupine Bank. On recovery this may be substituted by 2 near-bottom VACM moorings for recovery by SMBA in November.

4 To work 3 full-depth 14C 226/228 Ra stations as part of the meridional radiochemistry section, including one in Discovery Gap at 57°N 16°W. Each will be supplemented by a CTD profile with rosette sampling for nutrients.

5 To work up to 6 coring stations for Dr Kershaw.

6 To listen in the SOFAR Channel at the appropriate arrival times for float signals from the COB and IOS 1983 float trials when within range (within 1500 km of launch sites).

7 To work XBT sections in regions of interest including an oversampled grid around the proposed MAFF SOFAR float launch site in the Iberia Abyssal Plain (initialising data for the Harvard REM).

8 To recover the drum used in the NEA dumpsite colonisation experiment and redeploy.

- 9 Fish traps where convenient.
- 10 Tests of satellite-linked search and rescue buoys where convenient.

NARRATIVE: (times are GMT throughout)

After a delay of one tide to permit final weight tests on the ship-board crane, CIROLANA sailed 1836h, 28 June and proceeded to the Porcupine Seabight for acoustic release tests before laying the thermistor chain mooring (83-01) on the slope erosion site west of Porcupine Bank. En route, surface Cs sampling for Mr Jefferies began at 5⁰W and at each 2⁰ of longitude thereafter, and the first leg of the XBT survey was begun at 12⁰W. By 0055h, 3 July the thermistor chain was moored and CIROLANA continued west to begin the recovery of the 5-mooring Rockall Bank Array beginning with the full-depth NEADS-6 mooring. By 2110h 5 July, all 5 moorings had been successfully recovered, the first fishtrap had been deployed and recovered, the Kasten and gravity corers had provided cores (one good, one partial) from the top of the bank, the hydro wire had been stretched, acoustic release tests performed and the NEADS-6 mooring had been relaid (83-02). The vessel then steamed west overnight to recover the remaining current meter mooring in the Mid Atlantic Ridge - Rockall gap which was all aboard by 1028h 6 July.

Returning east, 6000m of 18 and 20mm multiplait was stretched onto the net-drum winch in preparation for Gerard Barrel Work; during this steam east, the generator on the 3rd engine blew, preventing further use for the remainder of the cruise. After laying the 2nd fish trap mooring on 6 July the vessel was forced to dodge for most of the 7th in northerly winds exceeding 40 knots. These conditions moderated sufficiently by evening to permit recovery of the fishtrap and one attempt at a bottom sample using the Kasten corer. On 8 July a CTD lowering with full 301 rosette sampling to the bottom was followed by a double cast of Gerard Barrels for ¹⁴C at the head of the Porcupine Abyssal Plain (AP), completing the first partial station worked there in July 1981. Thereafter XBT coverage was resumed as CIROLANA returned east to Porcupine Bank where the thermistor chain was successfully recovered by 1212h 9 July.

CIROLANA then ran south, with XBT coverage every hour to a station on the Porcupine AP at 47°45'N 16°50'W. After arrival at noon on 10 July the ship remained at this site for the next 2 days, working three deep and two shallow GB casts for ¹⁴C and ²²⁸Ra (separately), laying and recovering the 3rd fishtrap, collecting one core with the gravity corer, and testing 4 acoustic releases on GB cable. During this period, on the evening of 11 July an attempt to work the CTD and 301 resette to the bottom had to be aborted when, with 4000m of wire out and in light conditions of wind and swell the 4 bolts connecting the winch drum to the drive shaft sheared off during the ascent, causing the CTD package to freewheel out. This was quickly brought under control with the band-brake, and with no hauling power on the CTD winch the wire was stoppered-off, cut and recovered on the main trawl winch with no damage to the gear but leaving the CTD cable too short to use. The bottom three Niskin samples which had been triggered before the accident were saved for ²⁰⁶Pb and nutrient analysis.

