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MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
FISHERIES LABORATORY, LOWESTOFT, SUFFOLK, ENGLAND

1984 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA: CRUISE 5
(PROVISIONAL: Not to be quoted without prior reference to the author)

STAFF: K Brander
 D Symonds
 M Vince
 D Palmer
 L Cox - 22 May-8 June
 S Milligan
 R Chapman
 T Benford
 R Flatt
 J Coleman
 G Moore - 22-23 May
 R White
 M Doyle - 8-18 June Menai Bridge
 R Williams) Galway
 D Conway) 6-8 June) IMER
 N Fragopoulou)

DURATION:
22 May-17 June

LOCALITY:
Irish Sea

AIMS:

1. Acoustic range trials.
2. To repeat standard trawl hauls on the Smalls Ground.
3. To carry out a series of transects across the NW Irish Sea front with a High Speed Tow Net and echo integrator.
4. To fish for potential predators on fish and Nephrops larvae, using a midwater trawl and high headline bottom trawl.
5. To fish for cod over a 24h period in order to investigate whether diel variations in feeding on adult Nephrops can be used to estimate consumption rates.
6. To carry out detailed sampling of Nephrops larvae distributions using HSTN and other gear.
7. To produce vertical profiles of particle size using water bottle samples and HIAC counter.
8. To produce vertical profiles of plankton distributions in areas of high density of fish and Nephrops larvae, using a Longhurst-Hardy Plankton Recorder.

9. To carry out a survey of fish and benthos across the position of the NW Irish Sea Front (using a bottom trawl with headline camera and an Agassiz trawl).
10. To produce a photographic index of common epibenthic species.

Narrative

The ship left Grimsby at 0900h GMT on 22 May and steamed to Portland, where noise trials were carried out on the acoustic range on the afternoon of 23 May. Mr Moore (RSG3) was put ashore at Portland and the ship then made passage for the Celtic Deeps, arriving at the first trawl station ($51^{\circ} 09.8'N$ $06^{\circ} 11.3'W$) at 0730h on 24 May. Six one hour hauls with the Portuguese High Headline Trawl were carried out in that area during the day and the ship then steamed overnight to the starting position for the plankton grid (Fig 1). The 36 station grid was worked with the 76 cm MG 82 tow net with 40 cm nose cone and the Simrad-QD integrator ran throughout, recording total integrated voltage and volume backscatter every mile in eight depth bands. Surface nitrate and fluorescence were monitored continuously and water samples were taken at each station (for fuller analysis of nutrients). The Guildline CTD logged temperature and salinity profiles on each V haul and the Aquatracka fluorometer gave a paper record of the fluorescence profile. The grid was completed by 2000h on 27 May.

On the morning of 28 May a start was made with midwater fishing using the Engel and Isaacs Kidd trawls to catch potential predators on fish and Nephrops larvae. At 1300h the ship's workboat went ashore in Holyhead to collect a spare Guildline CTD and depressor, which were brought to Holyhead by Mr E I S Rees from Menai Bridge. Midwater fishing continued until the evening of 30 May, by which time eight Engel and twelve Isaacs-Kidd hauls had been carried out at positions shown on Fig 2.

Meanwhile the plankton taken during the initial grid had been subsampled and identified and the temperature and salinity profiles had been plotted to provide information for the design of subsequent plankton sampling work. A grid of 37 plankton stations which traversed the position of the "front" was carried out on 31 May and 1 June (Fig 3). Again the integrator was run continuously.

Five bottom trawl hauls were made on 2 June with the Portuguese high headline trawl in order to locate numbers of cod feeding on Nephrops (Fig 2). A trial was also carried out on the use of the CTD and transmissometer with the Niskin bottles for taking samples for particle profiling. A further two trials were carried out on 3 June and on the second of these the plankton camera was also deployed. Three Agassiz trawl hauls provided samples of epibenthic fauna for identification and photography. A series of four hauls overnight with the Portuguese high headline trawl completed the investigation of cod feeding on Nephrops over a 24h cycle. Four Isaacs Kidd trawl stations were worked on 4 June in a further attempt to locate fish larvae and in order to provide samples of Pasiphaea for a study of their feeding. Although large numbers of Nephrops larvae were taken over a wide area, fish larvae were more restricted in their distribution and far less abundant.

