MINISTRY OF AGRICULTURE, FISHERIES AND FOOD

FISHERIES LABORATORY, LOWESTOFT, SUFFOLK, ENGLAND

1983 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA: CRUISE 5

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

STAFF:

D S Woodhead
R J Pentreath (Part a)
P J Kershaw
D J Swift
M B Lovett
I A Huggins
D C Denoon
Ms G C Sills, S Oldham, N Baker — Oxford University (Part a)
P Gueguenia — France (Part b)
Miss S J Gerrell, Miss L M Thurston — (Part b)
K Williams (Part a)

DURATION:

Part (a) 22 April-4 May 1983
Part (b) 4 May -12 May 1983

LOCALITY:

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

AIMS:

1. To collect water samples to be analysed for Technetium-99, Caesium-137, Neptunium-237, Plutonium-238, Plutonium-239/240 and Americium-241. Preliminary chemical treatment of the samples will be made on board. The recording Caesium-137 monitor will be operated continuously throughout the cruise.

2. To sample plankton off Dounreay, Windscale and Cap de la Hague for the determination of radionuclide concentration factors.

3. To work 44 gravity core stations in the northeast Irish Sea to obtain an estimate of the inventories of Plutonium-239/240 and Americium-241. To achieve this objective, long cores ($\sim$1m) will be required at most stations.

4. To determine the feasibility of investigating the stability of the muddy sediments off Windscale using recording piezometers.

5. To obtain cores from hard sand and shell laminated sediments close to the outfall using the vibrocorer.

   Both aims 4 and 5 will require the vessel to be three-point anchored.

6. To obtain about 100 Reineck box cores from two transects close to the Windscale outfall. These will be examined on board to determine the distributions of benthic macrofauna (sieving) and the extent of biological reworking (X-radiography).

NARRATIVE:

CIROLANA sailed from Grimsby at 1127h, 22 April 1983, and proceeded north-about to the Irish Sea. Surface water samples were collected at 7 stations in the North Sea between Grimsby and latitude 61°10'N. A further two surface water samples were taken on a southerly track passing west of the Shetland and Orkney Islands to arrive off Dounreay on the Scottish coast at 0607h on 25 April. Six Tintow net hauls were made to obtain sufficient plankton samples for radionuclide analysis and two surface water samples were taken. CIROLANA then proceeded west to round Cape Wrath at 1616h and make a passage through the Minches and the North Channel, taking a further 7 surface water samples en route, to arrive west of the Isle of Man at 2050h 26 April. Two Reineck cores were obtained and water samples taken from surface, mid-water and bottom for Caesium analysis. Two attempts were made to obtain long sediment cores with the Kaston corer, but both were unsuccessful due to the trigger mechanism failing to operate the trap doors. Eleven gravity core, 1 Reineck core and 3 water sample stations were worked between the Isle of Man and Workington where CIROLANA anchored at 1438h 27 April to change staff. At 2207h 27 April CIROLANA had successfully laid three anchors to provide a very stable working platform off Windscale for 36h. During this period the Oxford group deployed their densitometer and piezometer equipment to study the stability of the seabed sediment and the TV and still camera equipment was laid on the seabed overnight to study the behaviour of the organisms inhabiting the mud bottom. Five long gravity cores were obtained and the Kaston corer, with a modified trigger mechanism, was successfully used to obtain 4 long box cores. At midday on 29 April the three anchors had been recovered and at 1351h the remote recording piezometer had been set in the seabed. During the period 29 April-4 May CIROLANA successfully laid three anchors on 5 occasions to make densitometer, piezometer and photographic studies and to obtain sediment samples from hard sand and laminated shell bottoms with the vibrocorer. Between 29 April and 6 May 49 Reineck core stations, 24 gravity core stations 5 Kaston core stations, 6 Vibrocore stations and 8 water stations were made in Cumbrian coastal waters.

