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***Surveys For Herring Larvae Off The  
Northwest And West Coasts Of Ireland In 1981***

***By***

***Richard Grainger And Elizabeth Mc Ardle***

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Fishery Leaflet 117, Department of Fisheries and Forestry, Dublin 2.

Summary

This Leaflet describes the methods used in sampling and gives the results of the 1981 survey in a series of maps showing the distribution of the young larvae. Sampling took place at fortnightly intervals and recorded the numbers of larvae in three size groups.

The area of operation extended from Lough Foyle to Galway Bay. This region has been chosen because it is believed to include the entire spawning stock of a new assessment area for the herring.

The survey has shown that spawning moves progressively southwards during the season in October and November and that there are three main spawning areas: north of Fanad Head, west of Aranmore and between Erris Head and Inishbofin.

When the survey has been in progress for a few years it will be possible to make an improved annual assessment of the herring stock in the region which can be used by management to ensure that the fishery is exploited to the fullest extent without risk of damage to the stocks in the future.

Introduction

In order to manage a fish stock it is essential to know the total weight of the fish old enough to spawn - the spawning stock biomass - on which the next generation depends. One way of monitoring herring spawning stock biomass is by surveying for larvae soon after they have hatched from the eggs. The method is based on the principle that the number of larvae produced in a season is proportional to the parent spawning stock biomass.

The Fisheries Research Centre of the Department of Fisheries and Forestry, for the first time, carried out herring larva surveys off the northwest and west coasts in 1981. Other countries, Scotland in

particular, have surveyed herring larvae in previous years off the north coast of Donegal and, on occasions, as far south as Donegal Bay. However, spawning areas were known to exist further south and for this reason Irish surveys in 1981 extended from Lough Foyle to Galway Bay. Another reason why this sampling area is appropriate is that in 1982 for the first time assessment of herring off these coasts is based on a single new area consisting of Divisions VIa south and VII b rather than the separate treatment of Divisions VIa and VIIb (Fig. 1). All spawning within this new management area should take place within the area sampled.

Herring spawn at about the same time and in the same areas each year on gravel substrate. Unlike most commercial fish whose eggs drift in the water, herring eggs remain stuck to the sea bed until the larvae hatch out. The time taken from spawning to hatching depends on temperature but in October and November is between 8 and 12 days. After hatching the larvae drift around in the currents until they change into a fish-like form up to 4 months later. It is very difficult to determine the numbers of eggs spawned on the bottom but it is possible to estimate the abundance of larvae drifting in the water. Only larvae less than 10mm long are used for assessment purposes. The larvae reach this size within about 14 days after hatching. Thus it is desirable to repeat the sampling every fortnight so that no larval production is missed.

Herring off the northwest and west coasts are predominantly autumn-spawners, spawning between September and November, though a small proportion of winter/spring-spawning fish is taken in the catches. Three cruises were conducted on 5-9 October, 19-24 October and 4-12 November 1981. The vessel used was the MFV Johnamlin (skipper John O'Connell) and despite almost relentless bad weather fair coverage of the sampling grid was achieved. During the first cruise the area covered was from north Donegal to Donegal Bay and on the second and third cruises it was from 55°N to Galway Bay.

#### Methods

The sampling method conformed as far as possible to agreed international standards. The survey grid consisted of sampling stations at about 19km apart. At each station a Dutch-modified Gulf III plankton

sampler with 275µm aperture mesh was towed in a double oblique fashion (i.e. from the surface to near the bottom and back to the surface) while the vessel was steaming at 9km/hour. Over smooth ground sampling generally took place to within 2m of the sea bed as indicated by a shine on the depressor which hangs below the sampler. However over rough ground previous trials with depth recorders have shown that sampling to within 10m of the sea bed is typical. The volume of water filtered was measured by a flow meter mounted in the nose cone of the sampler. Immediately after the tow plankton samples were preserved in jars using the fixative of Nichols and Wood. Later all herring larvae were identified and measured for total length.

The number of larvae below each square metre of sea surface was calculated ( $\text{numbers/m}^2 = \text{numbers/m}^3 \times (\text{water depth} - 5\text{m})$ ) for each of three size groups (<10mm, 10-15mm and >15mm) at each station. The number/m<sup>2</sup> was then multiplied by the area of sea represented by that station (generally 399km<sup>2</sup>) and the resulting figures were summed for all stations to give an estimate of total abundance of each size category for each cruise.