In preparation for the vertical profiling of plankton by the IMER group, twelve plankton hauls were made at different depths on 5 June at two main locations, where fish and Nephrops larvae had been shown to be abundant. Following a final vertical profile with CTD, plankton camera and Niskin bottle cast for particle counting on the morning of 6 June, CIROLANA then steamed to Holyhead to pick up Dr Williams, Mr Conway and Ms Fragopoulou. By 1800h on 6 June the ship was back on station and a series of nine hauls using the Double Longhurst-Hardy Plankton Recorder (LHPR) was carried out over the next 38 hours, with CTD, plankton camera and Niskin profiles interspersed between them. Once again the QD integrator was run throughout this period in order to be able to compare the results with the detailed vertical profiles provided by the LHPR. A whale, possibly a pilot whale, was sighted at 1730h on 7 June.

With the vertical plankton profiling completed, the group from IMER, Mr Vince and Mr Cox were put ashore at Holyhead at 1300h on 8 June and Ms Doyle, the Irish observer from Galway University, joined. Later on 8 June and throughout the next day, seven Granton trawl hauls were carried out along a line running from 53° 35.5'N 05° 00.4'W to 53° 49.2'N 05° 22.6'W (Fig 2) with the headline camera rigged to take photographs of the benthos across the position of the "front". On 10 June ten Agassiz trawl hauls along the same line provided further material for benthic work and for the photographic directory of benthic species. A CTD profile of the water column at each Agassiz station also gave a fairly tightly spaced transect (station every 2 miles), which shows the typical watermass structure found throughout the cruise (Fig 4).

Overnight the ship steamed to Workington, docking at 0800h on 11 June and leaving again at 0900h on 12 June. The final 30 station plankton grid (Fig 5) consisted of three transects across the position of the front, with each station position being sampled to the full depth of water and down to 35 m only. This work was completed at 2100h on 13 June and with all aims attempted, if not fully achieved, CIROLANA made passage for the Western Channel, to try to catch mackerel.

Very few traces were detected, which might be worth fishing on, but two hauls with the Engel trawl were carried out in the area off the Mewstone on 15 June, catching small quantities of mackerel and large quantities of scad. CIROLANA then sailed for Grimsby, docking at 0800h on 17 June.

Results

1. Four runs were made along the acoustic range at Portland.
2. Six standard trawl hauls were carried out on the Nephrops area in the Celtic Deep. A few small hake (12-19 cm) were taken in each haul. Stomachs of the main fish and crustacean predators were examined.
3. The plankton grid carried out on 25-27 May (see Fig 1) traversed the position of the NW Irish Sea front eight times, giving a clear picture of the hydrographic structure and of the distribution of plankton. Nephrops and fish larvae were staged and counted from subsamples at each station and the numbers of Nephrops larvae present were generally high (up to 47 larvae in one tenth of the sample).

The distributions for each larval stage of Nephrops have been plotted and are consistent with each other and with the pattern found in 1982. High numbers of Nephrops larvae were taken on the mixed as well as the stratified side of the front. Fish larvae were far less abundant, although the subsamples from each haul which have been sorted to date represent only about 40 m³ of water filtered on average.

A note describing the results of the acoustic profile work has already been submitted and suggests that an integrator system may be helpful in the designing and stratification of sampling strategies for plankton. There was a good correlation between the settled volume of plankton taken per haul and the total integrated voltage in the 16-36 m layer during the haul. Continuous monitoring of surface nitrate showed high values (.5 ug at /l) in the mixed water and lower values in the stratified than in the mixed water, as did a contour plot of fluorescence at 10 m taken from the Aquatracka profiles. Almost daily breakdown of the surface thermograph meant that no continuous monitoring of temperature was possible.

4. Predation by fish on Nephrops and fish larvae. Detailed examination of the stomach contents of 15 species of fish taken in midwater by Engels and Isaacs Kidd trawls (Fig 2) showed that predation on fish larvae was infrequent. This was not entirely unexpected since fish larvae were not numerous in the plankton samples taken in the same area. Feeding on Nephrops larvae was found in 5 species of fish with 16% of whiting and 75% of grey gurnards containing larvae. Larvae were found in these same fish species (although their occurrence was lower) when taken by bottom trawls. There were no obvious differences in the pattern of feeding during day and night sampling.
5. Predation on adult Nephrops by cod. Sampling was carried out over a 24 hour period in an area where cod and Nephrops were known to occur. Assuming that feeding of cod on Nephrops shows the same diel pattern as emergence from burrows and catch rates in this area (peaking at dusk and dawn) it was hoped that the changes in the stages of digestion throughout the period might give some indication of the rate of gastric evacuation. Catches of cod were small, particularly at night and only 36 fish, all of which were feeding almost entirely on Nephrops, were examined. The results suggest that the digestion stages used are not precise enough for this type of approach to the problem.
6. Detailed sampling of Nephrops larvae in relation to the 'front' was carried out using the 76 cm MC 82 net, covering the two grids shown in Figs 3 and 5. The samples from these stations will be worked up by Rowena White as part of her Ph.D. work at Menai Bridge and she will also have access to any other material collected during the cruise, which may be of use to her. To date only the temperature and salinity profiles from the 67 stations worked on these two grids. have been looked at.

