MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
FISHERIES LABORATORY, LOWESTOFT, SUFFOLK, NR33 0HT, ENGLAND

1994 RESEARCH VESSEL PROGRAMME

REPORT : RV CORYSTES : CRUISE 13/94

STAFF:

Dr J Brown (SIC)
Mrs A Reeve
Mr J Read
Mr A Young
Mr S Jones (4-17 Nov)
Mr C Quartley (Valeport) (24-27 Oct)
Mr L Fernand
Ms L Howell (24 Oct-4 Nov)
Mr A Harrison (POL) (27-30 Oct)
Mr J Lawrence (24 Oct-4 Nov)
Mr K Medler (4-17 Nov)

POL - Proudman Oceanographic Laboratory.

DURATION:

24 October - 17 November.

LOCALITY:

Irish Sea, North Channel and Malin Shelf.

AIMS:

The work is directed at a better understanding of the dynamics of the North Channel which control the flushing characteristics of the Irish Sea. Net outflow from the Irish Sea is northward, but there are apparently long periods of inflow on the western side of the channel. It is not known to what extent outflowing water recirculates and extends southward along the Irish coast or what importance inflows of Atlantic water have on flushing characteristics of the region. Variability in the flow regime and factors governing it are poorly understood. The main sampling aims of the cruise were:

1. To recover mooring arrays in the North Channel and western Irish Sea.
2. Deploy and retrieve free floating ARGOS buoys in the North Channel and western Irish Sea in order to determine the Lagrangian circulation.
3. Undertake physical surveys of the region in support of 1) and 2).
4. Perform trials of the new Valeport, MAFF sponsored, U-Tow.
5. Lay a short period (1 - 2 weeks) mooring at a site currently occupied, in order to evaluate the performance of the new Valeport BFM308 current meter in a comparison with an Aanderaa current meter.
6. Conduct a test deployment of a NAS 2 nitrate analyser on the same mooring as the Valeport.
7. Recover POL ADCP and perform a 12 hour trial of a second ADCP in the North Channel.

NARRATIVE (all times are GMT; See Fig. 1 for cruise track):

RV Corystes sailed at 23:00 (24 October), passing through the English Channel to the Irish Sea, a strong head wind and sea curtailing speed to 8 knots. By mid-afternoon of 25 October the weather had eased sufficiently to begin a series of test tows with the Valeport U-Tow, interspersed with Continuous Plankton Recorder (CPR) tows. Testing continued until midday 26 October, during which a variety of tow profiles and speeds were tried. Also en route, the SCANFISH cable was reterminated as a length had been crushed by the aft gantry.

It was intended that Mr Quartley be exchanged for Mr Harrison in Holyhead, but a stiff northerly wind made Douglas the only viable option. Transfer was completed by 16:00 (26 October) and followed by a line of 5 CTD's across the western Irish Sea and the deployment of two ARGOS buoys (Figs. 2 and 3). During the following 3 days, work was concentrated in the North Channel and included: the recovery of the POL ADCP; a 12 hour test deployment of a second POL ADCP; transects of discrete CTD's; the deployments of two ARGOS buoys; the recovery of one MAFF mooring (Fig. 4 for location), the redeployment of a second and dragging operations for a third. The toroid from the latter had previously been landed in Belfast, and the sub-surface buoy was subsequently reported ashore in Dumfries. Dragging was unsuccessful and the remainder of the mooring assumed lost. Mr Harrison was put ashore at Larne midday Sunday (29 October).

The intended recovery of two moorings on the eastern side of the North Channel was postponed because of strong south westerly winds. Instead, after a 13 hour ADCP transect across the moorings (29 October), Corystes travelled south east to occupy 3 lines of discrete CTD's in the lee of the Irish coast. The following morning (31 October) two moorings were recovered in the western Irish Sea in moderating conditions.

Shortly after lunch the SCANFISH was deployed close to the coast, north east of Dublin, and a grid (Fig. 5) undertaken through the western Irish Sea toward the North Channel (Fig. 4). Roughly 30 hours into the tow (leg 69; Fig. 5), the SCANFISH began to 'fly' erratically, with sensors indicating that the starboard control flap was jammed and a vehicle roll angle of approximately 50°. Weather conditions had deteriorated such that the lee of the western side of the Isle of Man (~12 miles away) was needed before the vehicle could be recovered. On transit, the attitude of the flap (and vehicle) was corrected by a brief period of towing on the sea surface. The vehicle was successfully recovered in poor conditions. On inspection, 2 screws connecting the flap control motor to the flap linkage had come loose, and subsequent repairs were made. The following day, the two moorings on the eastern side of the North Channel were retrieved in the comparative lee afforded by the Mull of Galloway from strong south easterly winds.