### Results and Discussion

The distributions of larvae in the three size categories on the three cruises are shown in Figures 2-4. In early October the smallest larvae were found in moderate abundance off the Donegal coast from Fanad Head to southwest of Aranmore, with maximum abundance northwest of Tory Island (Fig. 2a). On the next cruise high abundances of small larvae occurred over a wide area west of Aranmore and also off Achill Island, (Fig. 3a). No small larvae were taken south from Inishbofin to Galway Bay. However, in the first half of November the area of high abundance of small larvae off Achill Island extended from Erris Head to Inishbofin and moderate abundances were found southwards along the coast and into Galway Bay (Fig. 4a).

The distributions of medium size (10-15mm) larvae (Figs. 2b, 3b and 4b) reflect those of the smaller larvae though they are more extensive because they have been adrift for longer. The distributions of >15mm larvae (Figs. 2c, 3c and 4c) are not adequately described because highest abundances of large larvae may have occurred after these surveys and also by the time larvae reach 15mm a large proportion may have drifted out of the survey area.

Taking into account results from Scottish surveys in 1981 as well as those reported here, the abundance of small larvae throughout the season has been summarised in Figure 5. There is a southward shift in spawning with high abundances first appearing in a broad area north of Fanad Head, then west of Aranmore and finally between Erris Head and Inishbofin. Between mid-September and mid-November small larvae were present in at least part of the area between Malin Head and Galway Bay.

The abundance of small larvae in the whole area throughout the 1981 spawning season is shown in Figure 6, where Scottish and Irish data have been combined. A minor peak in late September is evident, followed by the major peak in late October. It is intended to continue these surveys and they will be planned so that the areas of high larval abundance will be sampled at the appropriate times. By this means, it will be possible to assess the spawning stock biomass; this is essential for effective management of the herring off these coasts.

#### Acknowledgements

The authors are very grateful to Mr John O'Connell (skipper) and the crew of MFV Johnamlin and Mr Paul Gleeson (FRC) for their help and co-operation at sea, often in bad weather conditions.

