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

1986 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA: CRUISE 5

STAFF

J H Nichols
C L Whiting
B F Riches
D R Eaton
S M Stevens
S P Milligan
Ms L S Emerson
Mrs G M Haynes
N R Collins (IMER Plymouth) 9-23 May
T L O Davis (CSIRO, Tasmania) 9-23 May
S H Coombs (IMER, Plymouth) 23 May-5 June
D B Robins (IMER, Plymouth) 23 May-5 June

DURATION

9 May-5 June

LOCALITY:

Western Approaches, Celtic Sea and Biscay.

AIMS:

1. To conduct a plankton survey using the 53cm sampler with Guildline CTD, to assess the production of mackerel eggs from the western stock.

2. To sample mackerel on the spawning grounds using either a bottom or midwater trawl and to take samples for fecundity estimates. Other groundfish will also be sampled from the bottom trawl hauls.

3. To monitor continuously sub-surface sea water for temperature, salinity and chlorophyll 'a' fluorescence. Periodic calibration of the chlorophyll 'a' measurements will be made by acetone extractions.

4. To undertake additional sampling to study the spawning environment and recruitment processes in relation to mackerel eggs and larvae as part of the IMER parallel research programmes.

NARRATIVE:

RV CIROLANA sailed from Lowestoft at 0915h and proceeded through the English Channel towards the first plankton sampling station at latitude 49°15'N longitude, 06°15'W. A heavy swell delayed the start of sampling until 0830h 11 May. Thereafter the plankton sampling survey interspersed with bottom trawl hauls and tows with the Longhurst-Hardy plankton recorder (LHPR), progressed at a satisfactory pace (Fig 1). There were three interuptions for bad weather, totalling 36 hours, before the final sampling station on the first half of the cruise was completed at 2230h 22 May. Passage was made for Falmouth arriving there at 1045h 23 May. Staff were changed and IMER's sampling equipment for the second half was taken on board. The vessel left Falmouth at 1300h 24 May and returned to the plankton sampling grid at latitude 48°45'N longitude 06°45'W. The Undulating Oceanographic Recorder (UOR) and the IMER 200khz towed transducer were rigged and tested on passage. The transducer remained in situ towed from the derrick over the port quarter, for the rest of the survey.

The following eleven days were spent sampling between latitude 49°45'N and 47°15'N. Plankton samples were taken in rectangles not sampled during the first half of the cruise, and repeat samples taken in selected rectangles in the centre of the mackerel spawning area (figure 2). The first sampling transect was made with the UOR on 25/26 May across ridges in the vicinity of the Great Sole Bank. At 1930h 27 May, after waiting 6 hours for suitable weather, the IMER sediment trap was set at latitude 49°08'N longitude 09°45'W in rectangle M18. The anchored trap was marked with a MAFF surface toroid. One LHPR haul and a larval collection tow in L18, and ten standard samples along rows M and L were taken before returning to rectangle M18 on 29 May. During the following 24 hours a series of standard plankton hauls and three demersal trawl hauls were made in this rectangle in relation to bottom topography. Larval collection tows and an LHPR haul were also made. On completion of sampling in M18 at 0140h 30 May a UOR transect was made across Little Sole Bank on passage to rectangle K13 to continue standard plankton tows out to longitude 11°00'W on rows J and H. During this sampling south of latitude 48°N two bottom trawl hauls were made on La Chapelle Bank on 31 May and 35 nml south-east of La Chapelle on 1 June. A larval collection tow was also made in this area. On completion of plankton sampling south of latitude 48°N at 1900h 1 June, passage was made back to the position of the sediment trap taking standard plankton samples along row K from longitude 5°15'W to 7°15'W, and towing an UOR from rectangle K13 to M16. The IMER sediment trap was recovered intact, approximately 2nml from its position at laying, in dense fog at 1930h 2 June. From 2030h to 0230h 3 June an intensive series of larval collection hauls and an LHPR was taken in rectangle M18 in relation to variation in chlorophyll levels vertically. After an 11 hour steam the final plankton sampling station at latitude 48°45'N longitude 6°15'W was completed at 1430h when course was set for Lowestoft. RV CIROLANA docked in Lowestoft at 0900h 5 June.

RESULTS

1. A total of 143 hauls with the standard plankton sampler was made within the mackerel spawning area between latitudes 47°00'N and 51°30'N. Within this area seven rectangles at the western edge on rows J, L, N, R and S were not sampled, and six rectangles in rows H, J and K close to the French coast, were also unsampled. The two rectangles at the eastern end of row L, where adjacent rectangles had no mackerel eggs, were not sampled. Three rectangles at the eastern edge on row N, and five south of Ireland on row S, not sampled by RV CIROLANA, were subsequently covered by RV SCOTIA. Most of this survey area was covered once during the first half of the cruise including all the rectangles in the central area of potentially high egg abundance, identified by the working group for priority coverage. Sampling in most of the high priority rectangles between latitude 47°15'N and 49°45'N was repeated during the second half of the cruise. The ratio of sampling between the areas of potentially high and low abundance was approximately 1:1 for the whole survey period, excluding the series of fourteen consecutive samples taken in M18.

