

IN CONFIDENCE: Not to be quoted without reference to the Laboratory.

CRUISE REPORT

FRV "MARA"

12-21 March 1975

Objectives

1. Hydro-chemical survey.
2. Grab sampling in selected areas.
3. Water samples for particulate matter.
4. Zooplankton sampling.
5. The placing of experimental live boxes containing queens and oysters.
6. Sampling for Institute of Geology, University of Edinburgh.

Narrative

The commencement of the cruise was delayed for two days while the "Mara" underwent emergency repairs. The ship sailed from Buckie on the afternoon of 12 March and arrived at Methil before noon the next day and work commenced immediately. The ship was based on Methil and use was made of the store in Kirkcaldy kindly put at our disposal by Mr Eric Parkinson of the Forth River Purification Board. Due to the late start it was impossible to do hydro-chemical surveys at neap and spring tides and it was only feasible to do one survey. This apart all objectives were accomplished in good conditions and completed by 20 March. The "Mara" then sailed for Buckie and unloading took place on Monday, 24 March.

Results

Temperatures lay between 5.2° and 5.6°C, showing little variation throughout the Firth except along the southern coastline. There was no stratification. Salinity values showed a similar pattern east of Kinghorn, with salinities varying between 33.9‰ in the centre and northern parts of the Firth but falling to 32.8‰ in the south. The region between Kinghorn/Leith and the Bridges is clearly the main mixing area of the river outflow and estuarine waters. The lower temperatures and salinities to the south, and particularly in Aberlady Bay, appear to be the result of local rivers' outflow.

**Chemistry:** Depth profiles of samples for nutrient determination were obtained from 29 stations with a number of the stations repeated.

**Silicate:** The middle of the Firth produced silicate values  $\sim 9 \mu\text{g at/L}$  with high values along both shores and in all areas west of Kinghorn. The southern shore gave values  $\sim 12 \mu\text{g at/L}$  and were higher and more extensive than the northern shore. The highest values of all ( $13 - 15 \mu\text{g at/L}$ ) were west of Kinghorn.

**Phosphate:** The distribution of phosphate was similar to that of silicate with concentrations of  $2 \mu\text{g at/L}$  west of Kinghorn. Values of  $4 \mu\text{g at/L}$  were found, however, immediately east of Edinburgh.

Ammonia: The minimum ammonia concentration was less than 1  $\mu\text{g at/L}$  at the eastern end of the survey. The values rose both shorewards and westwards, rising to 1-2  $\mu\text{g at/L}$  on the north side, 2-6  $\mu\text{g at/L}$  to the south and 5-8  $\mu\text{g at/L}$  west of Kinghorn.

Nitrate: The distribution of nitrate was more uniform with concentrations of the order 8-10  $\mu\text{g at/L}$ . Higher values (11-14  $\mu\text{g at/L}$ ) were, however, found east of Edinburgh.

Geological report: Aliquots of water and sediment grab samples were obtained during the hydro-chemical survey. 206 samples were filtered for total suspended load and particulate chemistry. 8 cores were retrieved for geochemical analysis.

Preliminary analysis of total suspended load data indicates that TSL ranged from 1.0 mg/L to 34.0 mg/L. Highest average loads ( $\approx$  10-15 mg/L) were present west of Kinghorn with pronounced resuspension phenomena in the deeper stations in the area. Lower TSL values (1-3 mg/L) were typical of the eastern stations with little evidence of resuspension. The data would indicate the deflection of river and effluent waters along the south shore and the suggestion of sea water dominated particulates in the north-east area of the Forth is substantiated by preliminary chemical analysis.

The Geological report was prepared by G Holmes of the Institute of Geology, University of Edinburgh.

J H A MARTIN  
26 June 1975

Seen in draft by W T Mair.