During the mid-cruise break (22:30 3 November to 11:00 5 November), Mr Lawrence and Ms Howell were replaced by Mr Medler and Mr Jones and the opportunity taken to unload the POL and Valeport equipment. After leaving Workington, the SCANFISH grid was recommenced (16:45 5 November) to the west of the Isle of Man (leg 72; Fig. 5) in light winds and calm seas, conditions which persisted well into 6 November. At approximately 03:53 the SCANFISH work was ended abruptly. Whilst turning at the end of an east-west leg (74; Fig. 5) to join the next, the vehicle apparently fouled moored gear. Corystes was in approximately 28 m of water executing a wide turn and the SCANFISH was 'parked' at 9 m, approximately 40 m behind the ship. The pressure record indicated the vehicle fluctuated

wildly for approximately 90 seconds, surfaced and then the signal ceased. On recovery, the Starboard third of the body was found to have sheared off. At first light a visual search of the area was made, but there was no sign of moored gear.

Following this until Thursday (10 November), time was occupied with transects of discrete CTD's in the North Channel, Clyde Sea and on the Malin Shelf. The work was twice interrupted by periods of bad weather, although it was possible to recover the two ARGOS buoys previously laid in the North Channel (Fig. 3) which had been advected northwards onto the Malin Shelf (Fig. 3).

The remainder of the work concentrated on a series (9) of CTD transects (Fig. 2), extending outward from the Irish coast, from immediately south of Belfast Lough to Carnsore Point at approximately 52°N. The work, directed at examining the region of fresh water influence, was interrupted once to recover the remaining ARGOS buoy in the western Irish Sea (Fig. 3). At the beginning of the eighth (08:30 13 November) line work was terminated by strong south-westerly winds. The forecast indicated that the conditions would persist for 2-3 days, so we set sail for Lowestoft and a rather uncomfortable passage.

RESULTS (Preliminary):

1) All moorings (see Fig. 4 for locations), excepting D, were recovered. The surface toroid and sub-surface buoy at D had been brought ashore. Although the position of the mooring was dragged through, it was not possible to recover the remainder. Data return appears good, but an indication of the flow regime will only be available after further processing ashore.

2) The ARGOS buoys deployed during Cor 7/94 described a cyclonic density driven circulation in the western Irish Sea in response to summer stratification. In contrast, during Cor 13/94 the water column was well mixed (Fig. 6). Unfortunately one buoy failed the day after deployment, but that placed on the western side of the western Irish Sea moved north east (Fig. 3), apparently largely driven by the wind. A motion at variance with the that during the summer deployments. Those buoys deployed at the southern end of the channel both exited to the Malin Shelf, responding to a series of strong south easterly wind events.

   Modifications were made to the instruments following Cor 7/94. A pellet float was added immediately above the drogue and bungy rubber inserted in the line between buoy and drogue, both to allow the buoy to ride easier at the surface. This was apparently successful as the sea state was rougher than during Cor 7/94, yet the number of position fixes were increased. In addition, the VHF tracking was improved, with a buoy detected at 3 miles range on one occasion, although the installation of a RF direction indicator on the bridge proved fruitless. With the addition of a Satcom C system to the ship and some clever programming by Mr Wooltorton it was possible to get hourly updates of the latest buoy positions. This knowledge greatly aided recovery. The simple measure of painting the buoy tops fluorescent yellow with orange stripes improved visibility during the recovery search.

3) Prior to the damage of the SCANFISH, the survey of the western Irish Sea indicated that the transition from summer stratified to winter mixed was almost complete (Fig. 5). In addition to the nutrient, chlorophyll and suspended load samples taken during the discrete CTD casts, a number of measurements of dissolved oxygen measurements were made with an end point detector. After many teething problems, this system now appears to work accurately, largely due to the perseverance of Mrs Reeve and Dr Mills.