7. Six vertical profiles were made using Niskin bottles to obtain water samples for particle size counting with the HIAC counter. Three or four depths were sampled, one of which was in the layer which gave the highest reading on the transmissometer attached to the hydro wire just below the Niskin bottle. At four stations vertical profiles were taken with the plankton camera for possible comparison with the particle counts.
8. Work with the Double Longhurst Hardy Plankton Recorder (LHPR) took place in two main areas, in the stratified area, near 53° 35' N 05° 30' W and 53° 25' N 05° 24' W. Four valid hauls were made in each area to give day and night samples in each. Only one haul was completely clogged by jellyfish. The QD integrator was run for the entire period using narrower depth banding and integrating over every 1/10 mile. The intention is to try to match the integrator values with the depth layering of plankton biomass total organic carbon. A profile with the plankton camera and Niskin bottles for HIAC particle counting was carried out in each main area to correlate with the LHPR results.

The three scientists from IMER worked almost continuously throughout their 48 hours on board in order to produce these results, and their contribution is very highly appreciated. The samples will be sent to IMER for determination of organic carbon in each depth station.

9. Benthos samples were taken along a transect which crossed the "front", using both the Agassiz and Granton Trawls (Fig. 2). Close up photographs (of 89 species) were taken for the photographic catalogue and deck photographs were taken at each station to give a rough estimate of abundance. The headline camera was deployed for 7 one-hour tows and the black and white photographs taken, which were developed on board, look promising, with good visibility. Some samples have been taken for scientists at Menai Bridge to identify. The benthos was noticeably different between the areas below the mixed and stratified water, most notably the change in echinoderms from Spatangus sp to Brissopsis sp. The change in substrate should also be taken into account. The abundance and variety of benthos seemed greater in the mixed zone but the Agassiz trawl is not quantitative. In general, as the "front" was crossed, the numbers of bivalves, gastropods, hermit crabs, starfish, and Spatangus sp decreased and the number of Nephrops sp, Brissopsis sp and Calocaris sp increased. From the Agassiz trawls it was noted that the substrate changed from large stone gravel large shells small shells mud.
- Fish catches in the Granton trawl across the front have not been analysed yet, but the stomachs of nine species of fish were examined on board. The results will eventually be analysed in conjunction with the benthos data collected in the Granton and Agassiz trawls and photographed with the headline camera.
10. Length stratified samples of mackerel and scad were taken from the Western Channel.
 11. Samples of various species were frozen for Mr Franklin.

12. Samples of Pasiphaea were frozen for feeding studies by Mr P Johnson, Menai Bridge.
13. A total of 1265 stomachs from 22 species of fish were examined on board and the contents fully identified.

K Brander
21 June 1984

SEEN IN DRAFT:

G.S. (Master)
P.M. (Fishing Skipper)

INITIALLED:

D.J.G.

DISTRIBUTION:

Basic List +
K Brander (4 copies)
D Symonds
M Vince
D Palmer
L Cox
S Milligan
R Chapman
T Benford
R Flatt
J Coleman
G Moore
R White (Menai Bridge)
M Doyle (Galway)
R Williams)
D Conway) INER
N Fragopoulou)