Some samples were roughly sorted at sea and they confirmed the similarity in the spawning distribution with previous surveys of the area. Highest numbers of recently spawned eggs were found along the shelf edge in rows P and R. High numbers of older eggs were also found in these rectangles but the peak abundances of late stage eggs and of larvae were found between the shelf edge and longitude 8°30'W onrrows K, L and M. Few mackerel eggs or larvae were found in the area south of latitude 48°N.

No thermoclines of sufficient intensity to justify modification of the sampling strategy were found during this cruise. As a result all plankton hauls were either to 200m depth or to the bottom when this was <200m.

The logging software for the standard sampler tows, supplied by RSG3, was not working satisfactorily at the start of this cruise. The major problems were in the programme to calculate volume of water filtered, which gave nonsense answers. This together with problems with the plotting packages, were satisfactorily resolved by Messrs Stevens and Riches during the first few days of the cruise. Details of the problems and their solutions are available on the computer faults log.

2. Eleven bottom trawl hauls were made during the cruise the positions of which are shown in figures 1 and 2. Catches of mackerel were generally small ranging from 0.6 kg (2 fish) on La Chapelle Bank to 234 kg in two hours on the Cockburn Bank. Of the other species caught, horse mackerel was by far the most abundant with a catch of 1510 kg in two hours on the Cockburn bank and 1333kg in one and a half hours at latitude 51°10'N longitude 11°09'W. A catch of 657 kg of boar fish was taken in one hour on the Little Sole Bank on 20 May. The catch data were entered and processed on the groundfish survey suite on the computer, where catch details and summaries are available.

A total of 326 mackerel and 268 horse mackerel otoliths were taken from the pelagic sampling areas 7 and 8. Otoliths of 70 hake were also taken, and 93 megrim (L whiffiagonis and L boscii) were frozen whole, for subsequent analysis at the laboratory.

Forty four specimens of mackerel were taken for fecundity studies. Ovaries from these fish were fixed in Gilsons fluid or formalin for subsequent whole ovary counts or for histological estimation of fecundity.

Sixty blood samples were taken from fourteen species of fish and returned to the laboratory frozen for subsequent species typing by FSM3.

3. Sub-surface sea water was monitored continuously for temperature, salinity and chlorophyll 'a' fluorescence. The logging software for these data, supplied by RSG3, did not work and only chart records are available for the first half of the cruise. The software was re-written on board by Messrs Riches and Stevens and as a result logging was available for most of the second half of the cruise.

Chlorophyll 'a' fluorescence over much of the area gave values of about 1.0 ug Chlorophyll 'a' per litre seawater. Values up to 2.0 ug/litre were found over some parts of the shelf and up to 5.0 ug/litre at the south-eastern corner of the survey area. Regular calibrations of the readings were made by acetone extraction of the filtrate from sub-surface samples.

4. a) UOR Sampling

Over a total distance of about 170 miles 17 UOR tows were completed on three NW-SE transects across the submarine ridges at the edge of the Celtic Plateau. Preliminary inspection of the data showed considerable variation in the degree of thermal stratification and levels of sub-surface chlorophyll along the transects. There was some evidence that stratification was locally depressed over the top of the ridges. Plankton samples for subsequent analysis were taken on all tows.

b) LHPR tows

Eight LHPR hauls were taken with coarse and fine mesh systems. Valid samples were taken on all hauls. Samples of larvae were removed from 4 hauls for RNA/DNA, CHN, EM, HPLC and enzyme analysis. Laboratory analysis of the remainder of the LHPR samples will be used to compare these nutritional analyses with the food through the water column and will also give vertical distributions of the eggs and larvae.

c) Experimental Feeding of Mackerel Larvae

Mackerel larvae were reared from two artifical fertilisations from trawl caught adults. Four days after hatching the yolk-sac larva were transfered to rotating incubation chambers and fed separate diets of diatoms, copepod faecal pellets, copepod eggs and nauplii with an additional duplicate control sample of starved larvae. Over the subsequent 6 days of the experiment mortality was around 25% per day. No larvae were observed to feed. Emaciated specimens were preserved for RNA/DNA, enzyme and CHN analysis.

d) High-frequency echo-sounder

The 200 kHz echo-sounder was run continuously throughout the second half of the cruise. Relatively weak signals were recorded for the plankton in the water column compared with previ s years, probably due to the low degree of thermal stratification and dispersed distribution of the plankton.