Following the mid-cruise break, extensive discrete CTD surveys were made through the North Channel, Clyde Sea and on the southern Malin Shelf (Fig. 2). These indicated a contribution of fresher water from the Clyde Sea to the North Channel, but little other stratification. The CTD survey of the Irish coast revealed a number of regions of fresh water influence. As the salinity increased from the shore so did temperature. The sense of this was such that in most cases there was only a minor density gradient offshore, implying the absence of a density driven southward flow. The conditions might be characteristic of the time of year. During winter, riverine water would be expected to be significantly cooler than offshore giving a more pronounced gradient.

4) A variety of U-Tow towing configurations were tested on passage to the Irish Sea. The instrument is intended for deployment from ships of opportunity (e.g. ferries) capable of speeds well in excess of those (7 - 11 knots) at which tests were conducted on Corytes. Despite this, Mr Quartley appeared satisfied with the instruments performance, the vehicle easily undulating between 5 - 40 m. Recovery and deployment in rough conditions demonstrated its robustness.

5) Although a mooring was successfully deployed (10 days) and recovered at E (Fig. 4) the inter-comparison was only a partial success. After 4 days, a plastic bag became entangled with the Aanderaa rotor. The old Valeport instruments had unsuitable poor resolution compasses. It was only possible make a short comparison between instruments, but the performance appears much improved. It is intended that further evaluation be undertaken during Cirolana 1/95.

6) Shortly before the cruise, W.S. Oceans insurers stipulated that personnel from the company be present during deployment. Restrictions on cabin space meant a postponement of the trial, most probably until Cirolana 1/95.

7) The POL ADCP frame was recovered successfully, ending a deployment duration of 16 month, only interrupted by servicing at 4 - 6 week intervals. A successful 12 hour deployment of a second ADCP was made close to the Irish shore as a check on the instrument after repair.

Neglecting the obvious disappointment of the SCANFISH, the principal aims of the cruise were met. This was due in no small part to the expertise and good humour of the ships personnel, as well as the scientific staff, who were often required to work in uncomfortable conditions.

Juan Brown
14 November 1994

SEEN IN DRAFT:

M.J. Willcock (Master)
R.F. Graham (Senior Fishing Mate)

DISTRIBUTION:
BASIC LIST+

Dr J Brown x 10	Mr L Fernand
Mrs A Reeve	Mr A Young
Mr J Read	Mr J Lawrence
Mr S Jones	Mr K Medler
Ms L Howell	

