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RV Challenger

Cruise 0595H

REPORT

16-25 May 1995

Personnel

M Heath	PSO	In charge
C Hall	SSO	22-25 May
J Dunn	HSO	
D Basford	HSO	
J Hunter	PTO	16-22 May
A Gallego	PDRA	
J Fraser	RA	
A Ingvarsdottir	PhD student	AU
R Milne		RGU
M Viltard		RGU
H Anderson		NERC Fleet Support

Objectives

1. To track a drifting patch of larval haddock on the shelf north of Shetland and sequentially sample their vertical distribution, zooplankton prey distribution and abundance, and abiotic environment.
2. To obtain some data on the wider distribution of larvae and plankton across the shelf and into the Faroe-Shetland Channel.

Out-turn Days per Project: 10 days GBF1**Narrative**

Challenger sailed from Aberdeen at 1645 on 16 May following mobilisation of SOAFD gear. The vessel made a passage north to Shetland, carrying out gear trials on the way. Between 17-19 May, 12 stations were sampled with a range of gears along a transect across the Faroe-Shetland Channel.

On completion of the transect stations the vessel proceed to the station identified as having the highest concentration of haddock larvae, and a drifting buoy rig was deployed. Over the next 4.5 days continual sampling with a variety of gears was carried out nearby the drift buoy, the vessel maintaining contact with the buoy by a combination of radar, visual and VHF direction finding. During this time, an exchange of SOAFD staff was carried out in Burra Firth on the north coast of Unst.

Sampling was completed at 0430 on 24 May, the rig was recovered and the vessel made a passage back to Aberdeen, docking at 0845 the following day. The vessel track over the duration of the cruise is shown in Figure 1.

Results

The first task was to sample with the dual MIKT and ARIES along a transect across the shelf north of Shetland and out into the Faroe-Shetland Channel. Haddock larvae were enumerated in the MIKT samples from these station in order to position the start point for the drift study. Concentrations of haddock larvae per unit sea area at each station are shown in Figure 2, and the vertical distribution of larvae in Figure 3. On the basis of these data, a start position for the drift study was selected.

The hydrographic data from the transect showed a familiar structure, with cold ($<0^{\circ}\text{C}$) water in the bottom of the Faroe-Shetland Channel, and a core of warm ($>8.5^{\circ}\text{C}$) water at the shelf break (Fig. 4). Haddock larvae were almost exclusively inshore of the shelf break front. High chlorophyll biomass was present at the shelf break. Large concentrations of *Calanus finmarchicus* were caught on the off shore side of the break front in the surface waters, but in contrast to the winter situation, no *C. finmarchicus* were present in the deep water >600 m. *C. finmarchicus* egg production rates were highest on the offshore side of the break front.

The station having the highest concentration of haddock larvae was chosen for release of the drift buoy at 1640 on 19 May. Each 24 h during the drift study, a particle tracking model was run using flow field in 8 m depth layers below the ship measured by the Acoustic Doppler Current Profiler (ADCP). The results were used to verify that the drift buoy was reliably tracking the water currents in the area. Sampling was carried out continually as the vessel followed the drift buoy, using a dual MIKT, an Optical Plankton Counter (OPC), CTD, and a variety of plankton sampling nets. A total of 158 deployments were carried out during the four and a half day drift study. In addition, instruments attached to the drogue wire of the drift rig measured temperature at 4, 20, 40 and 50 m.

During the study period the weather was extremely variable. Northwesterly winds prevailed to begin with, followed by a calm spell and then strong southerly winds. Both the drift buoy and the ADCP data indicated that the water currents were predominantly wind driven. The buoy first moved slowly southeast, and then moved away more rapidly to the northeast with the change to southerly winds (Fig. 5). Despite a net displacement of approximately 55 km over the 4.5 days, the recovery position, and the centre of density of particles simulated from the ADCP data were less than 4 km apart.

The temperature data from the drift rig indicated a stratified water column at the beginning of the study, which become deeply mixed with the advent of southerly winds and then began to re-stratify as the rig moved off into deeper water (Fig. 6). Relatively little analysis of the plankton data was possible aboard the ship, but fluorometer measurements indicated that an increase in phytoplankton biomass occurred around the middle of the period. A wide range of larval fish species were caught in the MIKT nets, and haddock constituted around 5-10% of the total gadoid larvae caught. Specimens from each haul were measured and preserved for otolith and biochemical analysis. An analysis of approximately 25% of the samples of fish larvae caught produced a composite picture of diurnal changes in the vertical distribution of haddock larvae which suggests that larvae descend during daylight and ascended towards the surface at night. The mean concentration of haddock larvae in these samples was approximately $0.01/\text{m}^3$.

