

R1/12

Not to be cited without prior reference to the Laboratory

FRV *Scotia*

4pt2SR90

Cruise 4/90 Part 2

REPORT

1-11 May 1990

Personnel

| | |
|------------------|-----------------|
| A McIntosh | HSO (in charge) |
| R Stagg | PSO |
| D Moore | SSO |
| J Rusin | SO |
| S Forsyth | ASO |
| P Mackie | TRS |
| P Simpson (Miss) | TRS |

Objectives

1. To investigate the distribution of hydrocarbons in sediments at the Argyll, Duncan and Innes developments prior to their abandonment and to provide a baseline for subsequent sea bed recovery monitoring.
2. To investigate the distribution of hydrocarbons in sediments in the Fulmar/Auk development area and to assess the physiological and biochemical status of fish along a gradient from the production facilities to open sea "clean" areas.
3. To investigate the distribution of hydrocarbons in sediments and fish along a gradient from the Fulmar field to the Firth of Forth.
4. To investigate the distribution of sediment hydrocarbons at selected sites in the Forth estuary and up to the Bridges.
5. To obtain sediment and fish samples from the Kingston Hudds ground.
6. To obtain fish samples from one of the Lothian sewage disposal grounds following up the physiological and biochemical studies initiated last year.

Narrative

Scotia departed from Aberdeen at 2000 on 1 May and after some final engine checks by GEC made uninterrupted passage to the Fulmar oilfield.

Over the next 72 hours a comprehensive sampling programme around the Fulmar, Clyde and Auk oilfields was undertaken, providing fish from trawls and traps for physiological and biochemical analysis, and sediment samples for hydrocarbon analysis.

Scotia left this area on the morning of 6 May and headed for the Argyll oilfield area where, over the ensuing 24 hours, 109 stations were occupied to provide samples for hydrocarbon analysis.

On completion of this work, trawls were taken at intervals from the Auk field on passage into the Firth of Forth where sediment sampling at nine sites by grab and corer was undertaken during 10 May.

A further three trawls were completed by 1530 on 11 May when passage was made for Aberdeen where *Scotia* docked at 1900.

Results

The programme in the Fulmar/Auk/Clyde area covered 163 sites where sediment samples were obtained by grab. These samples were taken for total and detailed hydrocarbon analyses and, at selected stations, for heterotrophic mineralisation studies.

At the Argyll area, 109 stations were occupied providing samples by grab and corer for total and detailed hydrocarbon analyses and selected heterotrophic mineralisation studies.

Sampling in the Firth of Forth provided sediments from nine stations obtained by grab and corer for total and detailed hydrocarbon analyses and heterotrophic mineralisation studies.

The samples taken for heterotrophic mineralisation studies were partially worked up at sea, the remainder of the work to be carried out in the Laboratory. All sediment samples for hydrocarbon concentration were stored frozen for subsequent analysis in the Laboratory. The initial analysis by UV fluorescence from both the Argyll and Fulmar areas indicated levels of hydrocarbons in surface sediments consistent with the development of multi-well sites where oil-based muds have been employed and the greatly elevated hydrocarbon contamination, above a background of 15-20 ug/g, does not extend beyond an 800 m radius from the point source (Figs. 1 and 2).

Representative samples of fish species from successful trawls were processed on board to provide material for taste panel assessment for taint, and muscle and liver for hydrocarbon analyses, and tissue for physiological and biochemical measurements. Some liver tissue measurements of mixed function oxidase (MFO) activity were performed at sea, the other analyses to be completed in the Laboratory.

Induction of cytochrome P450 dependent monooxygenases (also known as the mixed function oxidases MFO system) is generally considered to represent a sensitive early warning system for the detection of deleterious effects of certain classes of chemicals (eg polycyclic aromatic hydrocarbons) present in the environment. Induction of MFO in dab (*Limanda limanda*) was measured in liver using ethoxyresorufin O-deethylase (EROD) and cyanoethoxycoumarin O-deethylase (cyanoECOD) as substrates at three sites along a westerly gradient from the Auk field and a correlation was demonstrated between induction and distance from contaminant source (Fig. 3).