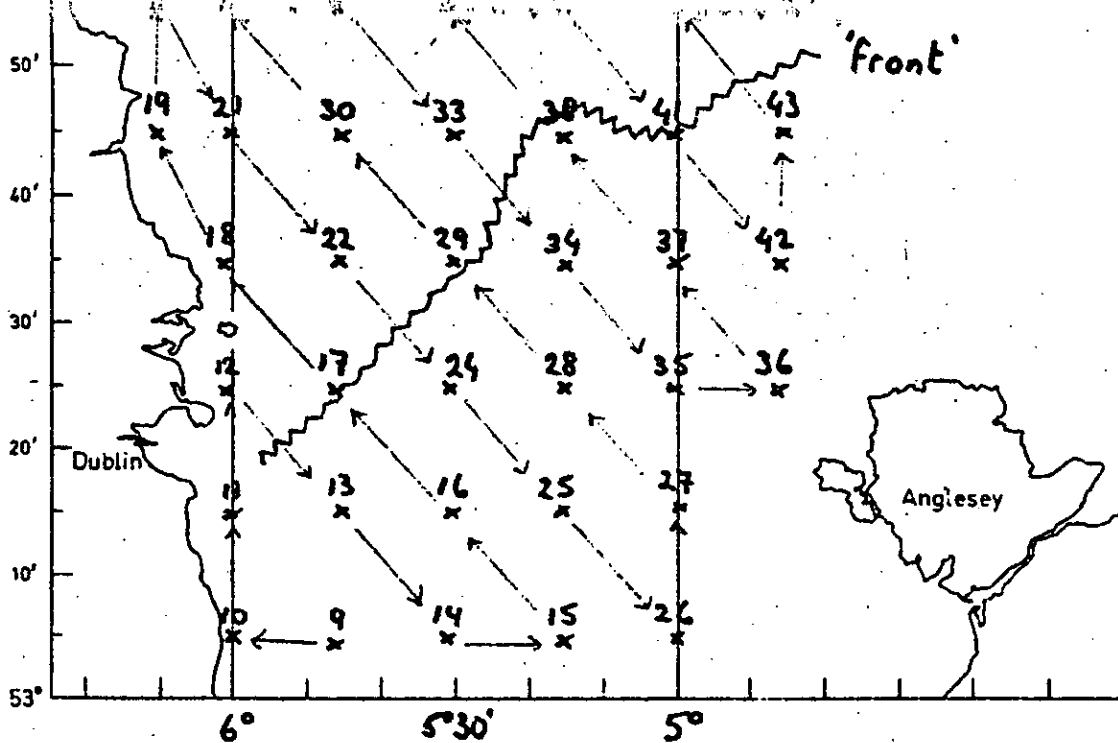


Fig 1. First plankton grid 25-27 May

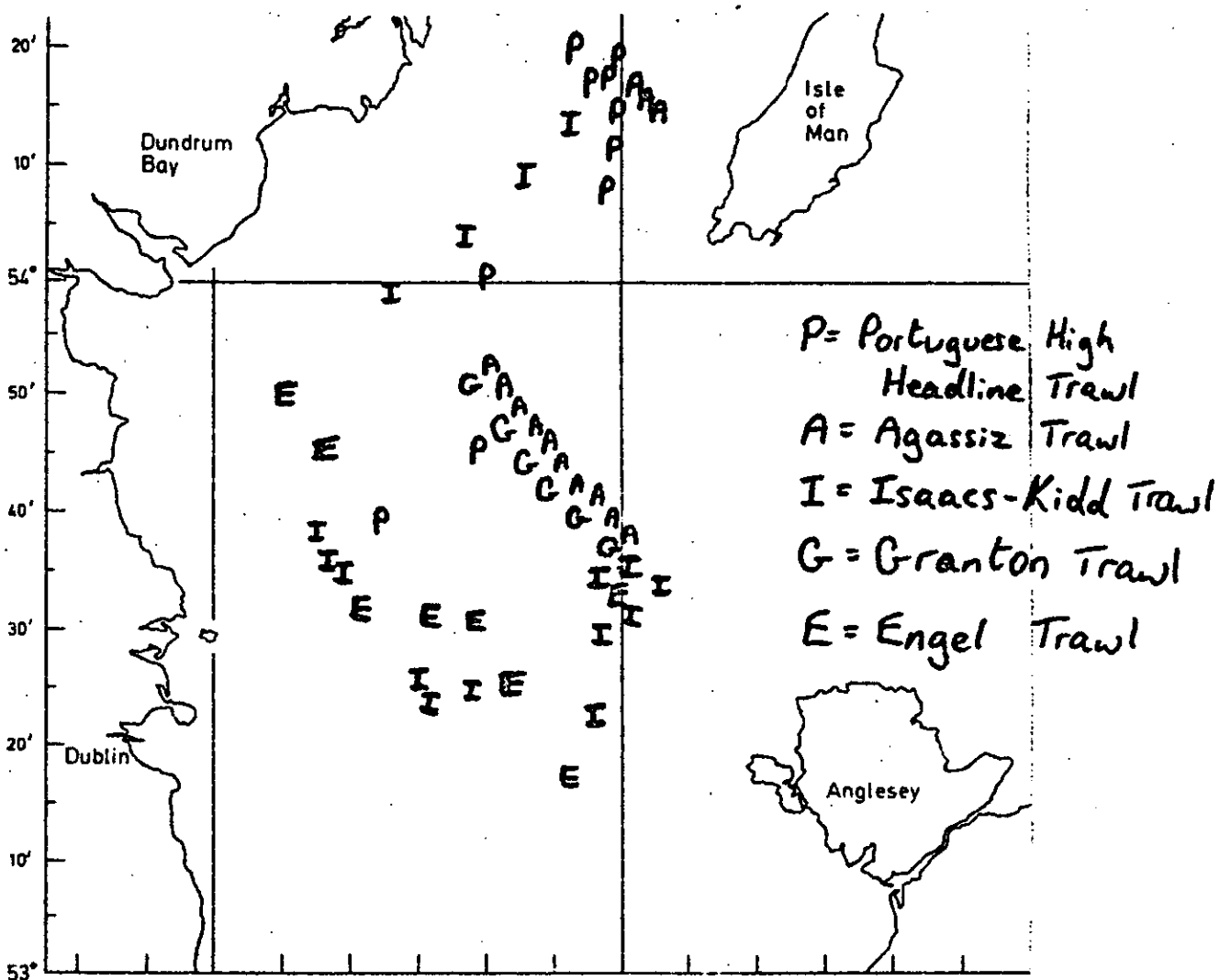