e) Additional TTN tows in M18

Fourteen additional TTN plankton tows were made in rectangle M18 to investigate the within rectangle variability of egg numbers and their distribution in relation to Cockburn Bank which is aligned across this rectangle. The hauls were separated into three groups; those taken along the top of the ridge, in the trough between Cockburn Bank and the adjacent ridge and on either side of the ridge slope. Fine mesh pup samples were taken on all these tows to give additional information on available food for mackerel larvae.

f) Sediment trap

A 60cm diameter sediment trap was deployed in rectangle M18 for 6 days to determine any flux of mackerel eggs and larvae to the sediment. Recovery was successful and the sample preserved for subsequent analysis.

g) collection tows for nutritional analysis of mackerel laraae.

Ten TTN hauls were made to obtain mackerel larvae for nutritional anlaysis. Fine mesh pup samples were taken on all tows to provide an index of food availability. Samples of larvae were removed from these tows for RNA/DNA, CHN, lipid, HPLC, EM and enzyme analysis.

Note: Regular radio contact on 2431 kHz was maintained with the RV Tridens and RV Scotia throughout most of the survey in order to ensure an adequate sampling coverage of the area.

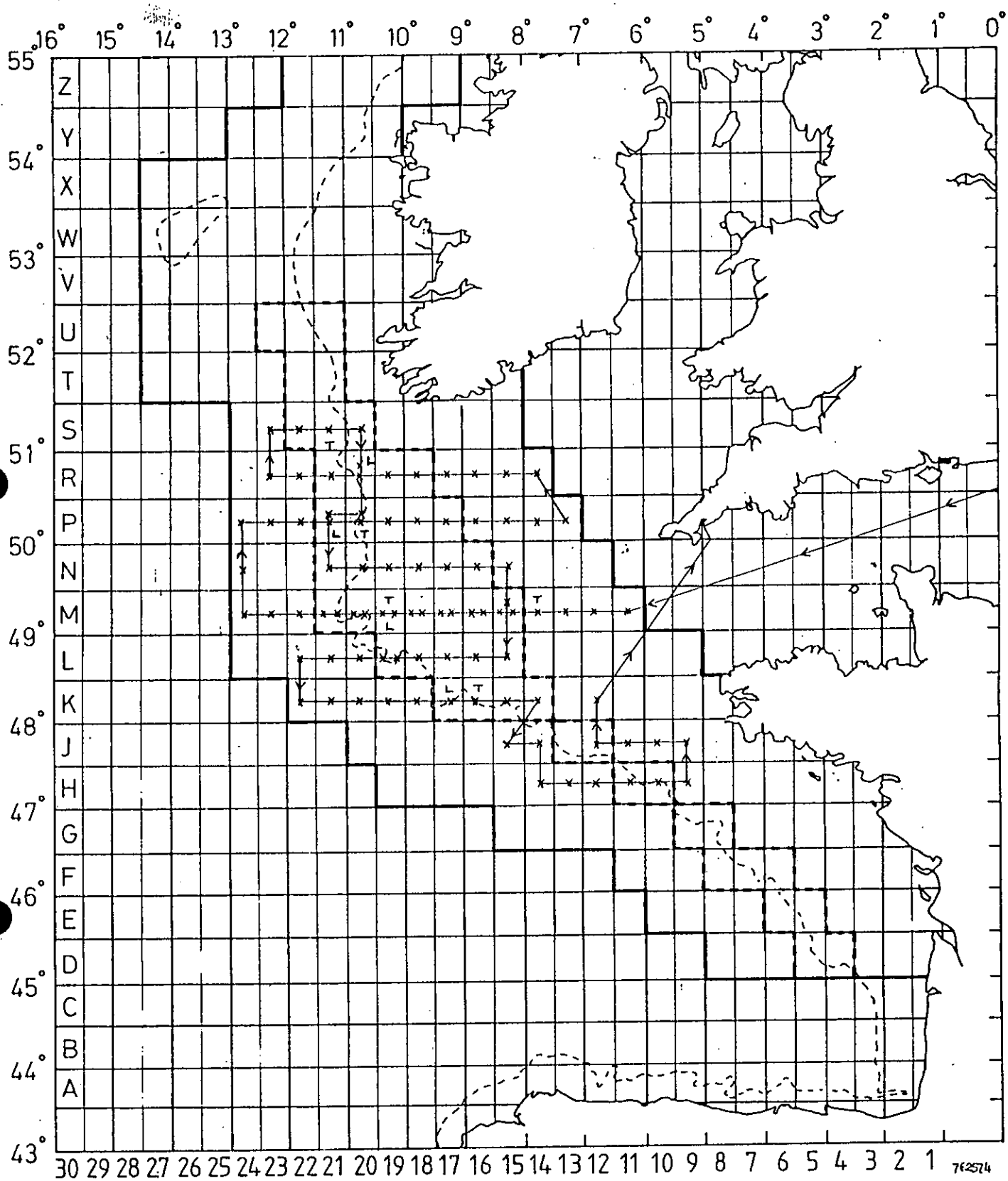
J H Nichols

SEEN IN DRAFT M J Willcock (Master)
P MacKay (Fishing Skipper)

