

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

1985 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA: CRUISE 8

(PROVISIONAL: Not to be quoted without prior reference to the author)

STAFF

J H Nichols
Mrs B M Thompson
T J Hulme
R S Millner
J Dann
P A Large
P M Hudson
A E Mitchell (IMB Aberdeen)
G Bunn (20 September-1 October)
B C Mumford (28 September-1 October)

DURATION

1230h 20 September - left Lowestoft
0750h 11 October - Docked South Shields

LOCALITY

West Central North Sea

AIMS

1. To participate in the ICES coordinated herring larval survey of region IVB during the two sampling periods 16-30 September and 1-15 October.
2. To study the drift and mortality of herring larvae in the area from hatching through their planktonic phase.
3. To study herring larvae diet including the availability of food organisms.
4. To study the vertical distribution of herring larvae in relation to food organisms and potential predators.
5. To sample herring larvae, other zooplankton and phytoplankton for lipid analysis, with emphasis on polyunsaturated fatty acids.
6. To sample potential herring larvae predators and to examine their gut contents on board.
7. To collect samples of herring larvae for subsequent analysis of feeding status.
8. To monitor sub-surface water continuously for salinity and chlorophyll 'a' fluorescence and to take some measurements in profile.
9. To conduct sea trials on the performance of the HP 9000 computer.
10. To use the neuston net at 9 selected stations to look for turbot larvae.

NARRATIVE

RV CIROLANA sailed from Lowestoft at 1230h 20 September and anchored off Corton for trials with the MBA plankton pump at 1400h. On successful completion of these trials at 1830h Messrs Head and Young (MBA Plymouth) and Mr B Riches were returned to Lowestoft by ships workboat.

On route to the first plankton sampling station some trials were conducted with different depressors and lead ballast on the 53cm sampler. Sampling on the herring larvae survey grid (figure 1) began at 0630h 21 September, at the southern end of the area. the survey progressed in calm weather with poor visibility at times until 1315h 24 September when the 800 Engel trawl was shot on heavy midwater traces off Robin Hoods Bay. After two Engel tows the plankton survey was resumed at 1700h and proceeded until interrupted by an accident to a deckhand at 0900h 25 September. CIROLANA made the passage from the easternmost end of the survey leg at latitude 53° 55'N, to the Tyne in 7½ hours to land the injured man by pilot cutter. The larvae survey was resumed in Tees Bay at 1800h on the same day.

At 1400h on 28 September with only two larvae survey stations remaining, two 'Argos' buoys together with Mr B Mumford, were taken on board by pilot cutter from South Shields. The first buoy was rigged immediately and released in a patch of small herring larvae at 1830h, at latitude 55°15'N, longitude 01° 10'W. The final station of the larvae survey was completed 20nml further south at 2045h on the same day. Passage was then made to an area off Robin Hoods Bay where high densities of yolk sac herring larvae had been noted earlier. The following 48 hours were spent sampling in this 'patch' using the MBA plankton pump, the 53cm sampler and a one metre net. During sampling the second 'Argos' buoy was released at 0900h 29 September at latitude 54° 25'N, longitude 00°11'W.

At 0900h 1 October CIROLANA docked at North Shields where Messrs Bunn and Mumford together with the HP 9000 computer were disembarked to return to Lowestoft by road. The vessel left North Shields at 0945h on the same day and commenced sampling with the 53cm sampler on a concentrated grid of 46 stations south of latitude 54° 45'N and west of longitude 01° 00'E (figure 2). This survey was completed by 0930h 3 October at the southernmost station. A series of four hauls to collect live larvae was made between 1300h and 1700h at positions indicated on figure 2. At 1900h the Engel trawl was shot in the area of highest herring larvae abundance, about 15nml off Scarborough, and towed for one hour. After two further larvae collection tows in the same area passage was made to the south to begin a second plankton pump station at latitude 53° 45'N, longitude 00°25'E. On arrival there at 0130h 4 October the sea conditions were judged unsuitable for rigging the pump before daylight and CIROLANA hove to for seven hours. Rigging the pump began at 0830h and pumping began at 1000h using the bow thruster to maintain station and to provide a stable platform in the strong SW wind. Pump sampling continued at approximately four hourly intervals until 0100h 5 October. There was a short stoppage to recover and redeploy the system when the hydrographic wire used to hold the intake pipe parted. After final recovery of the pump overnight passage was made to Tees Bay where the final larvae survey grid of the whole area began at 0800h 5 October (figure 3).