Fig 2. Trawl station positions

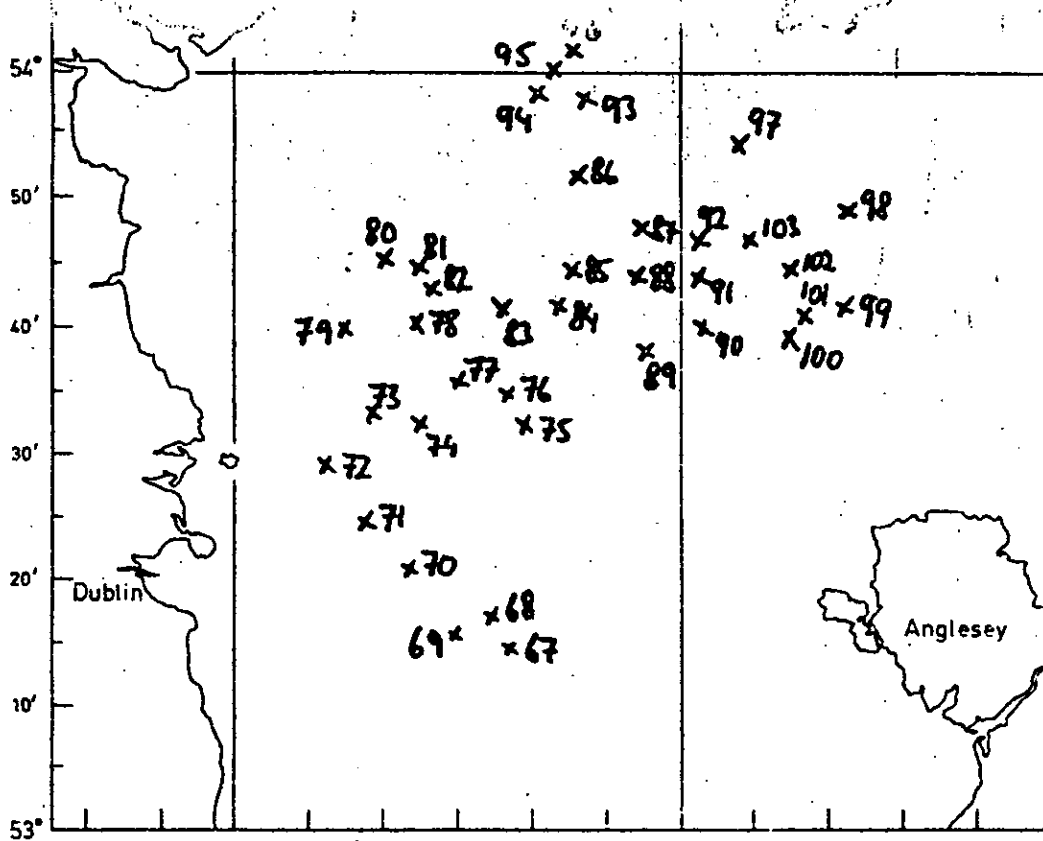


Fig. 3 Second plankton grid 31 May - 1 June