CORYSTES 13/94 : Cruise track

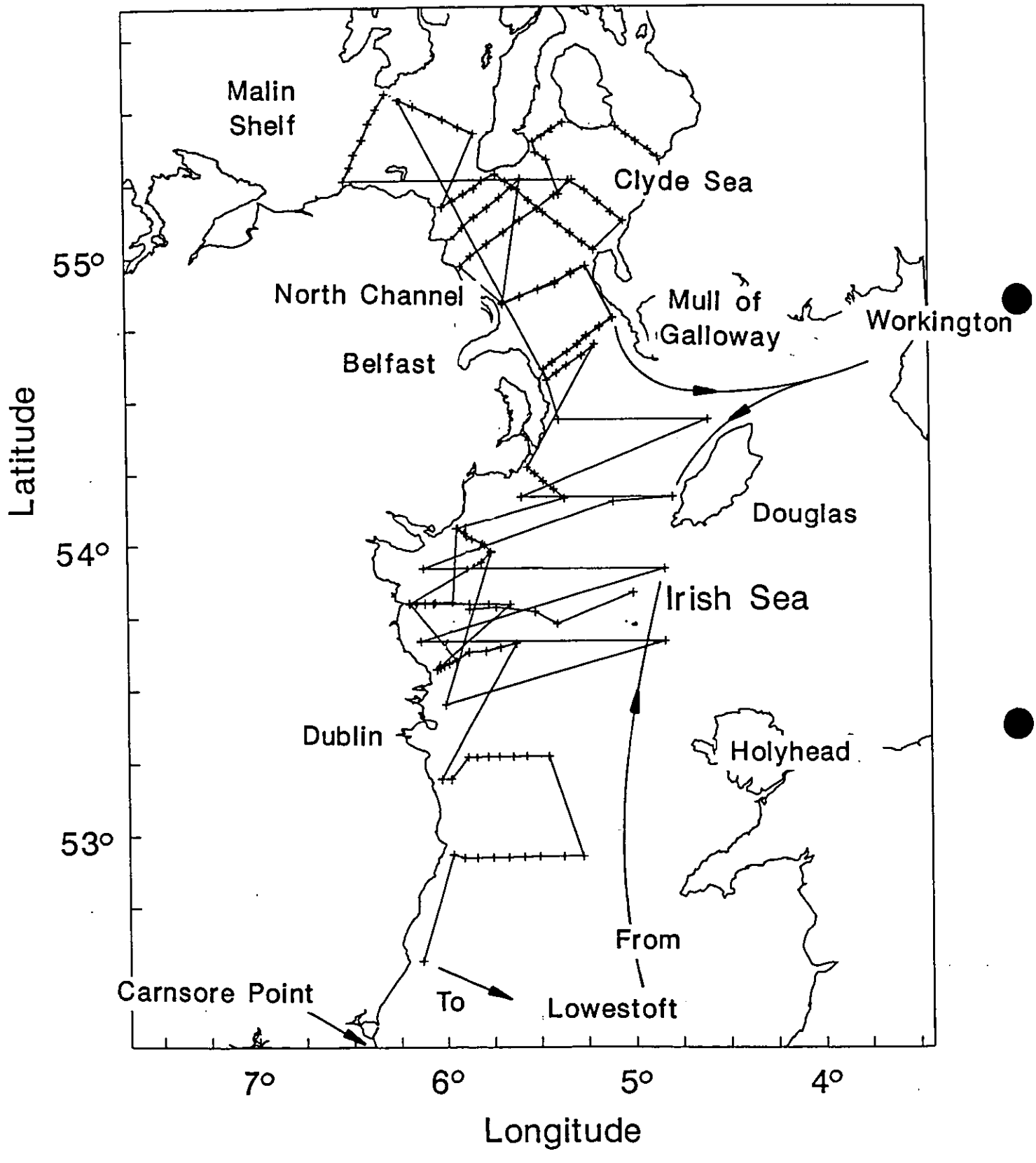

Fig.1

CORYSTES 13/94 : CTD stations