Reasonable weather prevailed throughout the remainder of the cruise and the final sampling station, off Whitby was completed at 0300h 11 October. CIROLANA docked in South Shields at 0750h on the same day. Scientific staff and crew departed for Lowestoft by coach at 1515h, arriving at the laboratory at 2315h.

RESULTS

AIM 1

A total of 132 sampling stations were completed with the 53cm sampler within the standard sampling period 16-30 September. Preliminary estimates of the abundance of <10mm herring larvae (figure 4) indicate an exceptionally high larvae production over a large area off the Yorkshire coast. Peak abundances were >10,000 larvae per square metre with ten standard stations having >1000- <10mm larvae per square metre. These abundances compare with just a single station over 1000 larvae per square metre during the comparable sampling period in 1984. There were practical difficulties in complying with the herring larvae working group's recommendation to take three or four extra samples in rectangles where there were more than 1000 larvae per haul. Twenty four additional samples were taken south of latitude 55°N in the nine rectangles with highest larvae numbers. Preliminary counts of these samples show a remarkable consistency in the distributions over a wide area.

Abundance of <10mm larvae was also high in the area north of latitude 55°N, with a peak value of about 700 per square metre off Druridge Bay. There was no evidence of any larvae production at the south eastern corner of the survey area or in the vicinity of the south west patch of the Dogger Bank, during the first survey. The 108 standard sampling stations were repeated in the period 5-11 October. Preliminary counts were not done on these samples, but a quick examination of the jars confirms the continuing high production of larvae off the Yorkshire coast and in the Dowsing area.

The most remarkable feature of the final survey was the reappearance of larvae production along the western edge of the Dogger in the vicinity of the SW Patch. Small herring larvae, 8-11mm were noted in many samples in this area, which was also subject to a heavy outburst of phytoplankton production.

AIM 2

The dense patch of recently hatched larvae found off the Yorkshire coast on the first survey should provide a clearly identifiable cohort for growth and mortality estimates. This area of high larvae abundance was sampled for a second time between 1 October and 3 October, and again during the last two days of the cruise. On the second survey a further hatching, with yolk sac larvae abundances up to 15,000 per square metre, was found off Scarborough some 15nml SE of the original patch. Both these hatching groups and the production at the Dowsing, should still be sampled as <20mm larvae during the CLIONE 13/85 survey in the second half of October.

The 'Argos' satellite tracked buoys, which were not available until the end of the first survey, were released on 28 and 29 September. The first was released in a patch of small 'Longstone' larvae off the Northumberland coast, the second in the dense patch of yolk sac larvae 12nml off Robin Hoods Bay (figure 1). Data retrieval from the buoys was plagued by numerous problems on shore and no information on their positions was received for the first four days. Subsequently five daily positional updates were received which suggested that the transmitters were functioning correctly.

The most northerly buoy moved ca:11nml southwards during the first five days and then south-eastwards at a similar rate for the remainder of the cruise. The southern buoy drifted steadily south eastwards at ca: 2.8 nml per day. These early indications suggest that the modifications to the rig and drogue are working satisfactorily.

AIM 3

A total of 96 samples were taken with a naked 35 micron mesh net attached to the 53cm sampler above the Guildline cage. The samples were taken on stations south of latitude 54° 40'N and west of longitude 1°E on each of the three coverages of this area. These samples will be used to assess the abundance and production of food organisms found in the gut contents of herring larvae from this area.

AIM 4

The MBA plankton pump was successfully operated on two occasions during the cruise. The system delivers approximately 7,500 litres per minute via a 14cm diameter intake pipe and a submersible centrifugal pump. The water is filtered through a 200 micron mesh net, water cushioned inside a canvas cone mounted outside the ships starboard bulwark. The intake pipe was fitted with a MAFF depth transducer for accurate discrete sampling. Ten minute (75,000 litre) samples were taken at 10m depth intervals from 10m depth to the bottom and 5 minute samples at the intermediate 5m depths on return to the surface. In depths of 50m to 60m sampling took approximately two hours.