Also during the cruise, overside and on deck comparative trials of laser and white light source fluorometers were carried out by staff from RGU. Measurements of respiration rates at different temperatures and egg production rates by *Calanus finmarchicus* were carried out by a student from Aberdeen University.

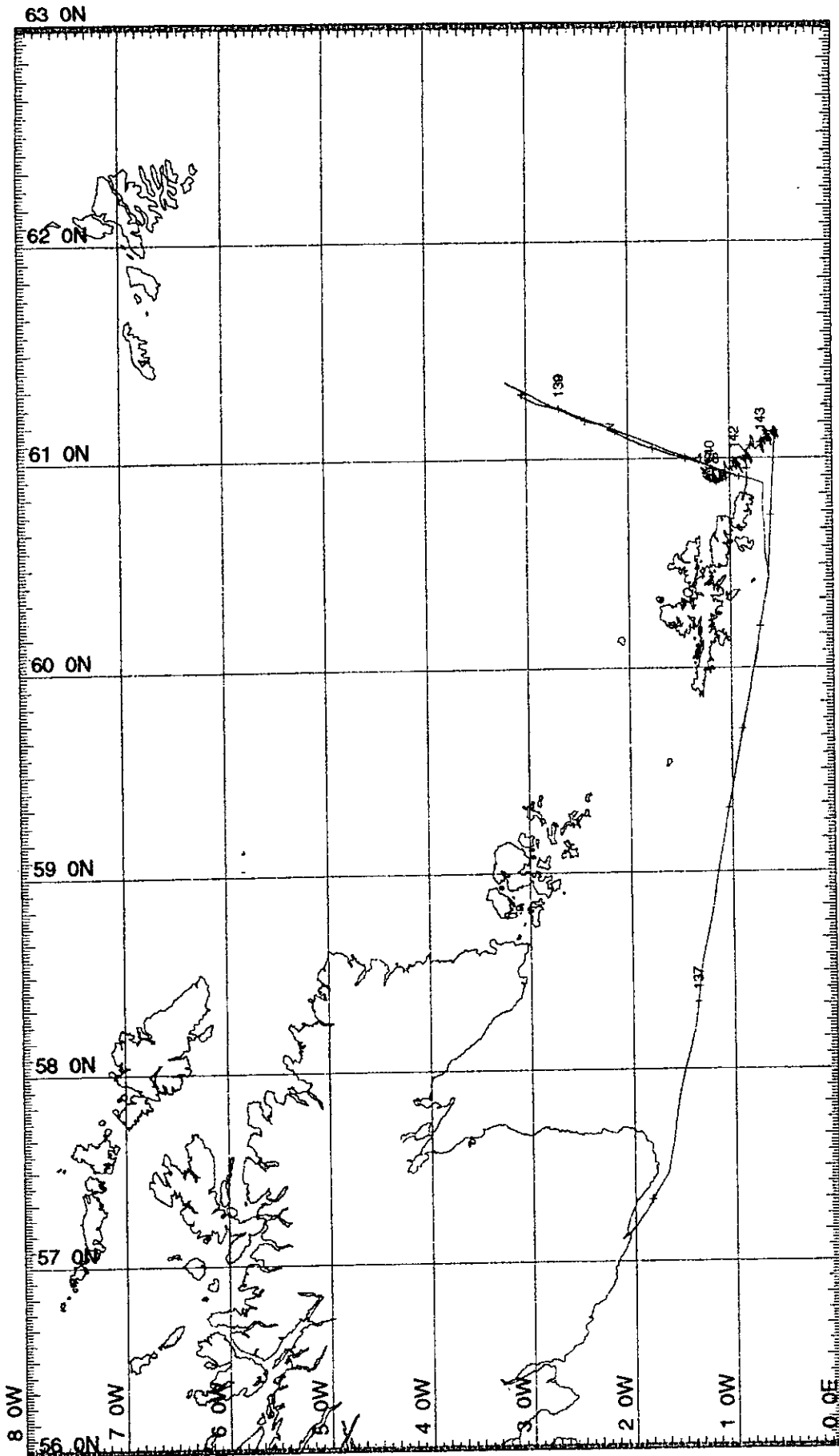
M Heath
8 June 1995

Transect stations sampled by *Challenger* cruise 17-19 May

Station	Latitude	Longitude	Depth
1	60°53.30	0°42.30'W	90
2	60°56.00	1°00.00'W	105
3	60°57.35	1°08.85'W	110
4	60°58.70	1°17.70'W	110
5	61°00.07	1°26.55'W	120
6	61°01.40	1°35.40'W	140
7	61°02.75	1°44.25'W	170
8	61°04.00	1°53.00'W	200
9	61°08.00	2°10.00'W	500
10	61°11.00	2°25.00'W	700
11	61°14.00	2°40.00'W	1200
12	61°21.00	3°10.00'W	1400

Station 3 was selected as the start point for the drift study

FIGURE 1



MERCATOR PROJECTION

SCALE 1 TO 3000000 (NATURAL SCALE AT LAT. 60)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 60