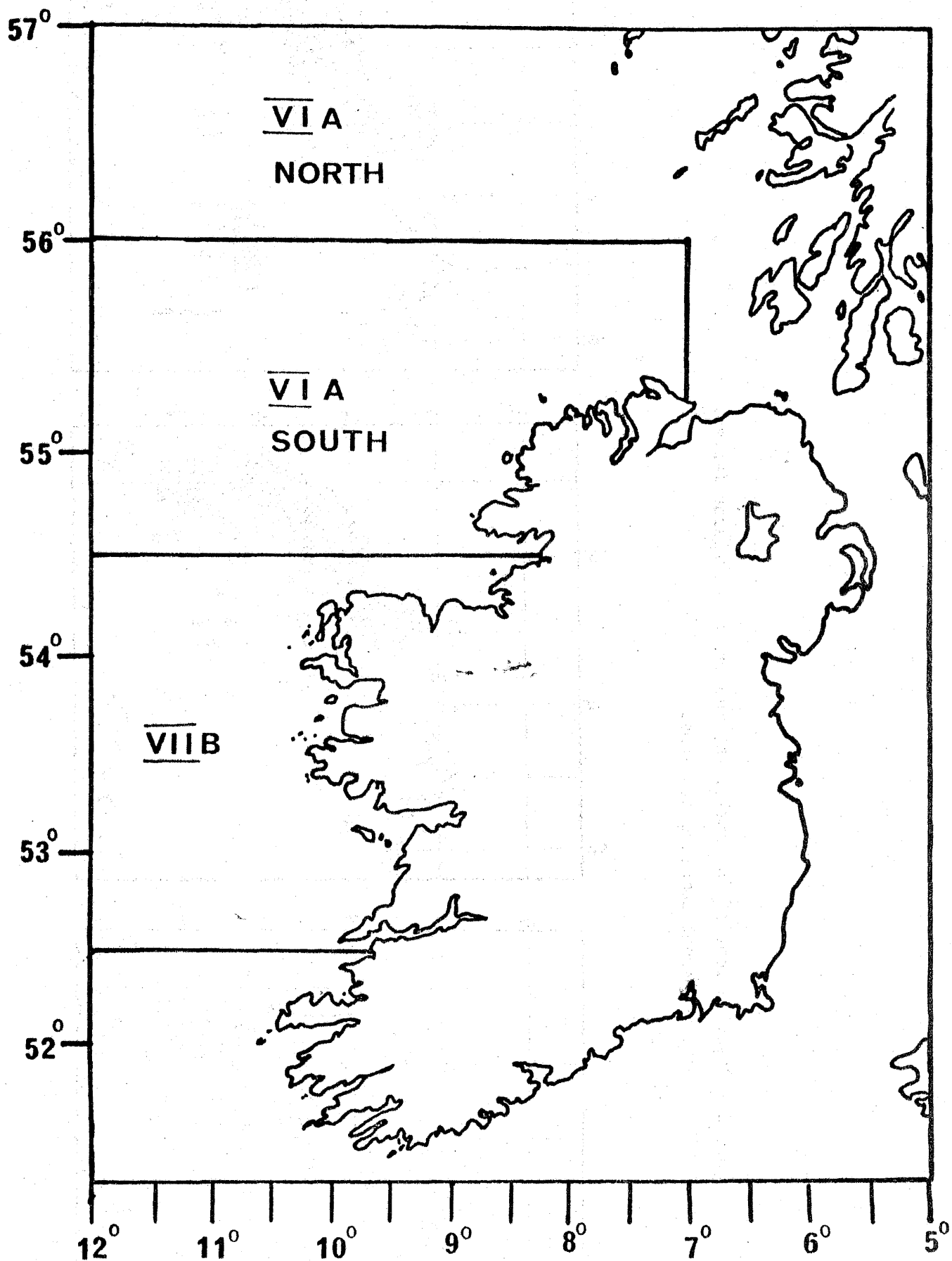


Figure 1: Sea area divisions referred to in the text.

Figure 2 : Distributions of (a) small, (b) medium and (c) large larvae.  
Dots represent sampling stations.

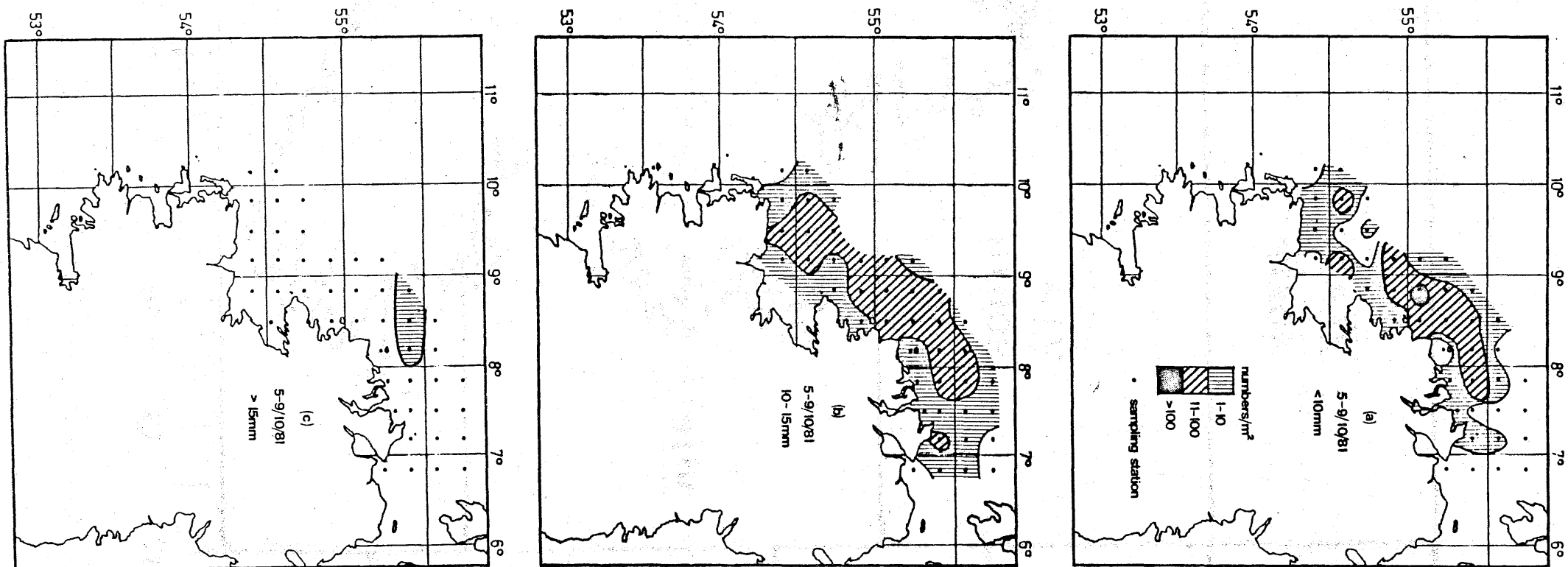


Figure 3: Distributions of (a) small, (b) medium and (c) large larvae.  
Dots represent sampling stations.