The station was then abandoned and from 1030h 12 July CIROLANA ran south with hourly XBT's as before to lay the planned moorings across 3 deep gaps in the Azores-Biscay Rise connecting the Iberia and Porcupine AP's. After a detailed topographic survey along the sill connecting the Rise with the North Charcot Seamount, two moorings (83-03 and 83-04) were laid across the second gap between Charcot and Coruna seamounts before returning to the northern gap to lay moorings 83-05 to 83-07 in the main

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deep gaps in the northern sill identified during the topographic survey. During these operations on 14 July and in flat calm conditions the new hydro wire broke without warning 3000m out on the way up during standard acoustic release tests, resulting in the loss of 2 releases and damage to the wire. A/r tests were completed using the GB cable. Returning to Coruna Seamount early on 15 July a good core from its crest was obtained using the gravity corer before beginning work in the 3rd main gap (the Theta Gap) while awaiting the availability of winch repair facilities in La Coruna. Between 1327h 15 July and 1737h 16 July the ship launched and recovered the 4th fishtrap, carried out a full-depth double cast of the Gerard Barrels for ^{228}Ra , conducted further a/r tests on the G-B cable and launched 3 current meter moorings (83-08 to 83-10) across the Gap, to the foot of Galicia Bank. The ship then steamed for La Coruna, docking 2112h, 17 July.

In port the CTD winch was repaired, the HIAB crane was made fully operational and the Irish Observer left the ship. CIROLANA sailed for the Iberia AP at 1200h 19 July but with the loss of the 3rd engine and the loss of about 1 day in waiting to enter La Coruna on Sunday 17th (rather than Friday 15th as planned) to enable winch repairs to take place, it was impracticable to reach the Discovery Gap site at $37^{\circ}\text{N } 16^{\circ}\text{W}$ and emphasis shifted onto providing reliable ^{228}Ra samples at the sites occupied by Dr Gurbutt in October 1982.

During the steam south to the second of these sites, ($40^{\circ}\text{N } 16^{\circ}25'\text{W}$) hourly XBT's were resumed west of Galicia Bank and the spare CTD wire was run onto the winch and stretched.

On pm 20 July this wire was used to lower the WHOI receiver into the SOFAR channel at 1800m to listen for the IOS float signals from the Madeira AP at their expected arrival time. On this occasion the range of 1266km proved too great and only one doubtful signal was received from the 3 floats. Between 0600h and 1140h 21 July the southern ^{228}Ra station was worked in two casts and on the return steam northwards the vessel was stopped to listen for float signals as before but at the reduced range of 1074 km. On this occasion one of the three floats was heard clearly, with one marginal and one undetected.

CIROLANA then continued north to the NEA dumpsite where the third of last year's stations was repeated for ^{228}Ra and where the barrel mooring for Dr Pentreath's colonisation experiment was recovered and relaid by 1144h 23 July. Thereafter the only outstanding work of the cruise was to provide the ^{226}Ra samples from the Porcupine AP site that were uncollected when the CTD winch failed earlier in the cruise. These samples were collected by a CTD+301 rosette cast between 2121h 23 July and 0106h 24 July, and CIROLANA then proceeded to Grimsby, docking 1900h 27 July.

RESULTS:

1. All 6 current meter moorings were recovered, all 15 instruments were in perfect order with free rotors, all data tapes were full and yielded a total of 98.8% good data.
2. The computer processing of these and other records worked flawlessly and was heavily used throughout the cruise. Current meter data were completely processed through VECPLOT within 1-2 days of recovery, much secondary analysis of the data was completed and statistics transmitted to Mr Medler for inclusion in graphics for the IUGG Hamburg meeting in August.

The main results were (a) that the expected seasonal change in eddy kinetic energy was clearly observed across the array. The spectral content of the change and the changes in KE with depth and time are being explored. (b) Mean flows at the head of the Porcupine AP/tail of Rockall Bank were surprisingly vigorous (up to 7 cm s^{-1} in the mean). (c) There appears to be a marked shear in currents at about 2000m depth with mean flows above this depth directed NE into the Rockall Trough and those below this depth turning SW around the tail of the Bank. This result was confirmed in both deployments of this array. (d) The near-bottom mooring laid in the narrow north-south gap between the Mid Atlantic Ridge and Rockall Bank confirmed the interpretation of tracer results from T10 by Claes Rooth (U.Miami) in showing a strong bottom-intensified northward mean flow from the Porcupine AP to the South Iceland Basin. Mean northward flows over one year were 3.3 and 4.9 cm s^{-1} at 4085 and 4269m respectively.