GRID NO. 1

Challenger 118A SOAFD Charter - Cruise Track

FIGURE 2

Challenger, 17-19 May 1995. Haddock larvae

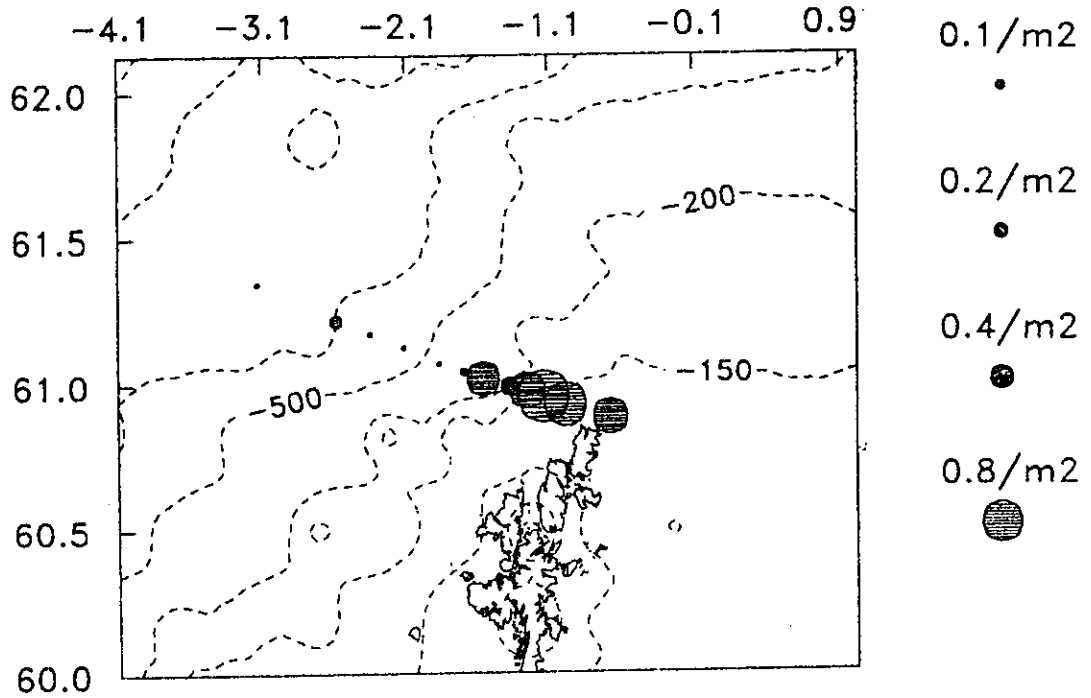


FIGURE 3