The recovery of the remote recording piezometer on 2 May was only partially successful. The mooring rope fouled the Kort nozzle and the probe was lost although the instrument package including the data-logger were recovered. Further staff changes were made at Workington at 0900h 4 May. On 5 and 6 May a further 25 Reineck core stations, 10 gravity core stations, 2 Kaston core stations, 6 water stations and 2 Tintow net hauls were made. CIROLANA left the vicinity of Windscale at 1917h 6 May and took a southerly passage towards the Soillies, Channel Islands and Cherbourg. En route 14 seawater stations, 2 gravity core stations and 3 Tintow net hauls were made.

CIROLANA docked at Cherbourg 0940h 10 May to disembark Dr Guegueniat and his part-processed seawater samples. CIROLANA sailed from Cherbourg at 1407h 10 May and made an easy passage up the Channel taking 4 water samples and 2 Tintow net hauls en route before docking at Grimsby at 0442h 12 May 1983. The weather was uniformly good throughout the cruise and all the objectives set out in the cruise programme were attempted.

RESULTS:

1. Water samples have been obtained at 17 stations for Technetium-99, Neptunium-237, Plutonium-238, Plutonium 239/240 amd Americium-241 analyses and at 50 stations for Caesium-137 analysis. Partial processing of all the samples has been achieved on board.

2. Moderately good samples of plankton were obtained off Dounreay, in the Northeast Irish Sea and at Cap de la Hague for fission product analysis. Water samples were also taken and part processed on board.

3. 45 sediment cores ranging in length from 13cm-186cm were obtained using Reineck, gravity Kaston and Vibro corers. The much increased length of the cores at most stations means that complete samples of the contaminated sediment layer should have been obtained. The cores have been sub-sampled ready for analysis.

4. The densitometer and piezometer were successfully deployed in the soft mud off Windscale and the preliminary results indicate that the equipment operated satisfactorily. The remote recording piezometer operated well, but redesign might be necessary to facilitate recovery of the equipment.

5. The vibrocorer successfully obtained long cores from hard sand and laminated shell sediments close to the effluent outfall.

6. One long gravity core ($2\frac{1}{2}$m), three Kaston box cores ($\sim 1\frac{1}{2}$m), three vibrocores ($\sim 1\frac{1}{2}$m) and six Reineck box cores were collected and processed on board. The vibrocorer provided relatively undisturbed (as shown by x-radiographs), long cores at locations of high radioactivity in surface sediments where previous efforts had yielded no more than 40cm. The Kaston corer was successfully used for the first time and provided large volume samples, although the surface layer of the core is poorly preserved in very soft sediment. The Reineck box corer provided samples with well-preserved surface layers for geochemical analysis. Resin casts of the surface were made to examine the distribution of burrows and these, in conjunction with x-radiographs have revealed sedimentary and biologically-generated structure in, otherwise, apparently homogeneous sediments. Detailed sub-sampling of burrow structures was made to determine the distribution of radioactivity.

   The Reineck box core transects were successfully completed and an adequate number of samples were obtained at each station. The organisms retained after sieving the sediment through 2mm mesh were collected and preserved for examination in the laboratory. Measurements and photographs of burrow structures and other features of interest were made. A large number of the echiuroid Maxmulleria lankesteri were collected and preserved. Some animals were disected to obtain tissue and faecal samples for Pu analysis.

7. Dry cloth collectors of air-borne particulates were installed at 3 positions on the vessel throughout the cruise and the results can be compared with those obtained from a mechanical, high volume air filter.

   The recording Caesium-137 monitor operated well throughout the cruise.

The early indications are that all the major objectives of the cruise have been achieved.

D S Woodhead
11 May 1983

APPROVED:

HWH
4 March 1983

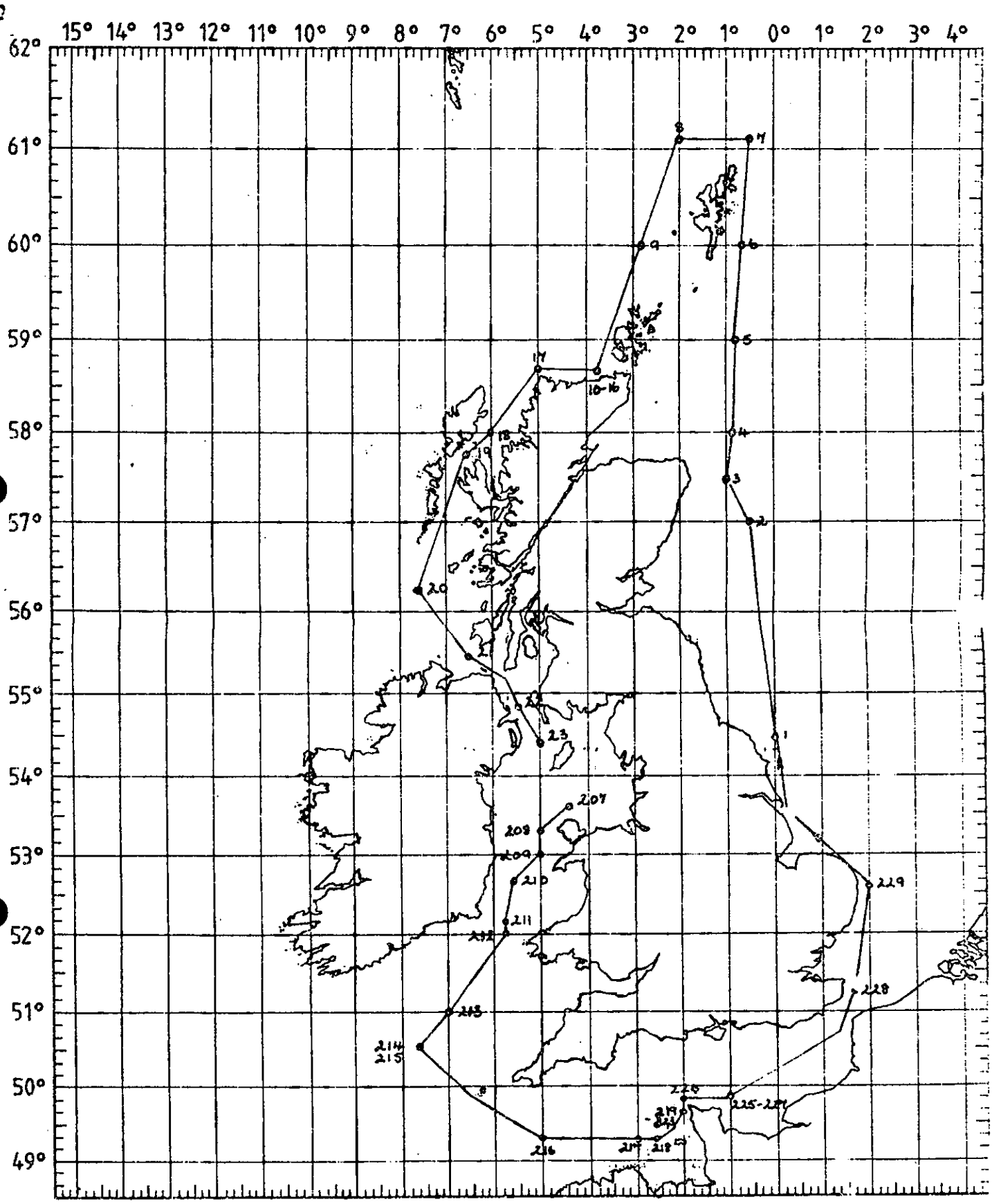
SEEN IN DRAFT:

M J Willcock Master
E W Pearson Fishing Skipper

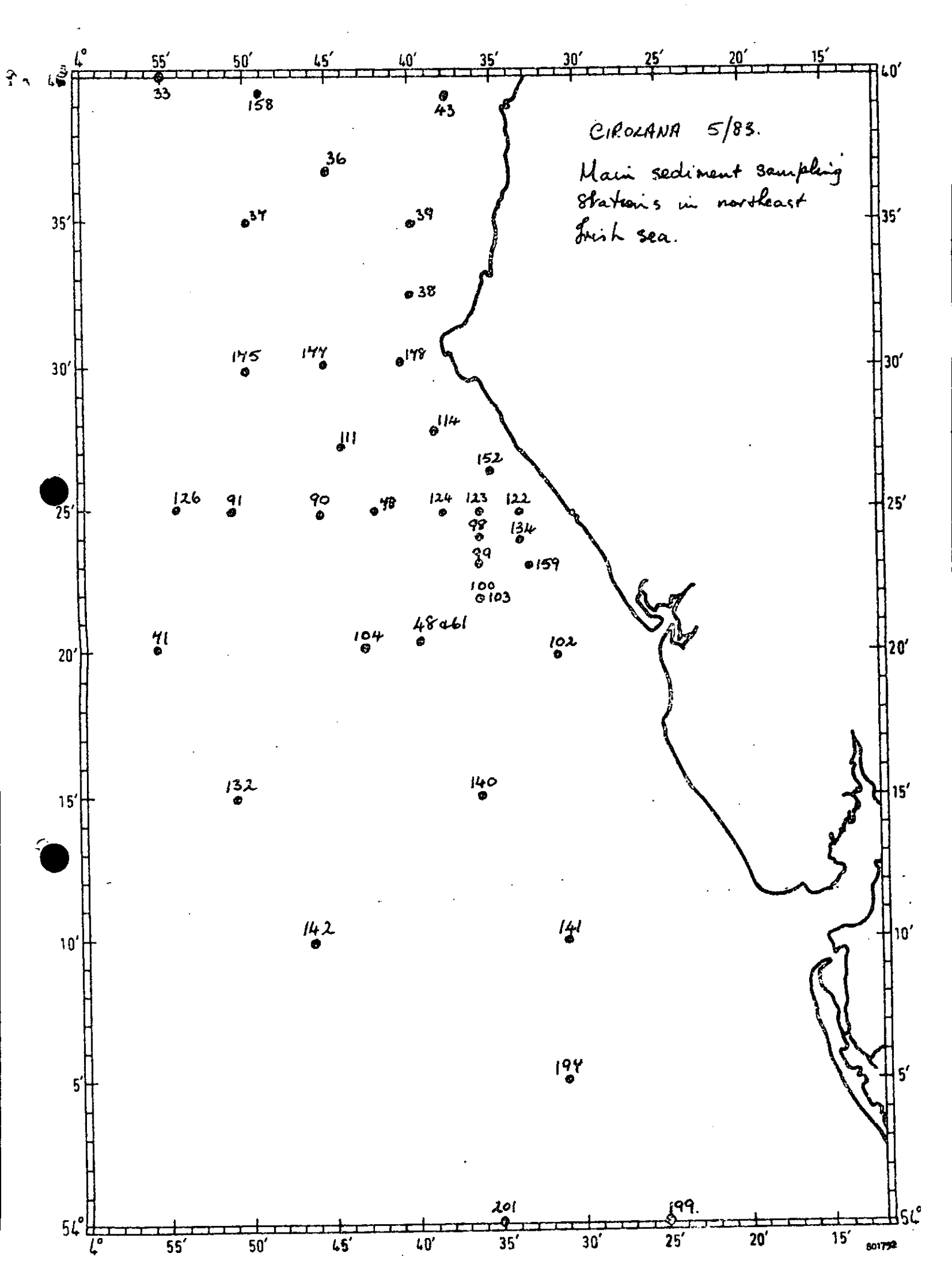
DISTRIBUTION:

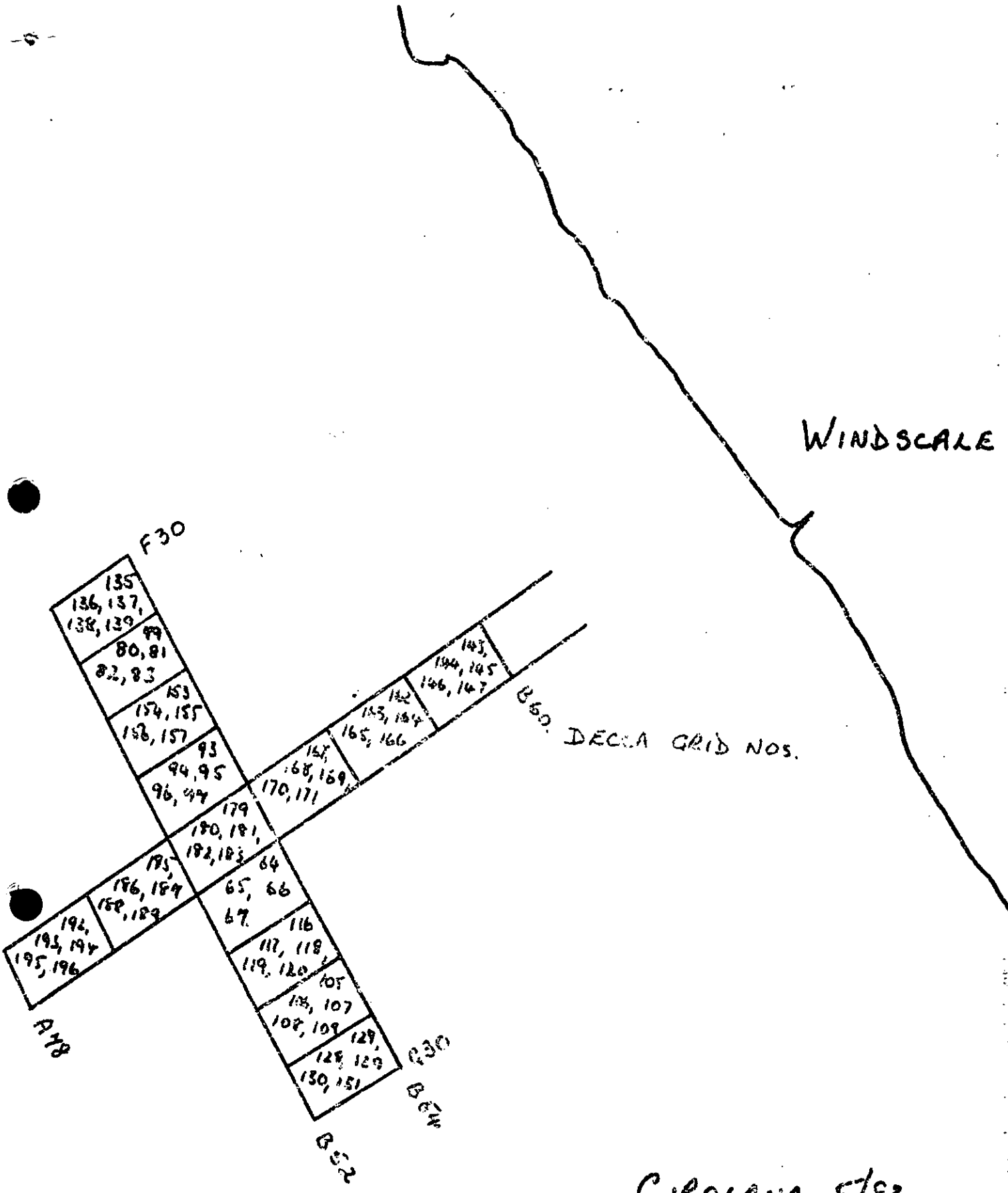
Basic +

D S Woodhead
R J Pentreath
P J Kershaw
D J Swift
M B Lovett
I A Huggins
D C Denoon
Ms G C Sills
S Oldham
N Baker
P Gueguéniat
Miss S J Gerrell
Miss L M Thurston
K Williams



CIROLANA 5/83. Main water sampling stations on outward and return tracks.


CIROLANA 5/83.
Main sediment sampling
stations in northeast
Irish Sea.
4° 55′ 50′ 45′ 40′ 35′ 30′ 25′ 20′ 15′
54° 55′ 50′ 45′ 40′ 35′ 30′ 25′ 20′ 15′
33
158
43
36
37
39
38
175
177
178
114
111
152
126
91
90
48
124
123
122
98
134
89
159
100
103
48 & 61
41
104
102
132
140
142
141
194
201
199.
801792



CIROLANA 5/83.

Transects of Rhinack caves for the biological survey.