INITIALLED: D J G

DISTRIBUTION: BASIC LIST+
Staff on Cruise

CIROLANA S/86 1ST SURVEY

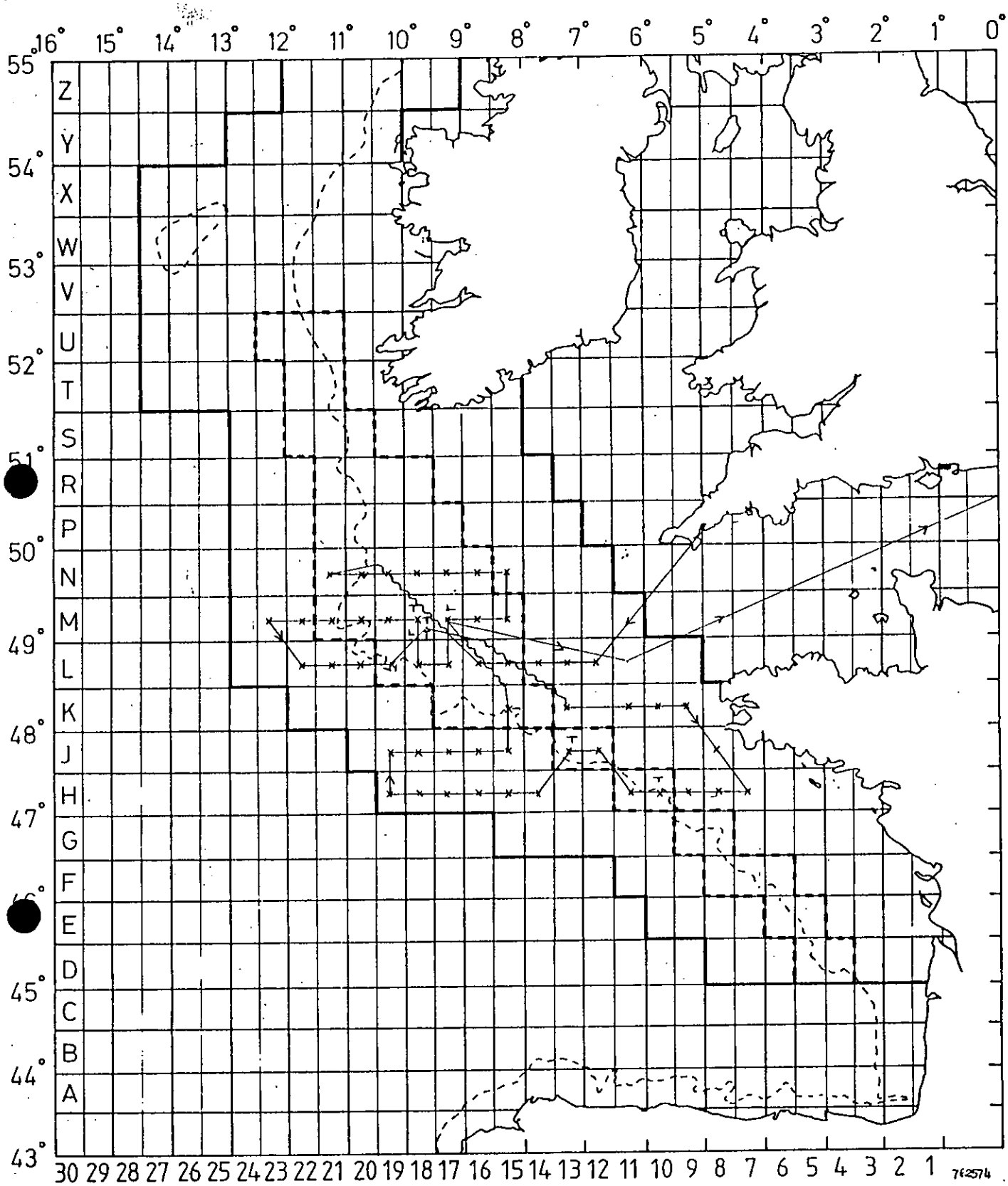


x STANDARD PLANKTON TOWS

T BOTTOM TRAWL HAULS

L L.H.P.R. TOWS

CIROLANA 5/86 2ND SURVEY



x STANDARD PLANKTON TOWS

T BOTTOM TRAWL

L L.H.P.R. TOWS

U.O.R TRANSECTS