Challenger 17-19 May '95. Haddock larvae

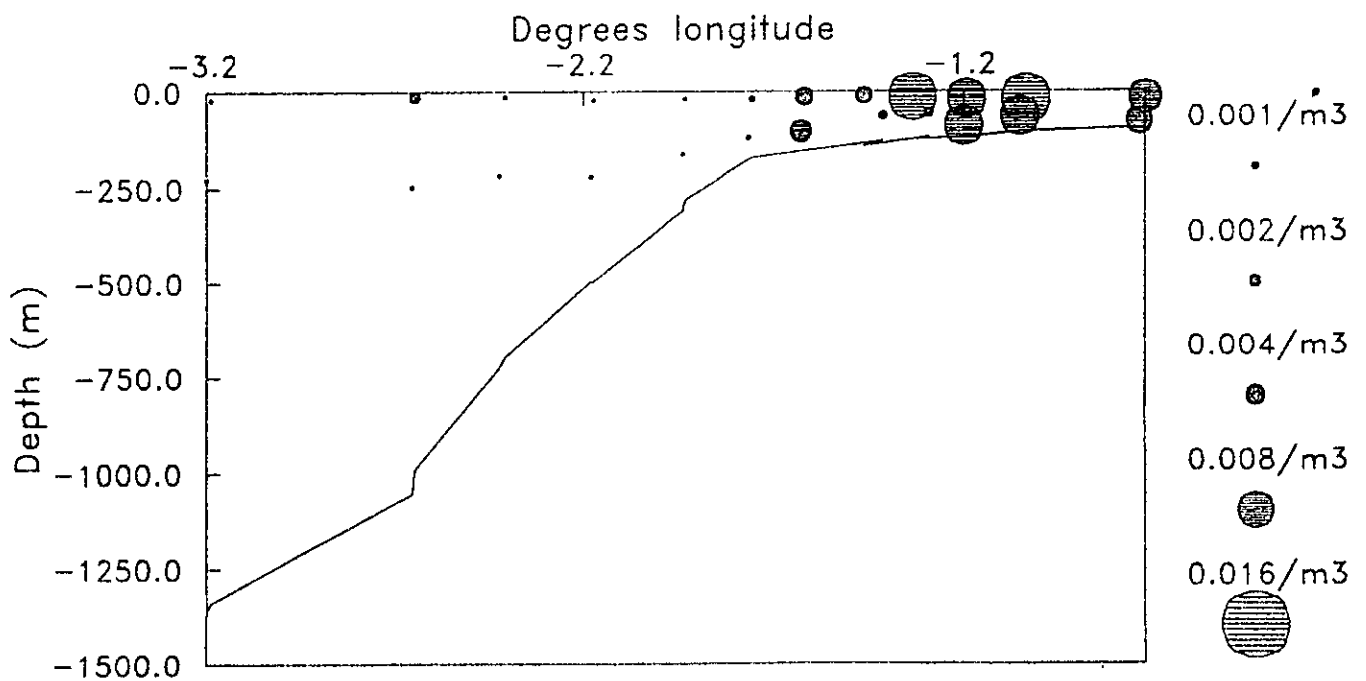


FIGURE 4

Challenger 17-19 May'95. Temperature

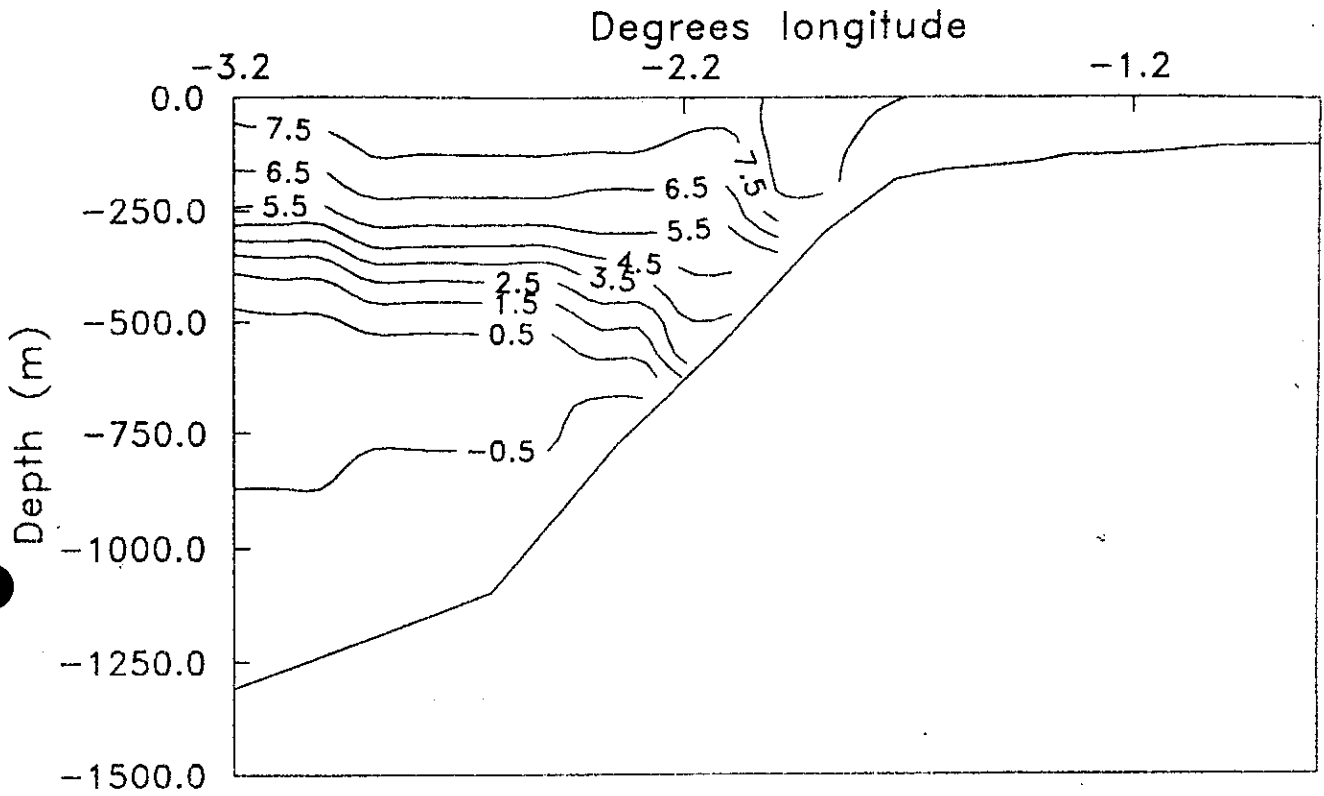