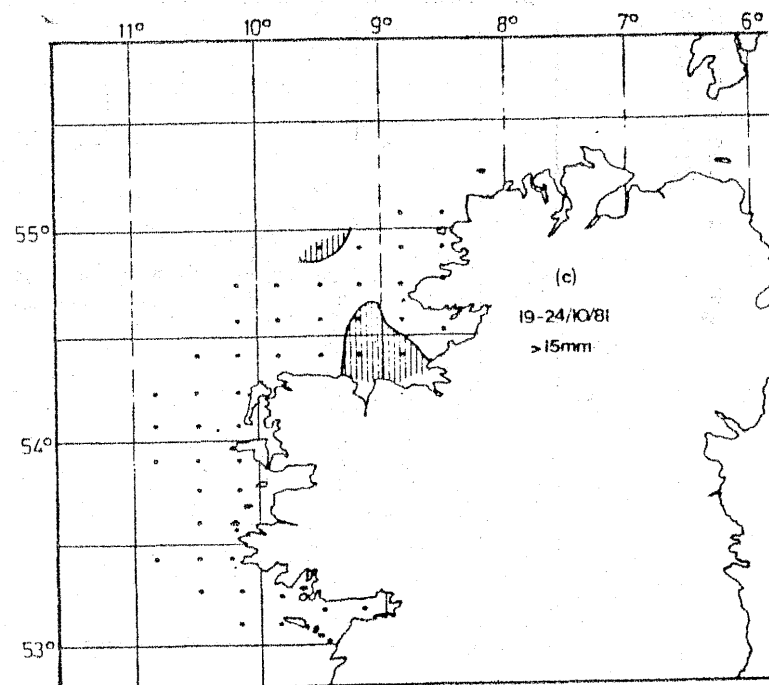
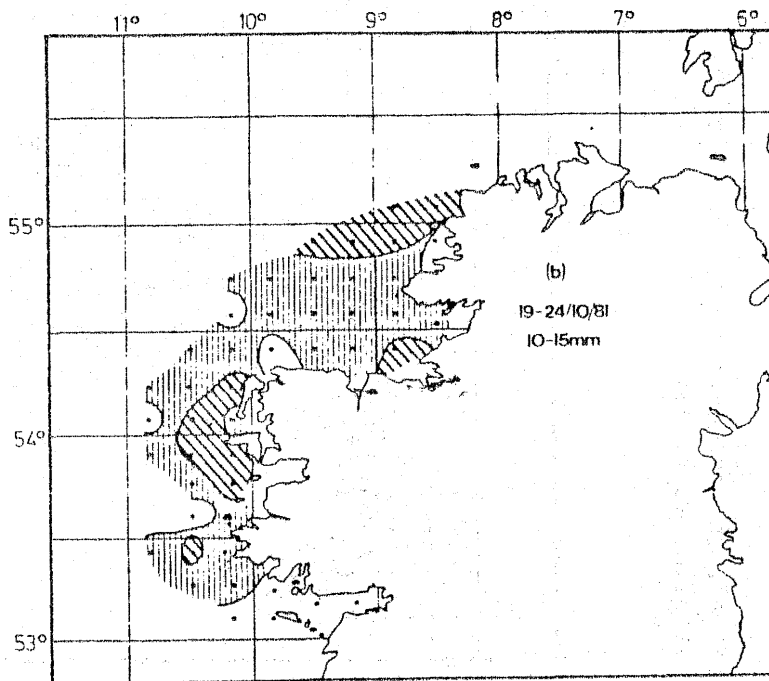