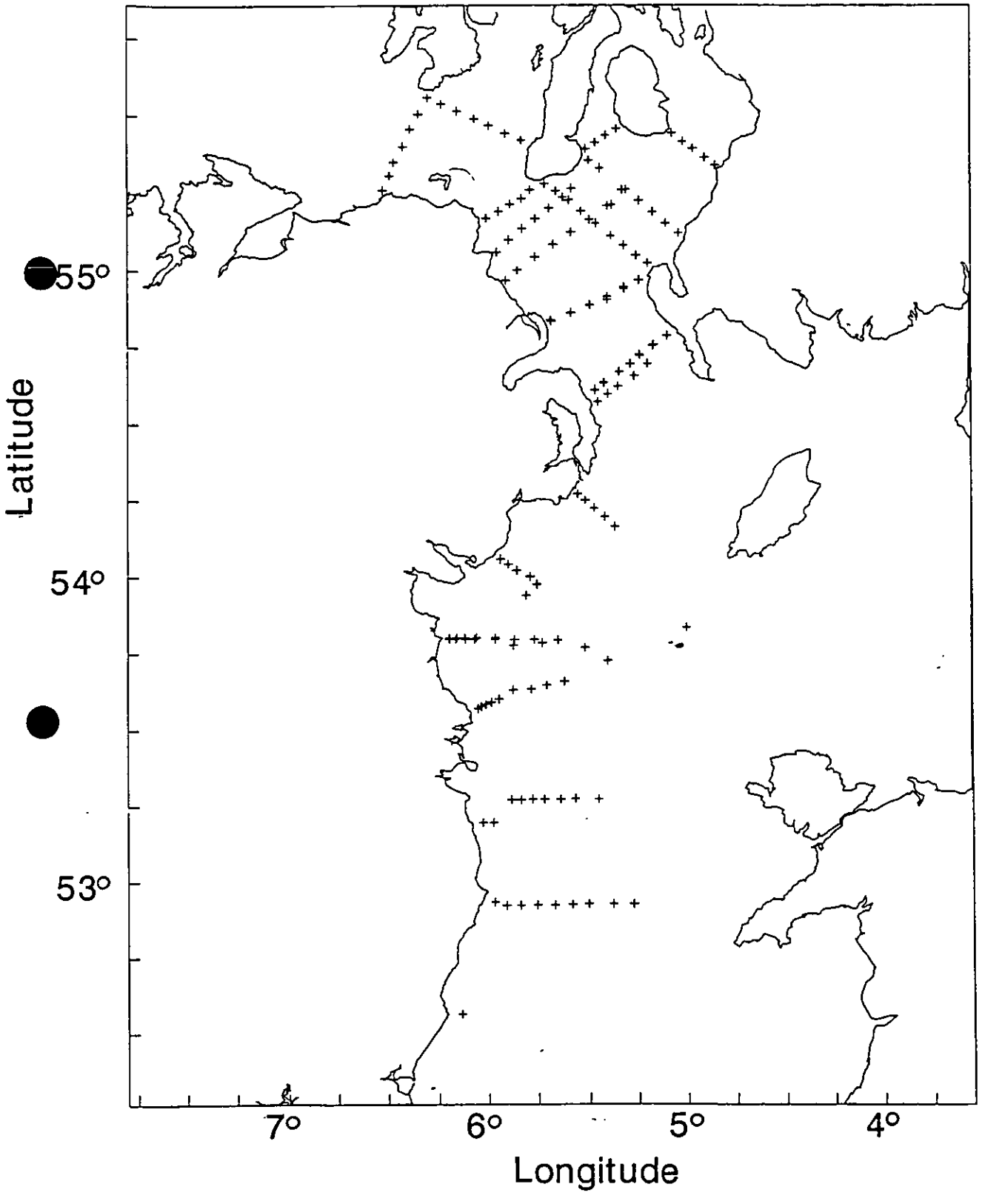

Fig.2

CORYSTES 13/94 : Track of 'ARGOS' drifting buoys

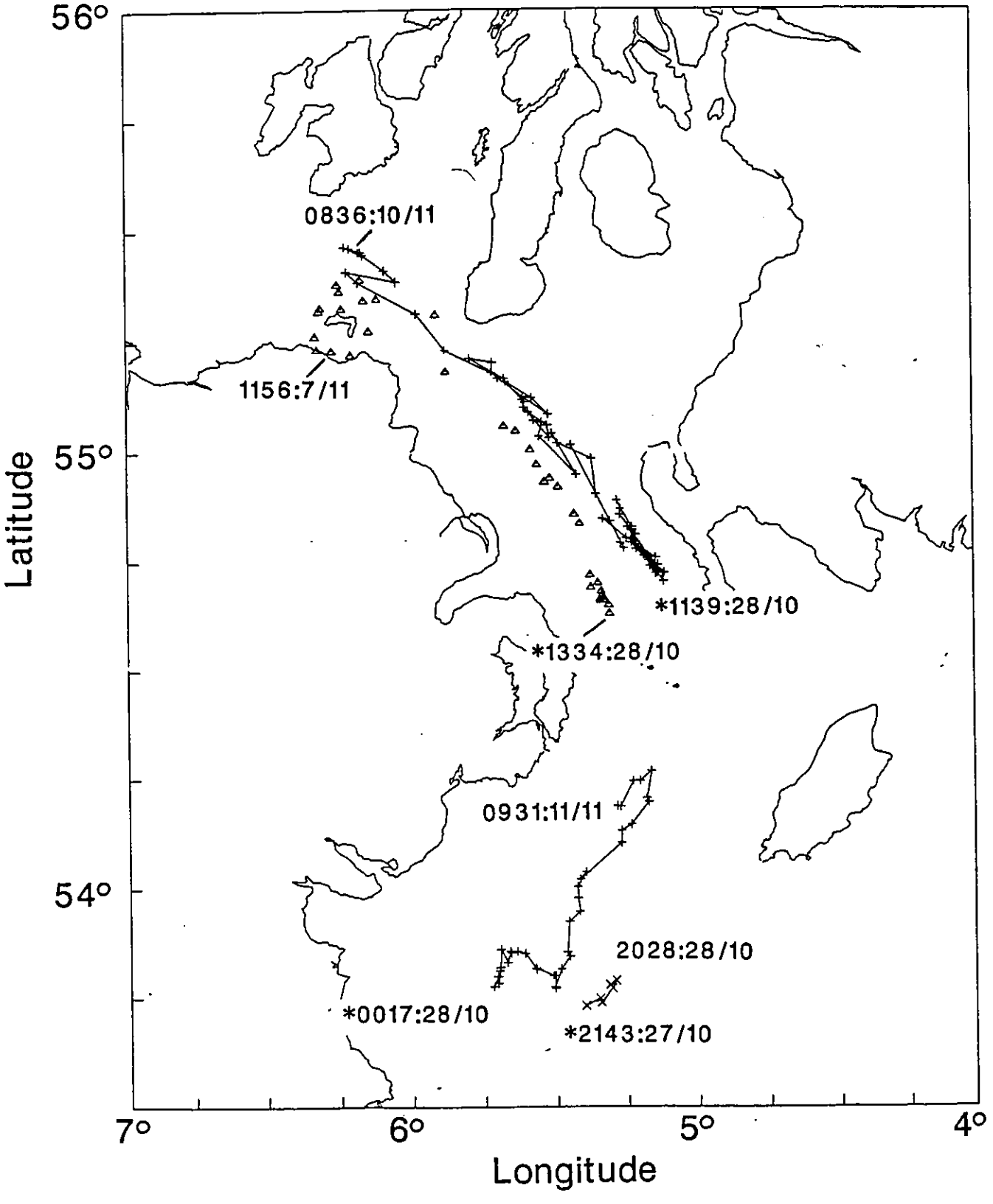

Fig.3