The first series of samples was taken in calm conditions over a 28 hour period in the patch of <10mm herring larvae off Robin Hoods Bay. The second series was taken in a patch of bigger larvae 35nm to the south east. Poor weather conditions and the limitation of long term running of the bow thruster restricted sampling to a 14 hour period.

Preliminary examination of the samples shows some diurnal variation in the stratification of the larvae, but with few occurring in the bottom 15m at any time. Crustacean zooplankton shows a clear layering at all times. Until catches in the pump system can be compared quantitatively with standard sampler tows taken in the same areas, it is not possible to comment on the efficiency of the pump for the range of herring larvae sizes encountered.

AIM 5

Herring larvae for lipid analysis were collected between 29 September and 5 October using the 53cm sampler, the MBA submersible pump and a one metre net. Larvae were grouped by length in the ranges: 6-8mm, 8-10mm, 10-15mm, 15-20mm and 20mm. Thirty seven samples were obtained in this way and immediately stored in liquid nitrogen.

Unfertilised eggs were obtained from one ripe female herring taken in the Engel trawl on 3 October. Three samples were taken and frozen. Several samples of zooplankton were also collected.

Seven 14 litre samples of seawater were taken at various points in the latter half of the cruise. They were filtered through glass fibre papers which were then stored in liquid nitrogen.

All samples will be taken back to the Institute of Marine Biochemistry, Aberdeen, for lipid analysis.

AIM 6

A single Engel trawl haul was made in the area of high herring larvae concentrations off the Yorkshire coast. Midwater traces over the whole area were sparse but the one hour tow did yield a basket of herring ranging in size from 13cm to 28cm, a few grey gurnards, dragonets and one mackerel. Examination of their gut contents on board proved impracticable. Instead, stomachs were removed from a representative sample of the herring (160 fish) and all other fish, and fixed in 4% formalin in individual bags for subsequent analysis at the laboratory.

AIM 7

A total of 156 herring larvae ranging in size from 6mm to 20mm were collected from selected areas during the period 29 September to 5 October, using the 53cm sampler and the MBA submersible pumps.

Morphometric measurements were made and the specimens fixed in Bouin's fluid for 24-48 hrs before being measured again and transferred to 70% alcohol in preparation for histological examination, and assessment of feeding status.

AIM 8

Sub-surface water was monitored continuously throughout the cruise for chlorophyll 'a' fluorescence using the Turner design's fluorometer. During the first larvae survey sub-surface temperature and salinity were also monitored. Sub-surface salinity and temperature were continuously logged to the HP 1000 computer but chlorophyll 'a' fluorescence is available only as a chart record.

A single profile of chlorophyll 'a' fluorescence with depth was taken at the first plankton pump station.

Using the Guildline CTD unit on the standard plankton sampler, profiles of temperature and salinity were taken concurrently with each deployment. A strong thermocline at 30-40m depth was present on the first survey at the north eastern corner of the sampled area (figure 5). This thermocline was still evident on the final survey at the beginning of October.

Three hauls were made with the 800 Engel trawl, two in Robin Hoods Bay and one approximately 15nm east of Scarborough Castle. The hauls in Robin Hoods Bay were made during the afternoon of 24 September, the first on traces close to the surface, the second on traces just off the bottom. The traces were identified as 0-group sprats near the surface and 0-group herring near the bottom. A length stratified sample of herring was preserved for racial character analysis.

During the early evening of 3 October, the Engel trawl was shot in an area where echo traces of the small plume type had been noted earlier. A total of 289 herring were caught from which a length stratified biological sample of 160 fish was taken. Most of these fish (84%) were from the very strong 1983 year class, having low maturity stages (≤ 2) and a mean length of 19.8cm.

ADDITIONAL AIMS

9. The HP 9000 computer was given a satisfactory ten days sea trial. Unfortunately, there were calm conditions throughout this period and the weather limitations of the system were not put to the test.

Improvements to the air conditioned housing for the HP 1000 appear to have solved the problems associated with overheating, experienced on the previous cruise.

10. Eight half-an-hour tows with the 2m Neuston net were made at selected stations off the north east coast during the first larvae survey. No turbot larvae were taken in any of these hauls.

