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RV CORELLA

Report for cruise 18(a)/18(b)/1969

Staff

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Duration

25 November-4 December

Aims

1. To continue the examination of the budget of artificial radionuclides in the Irish Sea.

2. To collect seawater samples at selected stations for trace element analysis.

3. To obtain a large volume of seawater from the vicinity of UKAEA Windscale for an IAEA intercalibration exercise.

4. Collection of seawater samples at Stations in the North Sea, English Channel and Bristol Channel to determine concentrations of caesium-137 and strontium-90 derived from nuclear weapon-test fallout.

5. To conduct total gamma counting above the sea surface using sodium iodide detectors in order to assess the usefulness of the method in discriminating between background and discharge situations.

6. Collection on behalf of Dr D R Robertson (Battelle Pacific Northwest Laboratory) of surface water samples from representative stations in United Kingdom coastal waters for trace element analysis by neutron activation.

Narrative

CORELLA sailed from Lowestoft on the morning tide of 25 November. 50-litre surface seawater samples were collected, for analysis of caesium-137 and strontium-90, derived from nuclear weapon-test fallout, at 5 stations in the North Sea, the English Channel and the Bristol Channel en route to the Irish Sea. In addition 1-litre seawater samples were taken for trace element analysis by the Fisheries Radiobiological Laboratory and 100 ml seawater samples for Dr D R Robertson for trace element analysis using neutron activation techniques.

The sampling programme in the Irish Sea commenced at 1415 hours, 27 November at a line of stations from Fishguard to Rosslare. Seawater samples were taken at surface, midwater and bottom, filtered through 0.22 /um membrano filters and bulked for gamma spectrometric analysis for each station at the Fisheries Radiobiological Laboratory. A 25-litre bulk sample was passed through a KCFC (potassium cobalt ferrocyanide) ion exchange column for selective extraction of the caesium radionuclides, and a 1-litre sample was retained from each depth for trace element analysis. Salinity samples were taken.

Work had to be abandoned at 2200 hours due to worsening weather conditions and CORELLA dodged at a position approximately 10 miles SW of the Arklow light vessel. On the morning of 28 November CORELLA stood by the SS WESTMORELAND off Tuskar Rock and prepared to give assistance if required while the Rosslare lifeboat took off a sick person requiring medical attention.

With strong to gale force winds, CORELLA steamed north along the coast and a further 6 stations were worked until 0900 hours, 29 November, when northerly gale force winds forced the temporary abandonment of the programme.

Sampling was again possible at 1700 hours and 7 stations were worked to the west of the Isle of Man up to the North Channel. The current meter rig laid at the Calfman (54°04'N 4°59'W) by the ERNEST HOLT(Cruise 10/69) was observed to be flashing while CORELLA was en passage.

Upon completion of work in the North Channel CORELLA then sailed to the Cumberland coast to a position in the near vicinity of the discharge point for radioactive effluent from the UKAEA Windscale. One of the main aims of the cruise was to collect a large colume of seawater for an IAEA intercalibration exercise. 1000 litres of seawater were collected, filtered through 0.45 /um membrane filters, homogenized and sub-sampled into 200 x 5 litre containers for distribution via the International Atomic Energy's Monaco laboratory to a number of national laboratories. A further 2000 litres were collected, filtered and subdivided amongst a variety of containers (high and low density polythene, polypropylene and PVC) for subsequent analysis at the Fisheries Radiobiological Laboratory to check the stability in seawater of selected fission product radionuclides. This work was completed at anchor in the shelter of Ramsey Bay.

The examination of the budget of artificial radionuclides in the Irish Sea was continued at 0800 hours, 2 December by sampling seawater, suspended matter and bottom sediment at a station at the Point of Ayre. The work at the station had to be interrupted when a Mayday call was received from a small vessel, the HEATHER BELLE, whose steering gear had failed at a position on the west of the Isle of Man. CORELLA steamed to assist but broke off when HEATHER BELLE was seen to be in the tow of another vessel.

CORELLA continued sampling at a grid of 24 stations between the Solway Firth and Liverpool Bay. Bottom sediment was taken in a modified Van Veen grab and at selected stations by a gravity corer for examination of the depth distribution of radionuclides.

Continuous total gamma counts were recorded during the period spent in the north-east Irish Sea using a 3" x 3" NaI (Tl) crystal suspended from the "A" frame and linked to a gamma spectrometer.

Small samples of plaice and thornback rays were taken in the vicinity of Windscale in order to determine the flesh radionuclide content.

CORELLA docked at Liverpool on the afternoon of 4 December.

Results

All the main aims were completed although the sampling grid in the Irish Sea had to be reduced because of weather conditions.

Shipboard chemistry demonstrated that a 6-column ion exchange system

could be worked satisfactorily in the ship's laboratory.

Although the gravity corer was able to make good penetration of the seabed, visual examination showed that there is considerable disturbance of the upper layers of the sediment. This may preclude the use of this device in examining the top 10 cm layer of soft mud areas where more than 90 per cent of the radioactivity is retained.

Results of total gamma counting demonstrated that with an improvement in background reduction this method can be a useful tool for tracing radionuclides in the immediate vicinity of Windscale. A very sharp increase in count rate was observed within a $\frac{1}{4}$ mile of the Windscale outfall. An energy scan demonstrated the main components to be caesium-137, ruthenium-106 and ziconium-95/niobium-95. When the seawater samples have been analysed it is hoped that a relationship can be established between radioactivity levels and total gamma counts.

CORELLA again proved to be an ideal vessel for the type of work conducted by the Fisheries Radiobiological Laboratory.

D F Jefferies
12 December 1969

Seen in draft: WC
CNS

Initialled: AJL

Distribution:

Basic list plus the following:-
H J Dunster (AHSB, Harwell)
H Howells (UKAEA, Windscale)
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P Kelly (MinTech)
Dr R Fukai (Monaco)
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