FIGURE 5

Challenger, 19-24 May 1995. Drift buoy track

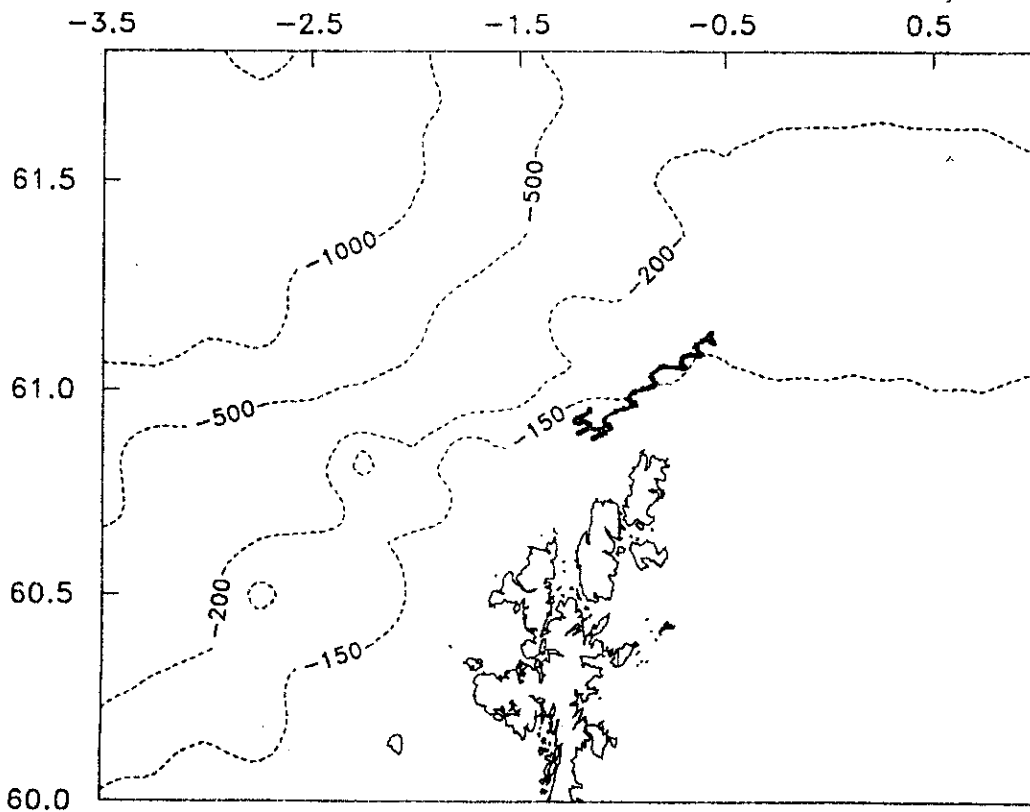


FIGURE 6

Challenger May 1995, drift study temperature data