CORYSTES 13/94 : Current meter stations

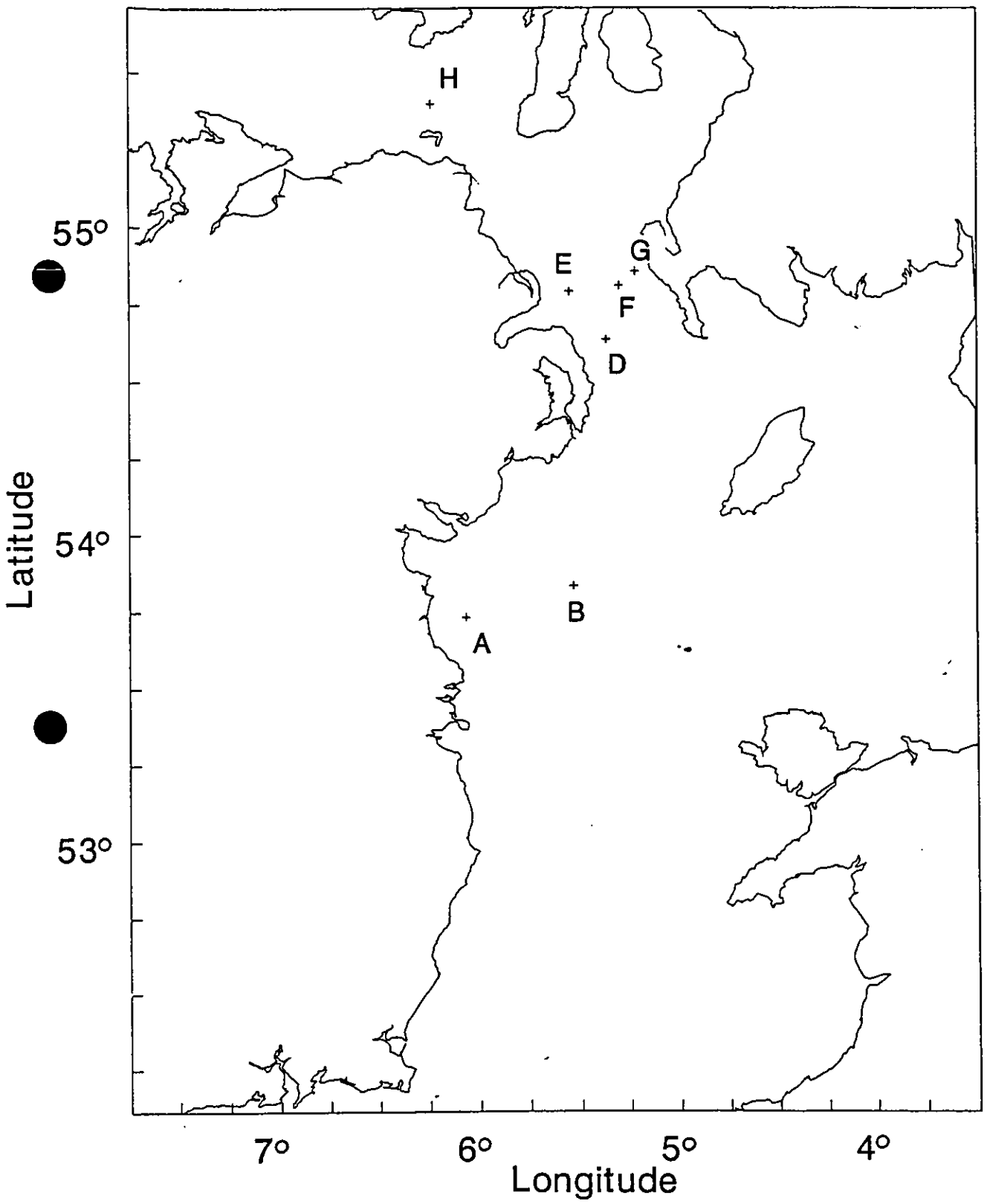

Fig.4

CORYSTES 13/94 : Scanfish legs