11. The MS 44 echo sounder was run continuously throughout most of the first larvae survey until a fault rendered the equipment u/s for the remainder of the cruise. Fish traces were patchy and fell into two distinct groups north and south of a line extending north eastwards from Robin Hoods Bay. Those to the south were mainly the small plume type, possibly herring, with one notable exception. This was a large trace between the surface and midwater at night; approximately 22nml north east of Spurn Point. This was probably a concentration of spawning herring.

Both in Robin Hoods Bay and in the area to the north of Tees Bay out to 0° longitude, small fleck traces were found. These were identified in Robin Hoods Bay as O-group sprat. The abundance of these traces in this area indicate that the 1985 year class of sprats could be present in strength along this part of the coast during the coming winter.

During the final survey a single large mid-water trace, which could have been spawning herring was noted on the colour sounder at the north western edge of the Dogger Bank.

INITIALLED : D J G

J H Nichols

22 October 1985

SEEN IN DRAFT : M J W Master

DISTRIBUTION : R C N S.F.M

Basic list+

J H Nichols

Mrs B M Thompson

T J Hulme

R S Millner

J Dann

P A Large

P M Hudson

A E Mitchell (IMB Aberdeen)

C Bunn

B C Mumford

Figure 1.

Cirolana 8/1985.

Herring Larvae Survey 1. (20 Sept - 1 Oct.)