3. A total of 9 upper-bottom current meter moorings were laid at deep gaps in the Azores-Biscay Rise and at NEADS-6 (7th deployment), rather than the 10 moorings that were planned. (a/r losses on wire test).

4. Two new full-depth ^{14}C stations of 17 samples were worked plus one new ^{228}Ra station (9 samples). In addition the ^{228}Ra at the 3 stations worked in October 1982, which had shown poor recoveries through attempting to extract both ^{14}C and ^{228}Ra from the same bulk sample, were completely re-done (29 samples), so that the meridional ^{14}C and ^{228}Ra transects are now in good order. These were supported by 2 CTD dips (new stations), with the full range of conventional nutrients, and with a total of 49 ^{226}Ra samples from either the 301 rosette or Gerard Barrels. With the advent of the crane, bulk radiochemical sampling is now a proven and trouble-free system, with only minor improvements envisaged.

5. The thermistor chain was recovered intact with a full 7 day data tape of 11 thermistors sampled at 2 minute intervals. With good luck it also appeared to provide confirmation of the present hypothesis regarding the cause of slope erosion. The northerly gale which caused the ship to dodge on 7 July was sufficient to draw up water from further down the slope, which was cooler by about 0.25°C than before the storm at the thermistors closest to the bed. Spectral analysis of the records before, during and after the storm showed that this near bed cooling was accompanied by increased high frequency oscillations in temperature over a broad spectral band compared with the pre-storm and post-storm periods, and that during the storm these energetic motions decreased in amplitude up the chain (away from the bed).

6. In the absence of the Rieneck box corer, which performed well last year, results from the Kaston and gravity corers were mixed. The kaston corer did not retain its sample on hauling, and after 2 unsuccessful attempts its use was discontinued. The gravity corer worked well at the 3 stations on which it was used, producing cores of 67, 154, and 167cm in water depths varying from 1339 to 4808 metres.

7. The CTD's and rosette worked well on the 2 stations that the winch problems permitted and the opportunity was taken to test the one CTD against the other during the repeat lowering on the site where the winch failed. However, the criss-crossing wire leads, the difficulty of getting the bulky package outboard and inboard without damage (the Minro davit was bent this cruise), the continued problems with the somewhat underpowered winch and the inconvenience of running-off a complex sequence of water samples on an exposed and often bucking platform all mean that this is by far the least satisfactory aspect of the ship's performance in physical oceanography fieldwork. These problems will continue so long as the port side aft option is retained instead of the

midships starboard scheme for which the ship was designed.

8. At the extreme ranges attempted, the performance of the WHCI receiver in the SOFAR Channel was much as expected and worked satisfactorily.

9. A total of 95 T-7 XBT dips were made on passage with a selection transmitted via the GPM to Bracknell/MOD. Delays through CTD winch problems prevented the working of the CTD grid in the Iberia AP.

10. From the 4 fish trap deployments, one Coryphanoides, abundant large amphipods, a few deep euphausiids, one small unidentified abyssal fish and one apparent abyssal fish postlarva were recovered. In addition, all coelenterates, barnacles and anemones found colonising current meters a/r's and cores were preserved for Dr Pentreath (about 9 specimens). A complete fish trap assembly was left at La Coruna for Dr Cendrero, as arranged.

11. On recovery of the dumpsite barrel mooring, the drum was found to be hung up and suspended off the bottom throughout its deployment rather than unrolling onto the bottom as planned. After modifications the same drum was relaid.

12. Eight 50. surface Caesium samples were taken for Mr Jefferies at the position he specified.

13. Tests of the satellite-linked search and rescue beacon were conducted by ships staff while on station but were abandoned when the beacon sustained damage.

R R Dickson
25 July 1983

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M J Willcock, Master
E D Pearson, Fishing Skipper

INITIALLED: DJG

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