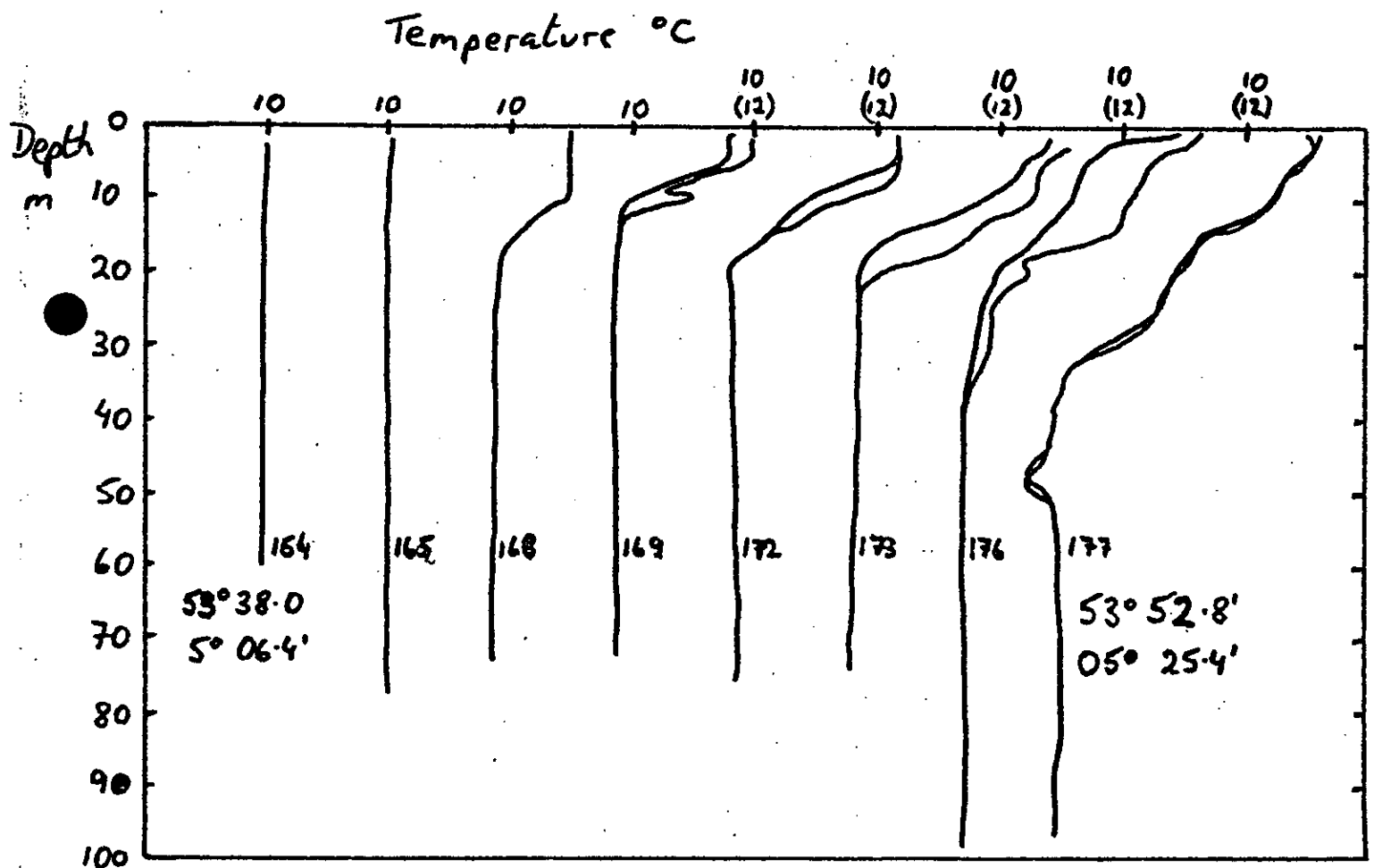


Fig 4. Temperature profile on 10 June

Fig 5
Third plankton
grid 12-13 June