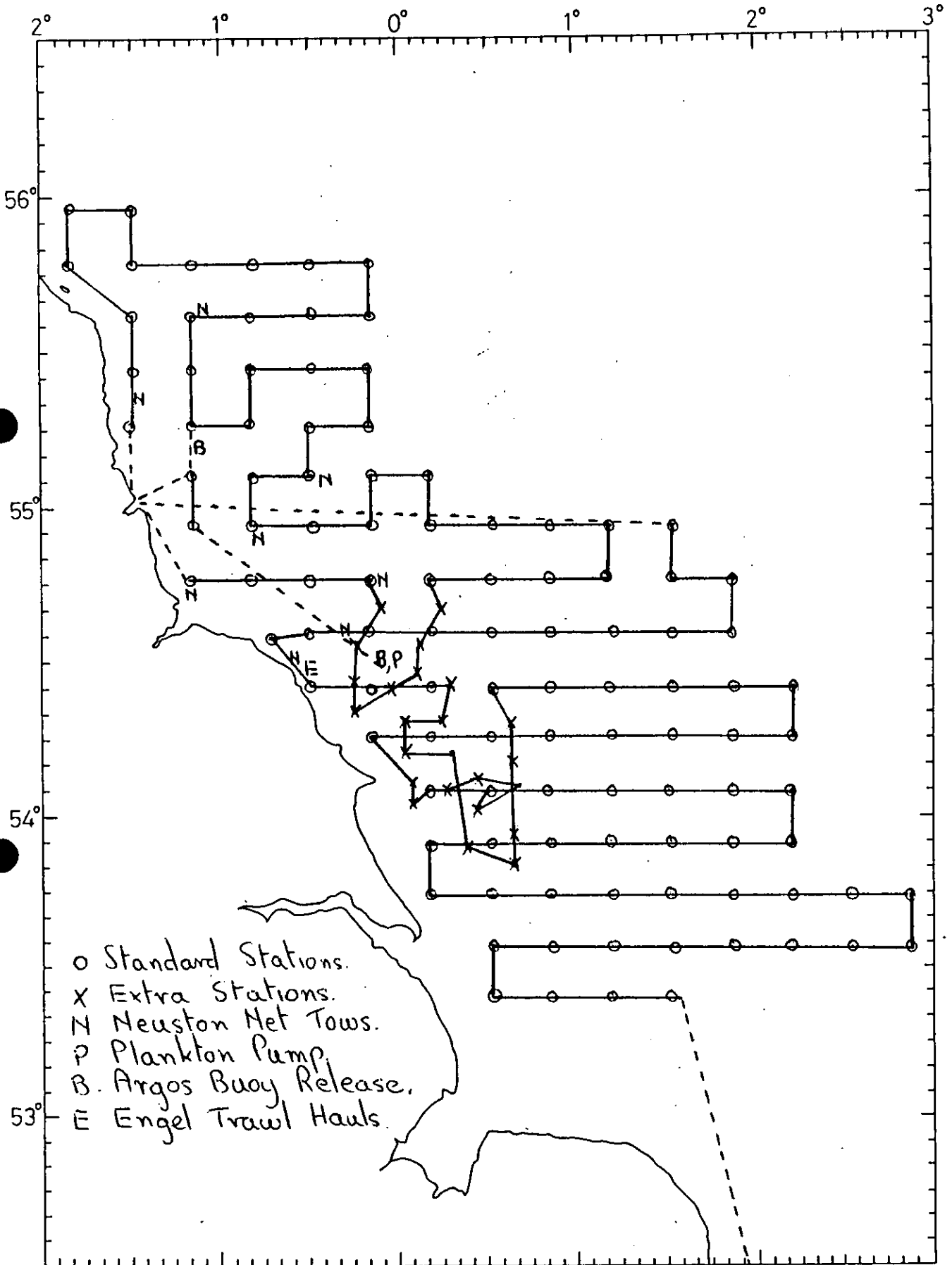


Figure 2.

Cirolana 8/1985
Herring Larvae Survey 2 (1-5 Oct.)

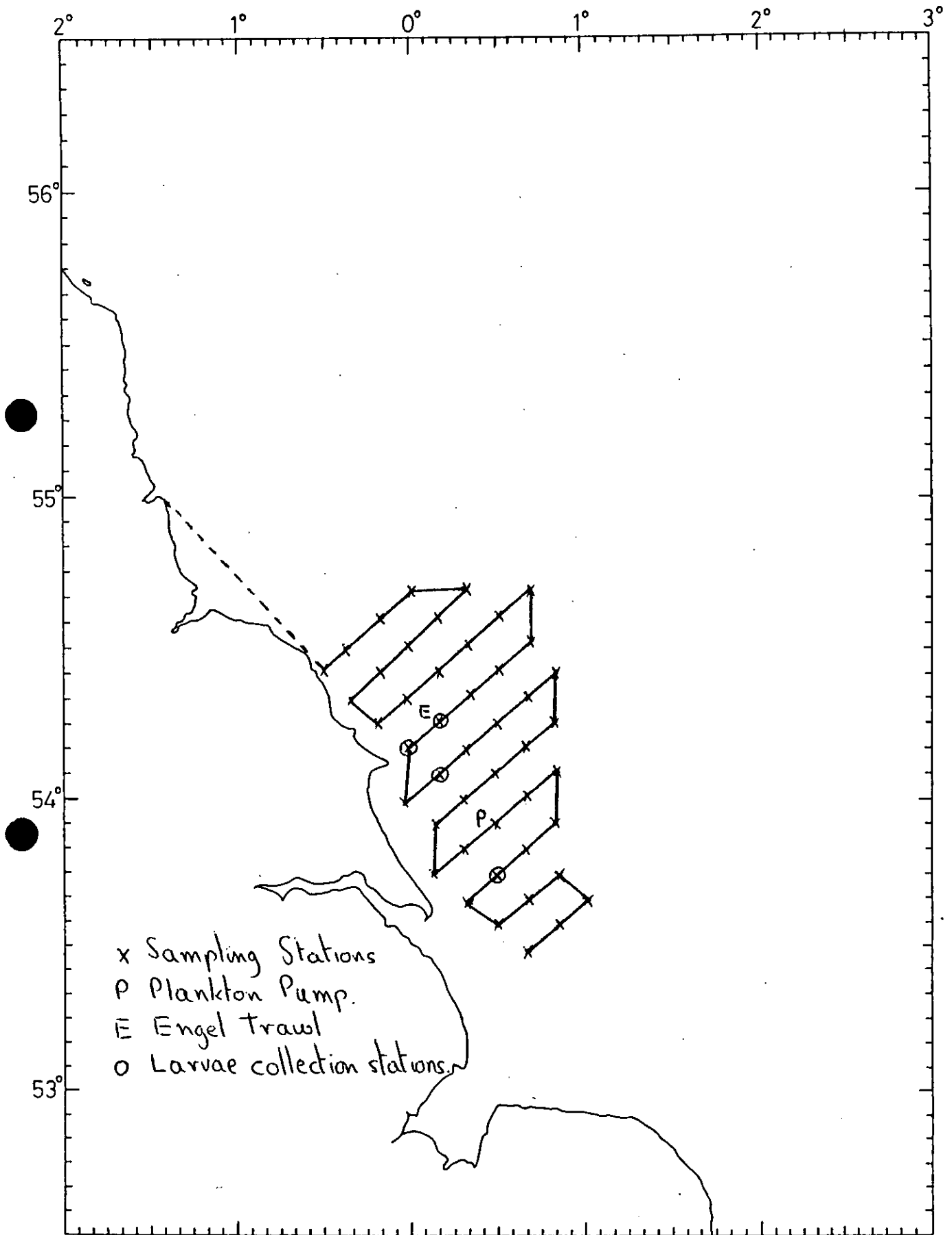


Figure 3

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Herring Larvae Survey 3 (5 - Oct.)