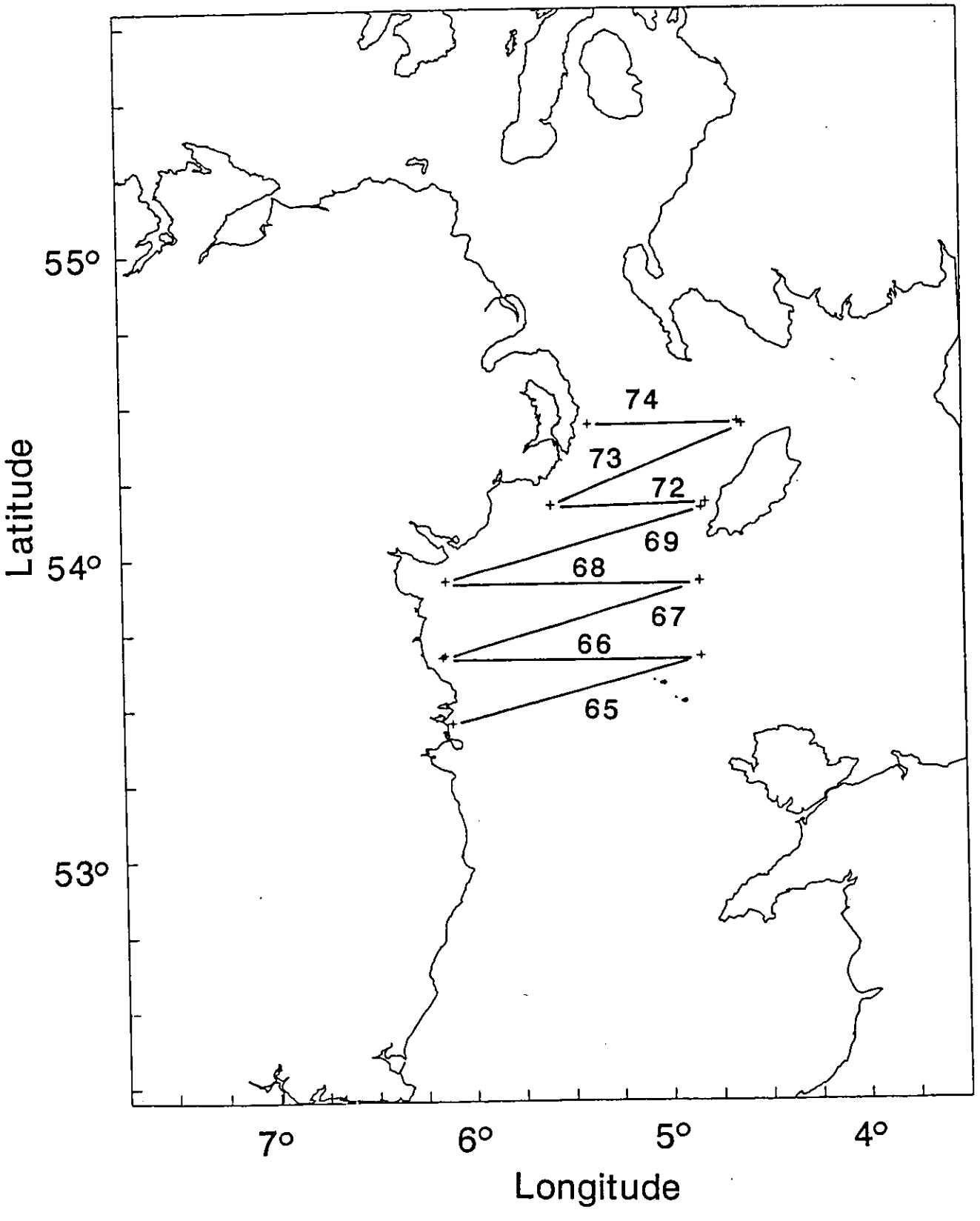

Fig.5

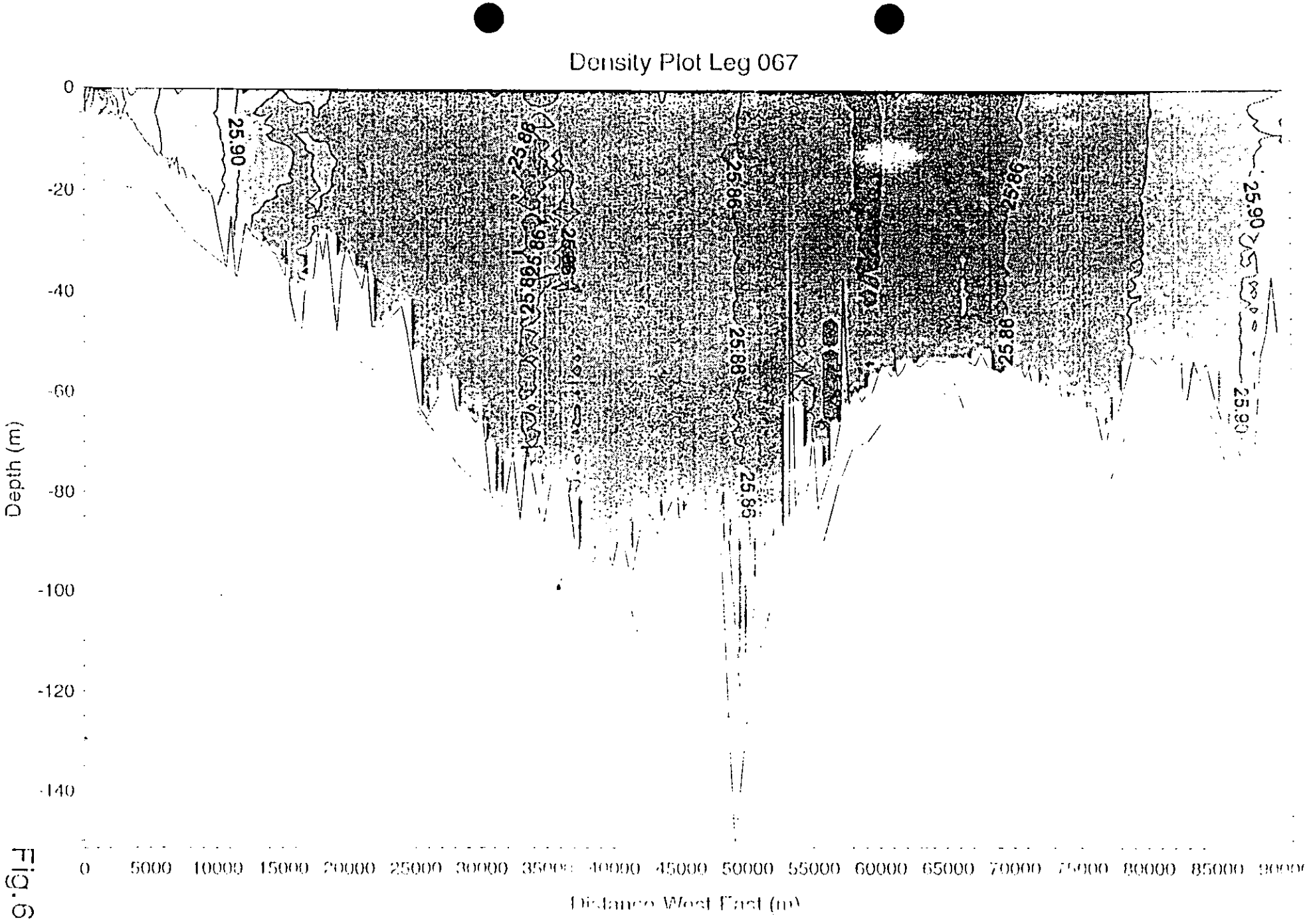
Density Plot Leg 067
Depth (m)
0
-20
-40
-60
-80
-100
-120
-140
25.90
25.86
25.88
25.85
0
5000
10000
15000
20000
25000
30000
40000
45000
50000
55000
60000
65000
70000
80000
85000

Fig. 6