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

1977 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA: CRUISE 10
(PROVISIONAL: Not to be quoted without prior reference to the author)

STAFF

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DURATION

Left Grimsby 0930 h 20 September
Arrived Grimsby 0830 h 4 October

LOCALITY

British Isles coastal waters.

AIMS

1. To continue the examination of the distribution of Caesium-134, Caesium-137, Plutonium-238, Plutonium-239/240 and Americium-241 in seawater of the Irish Sea and its approaches.

2. To collect and weigh the total suspended load in seawater at selected stations.

3. To collect grab and/or core samples of the seabed in the Irish Sea and off the west and north coast of Scotland.

4. To record the gamma count rate, in a selected energy range, from surface seawater of the Irish Sea and at depth in the vicinity of B.N.F.L. Windscale.

NARRATIVE

RV CIROLANA sailed from Grimsby on the morning tide of 20 September and proceeded south to the Irish Sea. At 23 stations between Grimsby and the entrance to the Irish Sea (see chart), 50 litre samples of seawater were collected and processed on board for later analysis of the 137 Cs and 134 Cs concentrations. At one station in the North Sea and one in the Celtic Sea 100 litre samples of seawater were collected and filtered through 0.22 μm membrane filters for the determination of 238 Pu, 239/240 Pu and 241 Am in both the "dissolved" and "particulate" fractions. In addition large volume samples were also taken for A.N.L. for the determination, after initial preparation on board, of the relative amounts of Plutonium-IV and Plutonium-VI oxidation states in seawater. Seawater sampling on a 77 station grid in the Irish Sea (see chart) commenced on a line of stations from Fishguard to Rosslare at 1630 h 23 September and was finally completed at 1630 h 29 September. At all stations water was collected and processed for radiocaesium analyses and at 16 stations for Plutonium and Americium

determinations. At all stations where Pu was to be determined and at 10 other locations seawater samples were filtered through weighed membrane filter papers, of pore size 0.22 μm. for the determination of the suspended load.

Day grab samples of seabed were obtained at 56 selected stations. At 4 stations 2" diameter cores were obtained by the use of a 1m barrel corer without use of a sphincter and at 9 stations 4" diameter cores were obtained by use of the Reineck box corer. At 5 of the latter stations, within 30 miles of BNFL Windscale, two cores from each station were sectioned on board into 5 cm sections and processed, by squeezing under pressure, to remove the interstitial water for later radioactivity analyses of both the solid and liquid phases. The solid phase will be analysed by gamma spectrometry using a Ge (li) detector, and alpha spectrometry, following chemical separation, for the determination of Pu radionuclides. The liquid phase will be analysed by ANL techniques for the examination of the fractionation of Pu-IV and Pu-VI. Their distribution with depth will be examined and a comparison made with bulk seawater above the seawater-seabed interface. Duplicate core samples were retained, frozen on board, for later determinations of the distribution, in finer detail, in the surface layer, of radionuclides discharged from Windscale. A recording was made of the gamma count rate, in the energy range 0.6 MeV-0.7MeV, from surface seawater, from the clean salt water supply, passing continuously over a 3" x 3" NaI crystal coupled to a gamma spectrometer. Maximum count rates, some 12 times the Atlantic water type background were obtained in an area just north of the Windscale pipeline discharge point. Because of the increase in wind speeds to gale force from the south west the aim of measuring the gamma count rate at depth in the Windscale vicinity, using the FRL developed gamma probe, had to be abandoned on 28 September and CIROLANA proceeded toward the North Channel completing the water and sea bed sampling grid. Northwesterly gale force winds on the night of 29 September prevented CIROLANA from proceeding directly out of the North Channel and the opportunity was taken to collect additional water samples whilst "dodging" in the Clyde.

Continuing gale to severe gale force winds caused 3 stations, planned for the area some 60 miles out into the Atlantic West of Scotland, to be abandoned and CIROLANA proceeded direct to the Minches sampling water for radiocaesium and at selected stations for plutonium. At one station in the North Minch, samples of sea bed mud were obtained by the Day Grab and a $>$ 80 cm core by use of the 1m barrel corer for radioactivity analyses for comparison with those obtained within the Irish Sea. CIROLANA moved north out of the Minch during the morning of 1 October to work a grid of 15 stations from the Butt of Lewis to Fair Isle but was again forced to "dodge" in severe gale force winds. By early morning on 2 October the wind had abated and a modified 9 station grid was worked to Fair Isle abandoning 10 of the originally planned stations including one in the immediate vicinity of DERE Dounreay where it had been hoped to obtain a core of the sea bed using the Reineck box corer. In improving weather conditions a further 15 stations were worked between Fair Isle and Grimsby.

CIROLANA docked at 0830 h 4 October.

RESULTS

All the aims of the cruise in relation to the collection of sea bed and seawater samples for subsequent plutonium analyses were completed except for the collection of one seabed core and/or grab sample off Dounreay. All the aims in relation to the determination of the distribution of radiocaesium in British coastal waters were completed although a minor modification had to be made to the programme off the west and north coasts of Scotland. Sufficient

volumes of interstitial water were obtained by squeezing two cores from each of 5 stations in the immediate Windscale vicinity for the determination of the oxidation states of plutonium. The data will also be used to compare the 238 Pu: 239/240 Pu in both the solid and liquid phases down the column. Although the towed sub-surface gamma probe could not be tested the surface probe gave good results in the sea area between the Isle of Man and the Cumberland coast.

D F Jefferies
10 October 1977

SEEN IN DRAFT: T H Finn

INITIALLED: AJL

DISTRIBUTION:

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60
50
10°
0°

55°
54°
53°
52°
6°
5°
4°
3°