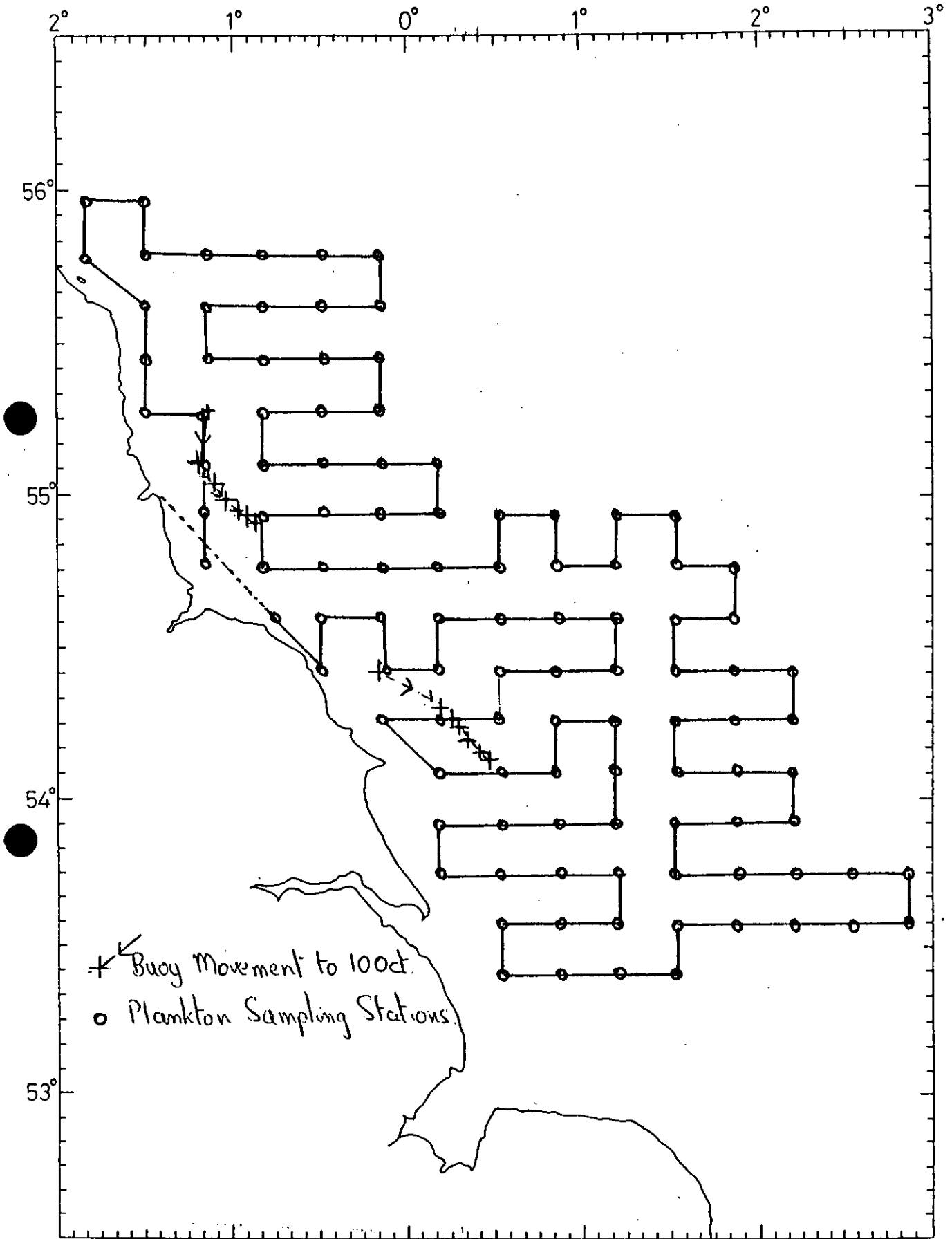


Figure 4.