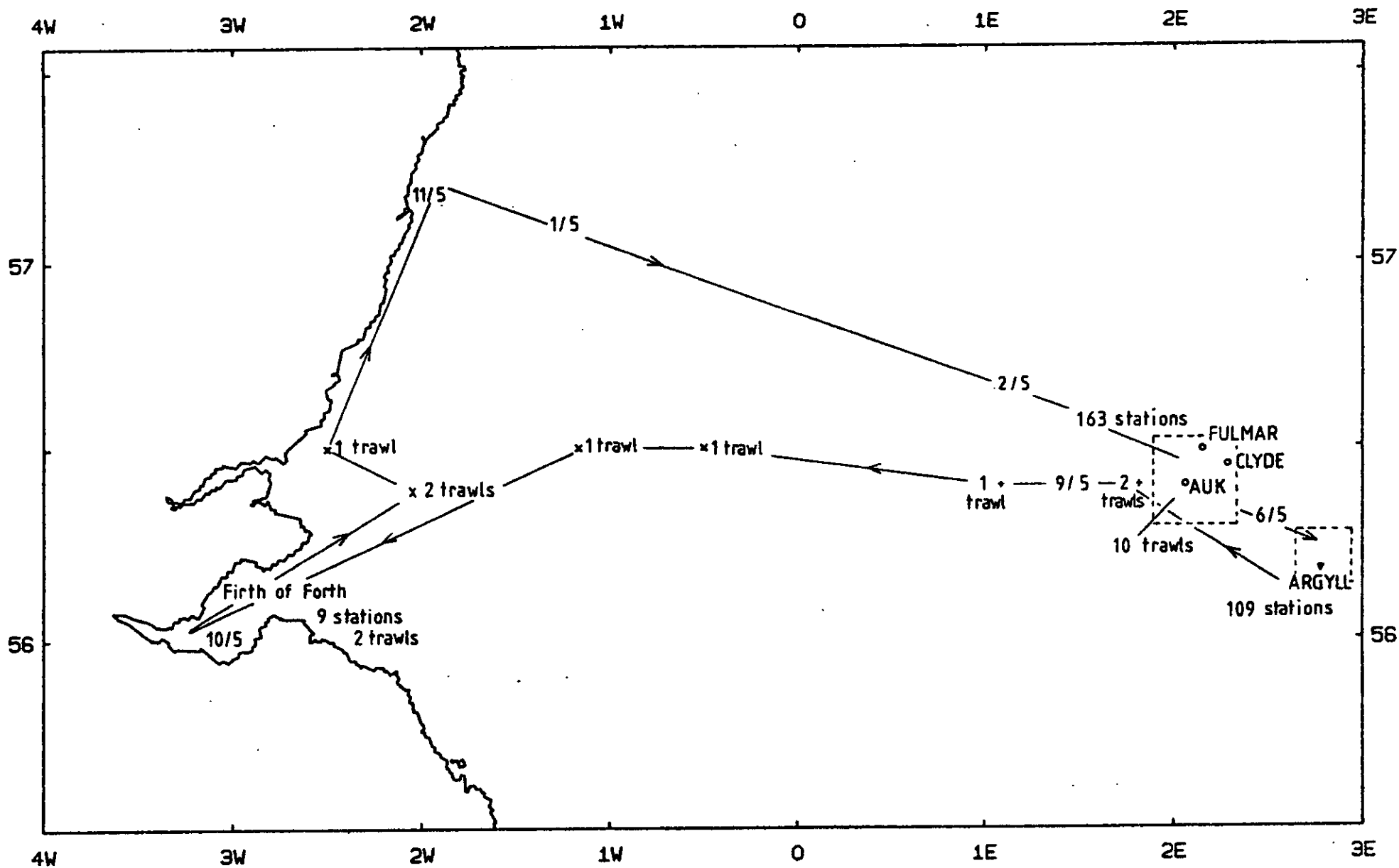
Obtaining suitable and sufficient fish samples from close to oil platforms remains a problem to overcome. The fish traps were partially successful in that they caught round fish, but not flatfish, but the principle is encouraging and should be pursued.