Cirolana 8/1985
Herring Larvae Survey 1 (20-27 Sept.)

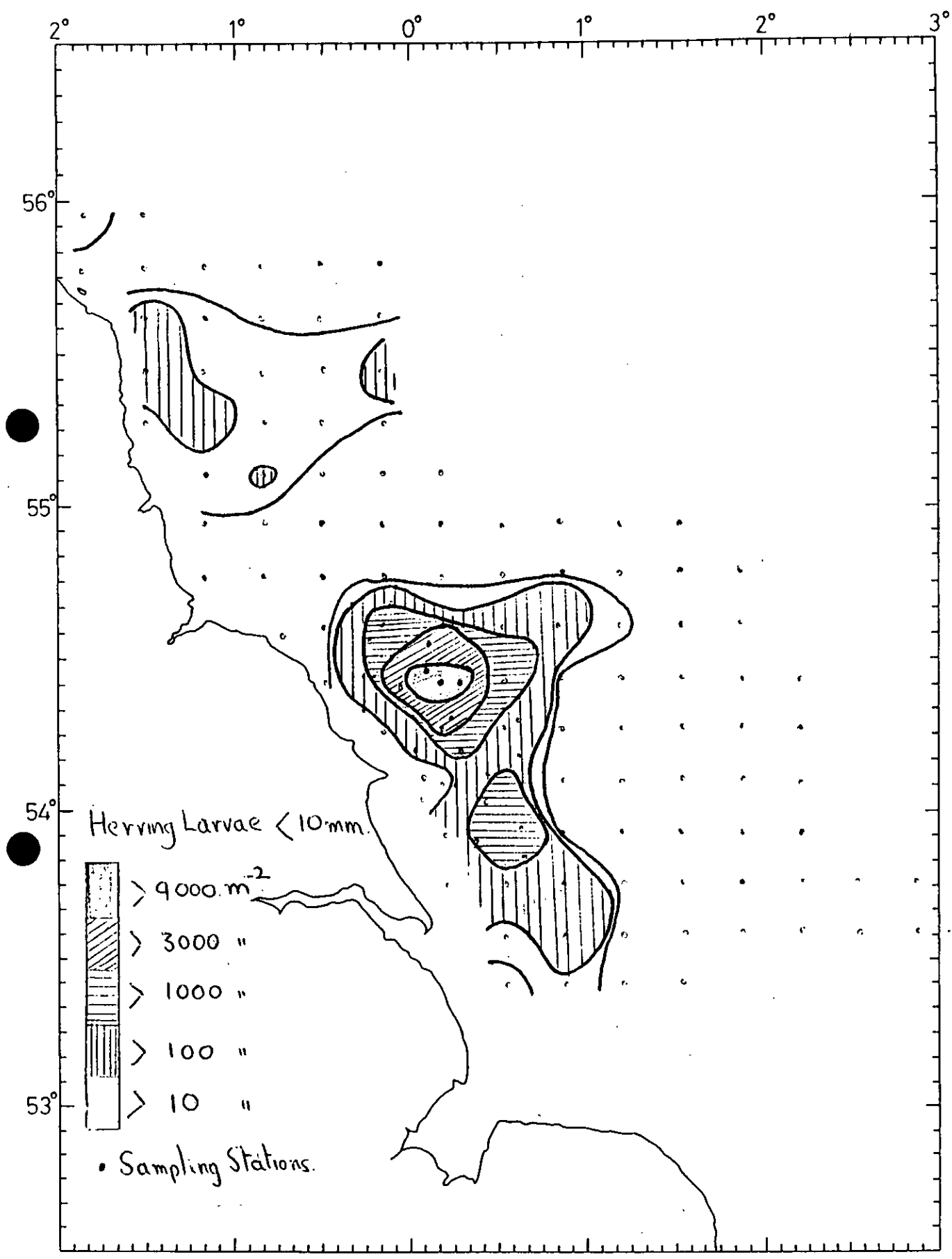


Figure 5

Cirolana 8/1985
Survey 1 (20 Sept. - 1 Oct.)