The accurate position fixing facilitated by the PULSE 8 system fully justified its use and its capabilities were fully utilised by the ship's officers in achieving and maintaining the prescribed positions during the sampling programme.

All objectives in this programme were completed successfully due to very good weather prevailing throughout the cruise and to the excellent cooperation and enthusiasm of the master and crew of *Scotia*.

A McIntosh
12 February 1991

TRACK CHART - SCOTIA 4pt2Sc90



Scotia 1 - 11/5/90

4pt2Sc90

Fig. 1

ARGYLL SAMPLING AREA - MAY '90

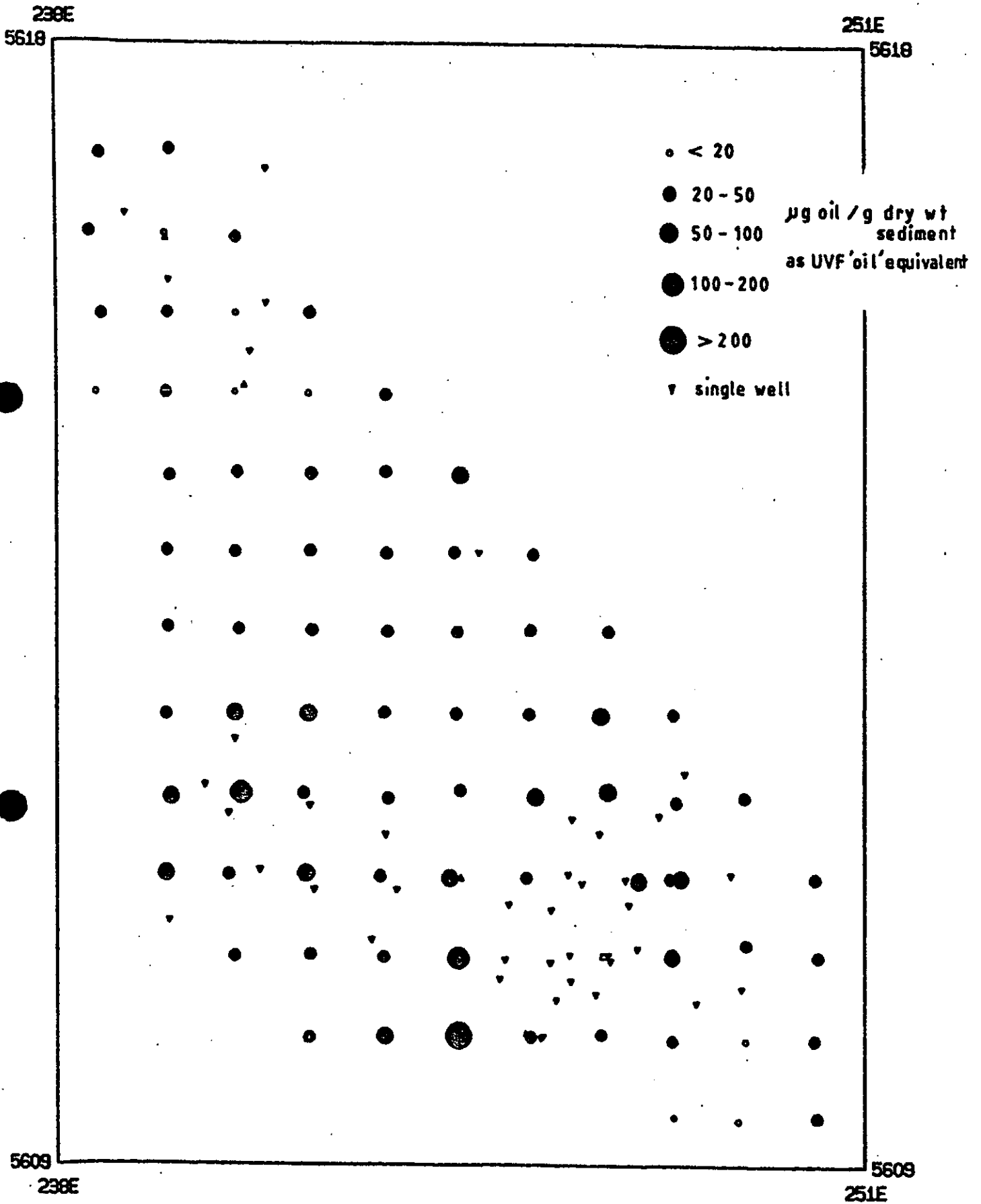
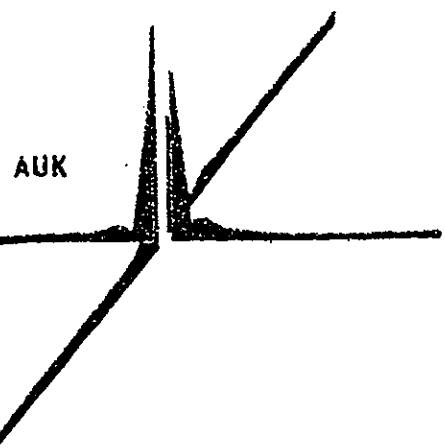
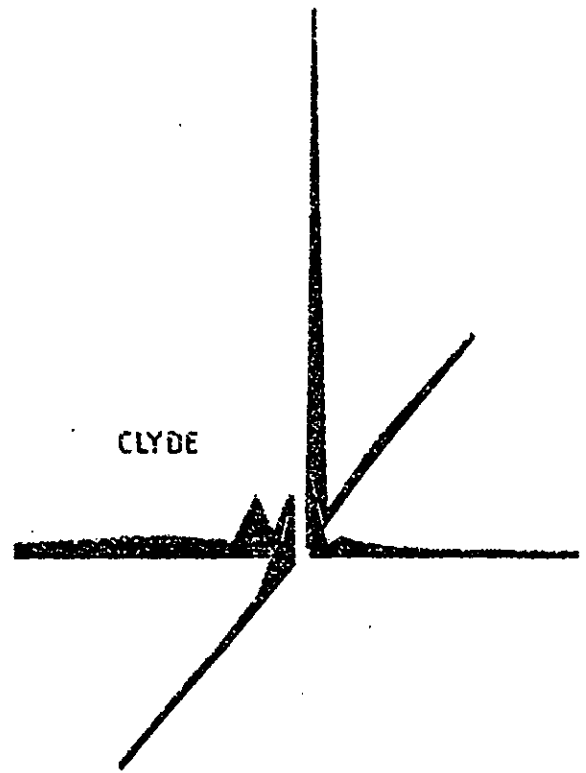
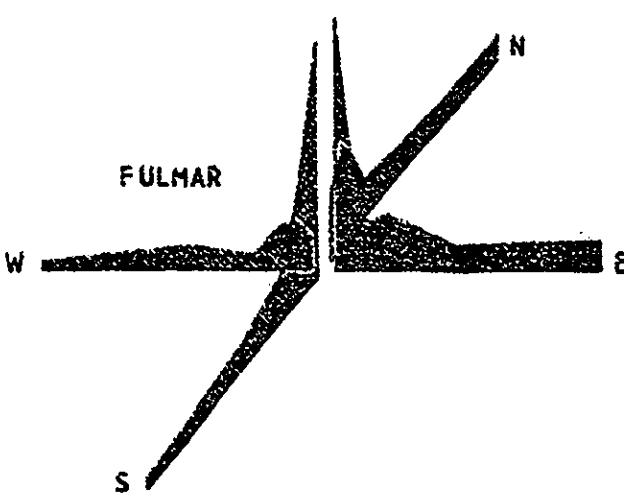
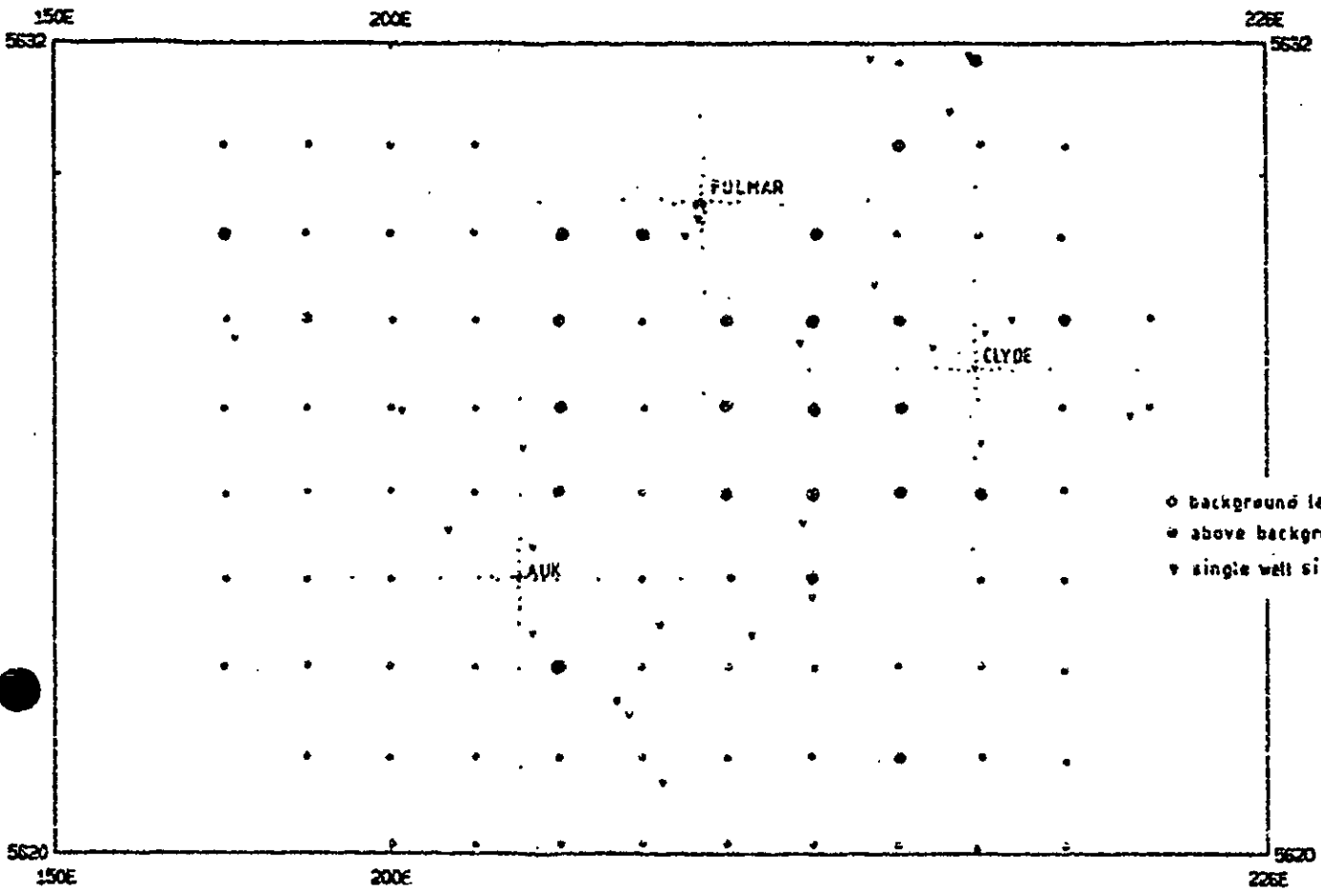
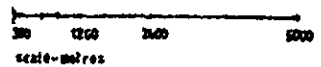


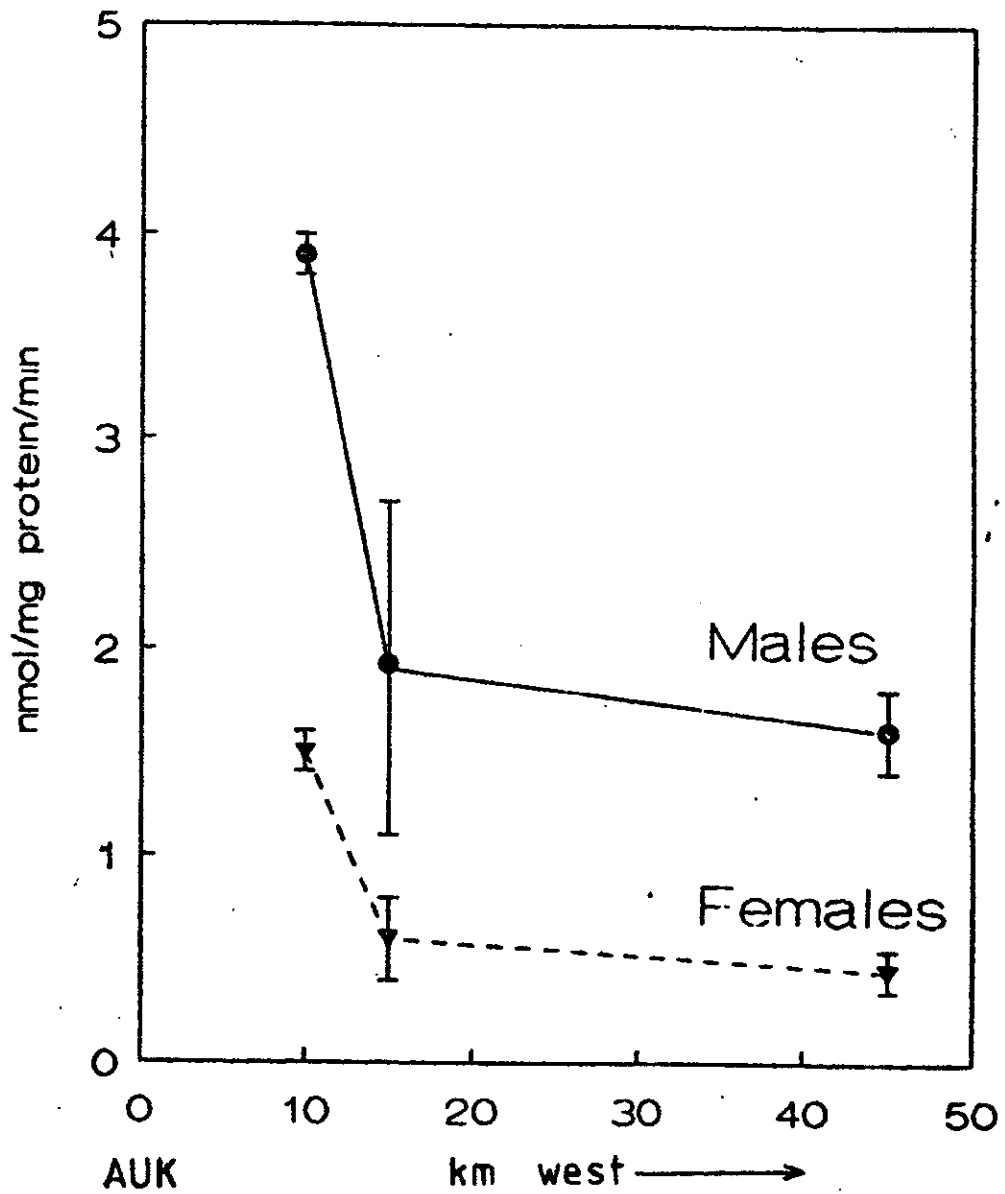
Fig. 2

FULMAR, AUK, CLYDE SAMPLING AREA - MAY '90



100ppb dry wt sediment
as UVF oil equivalents





**Hepatic microsomal MFO activity
in *Limanda limanda***

**using Ethoxyresorufin-O-deethylase (EROD)
as substrate**