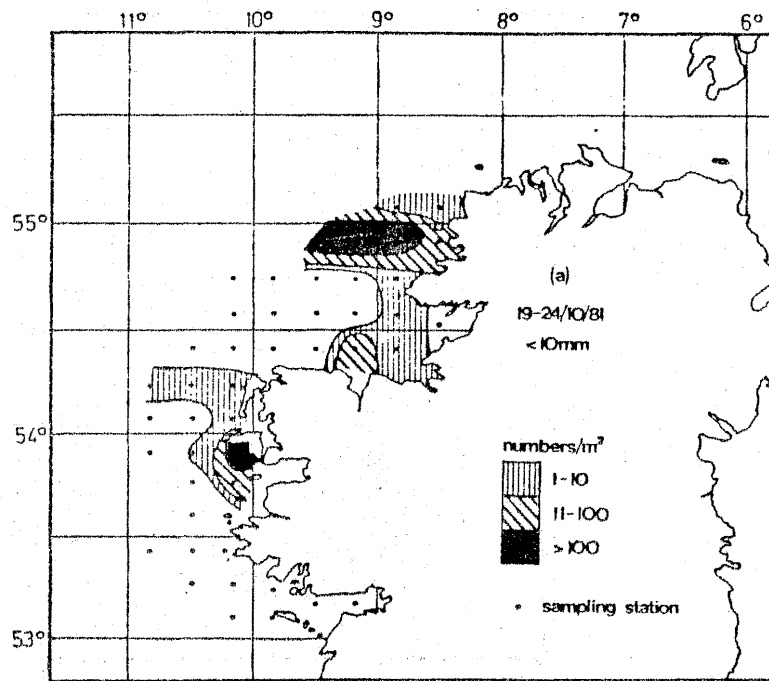
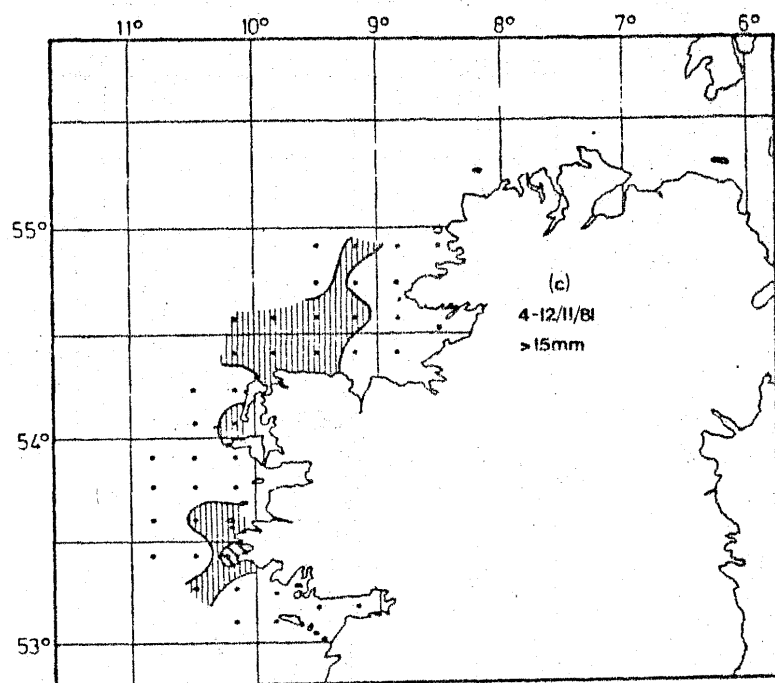
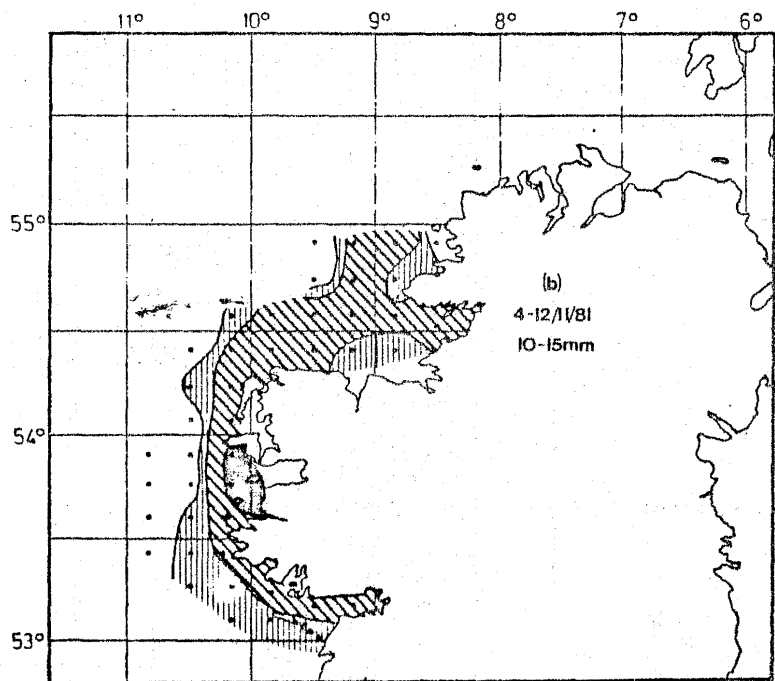
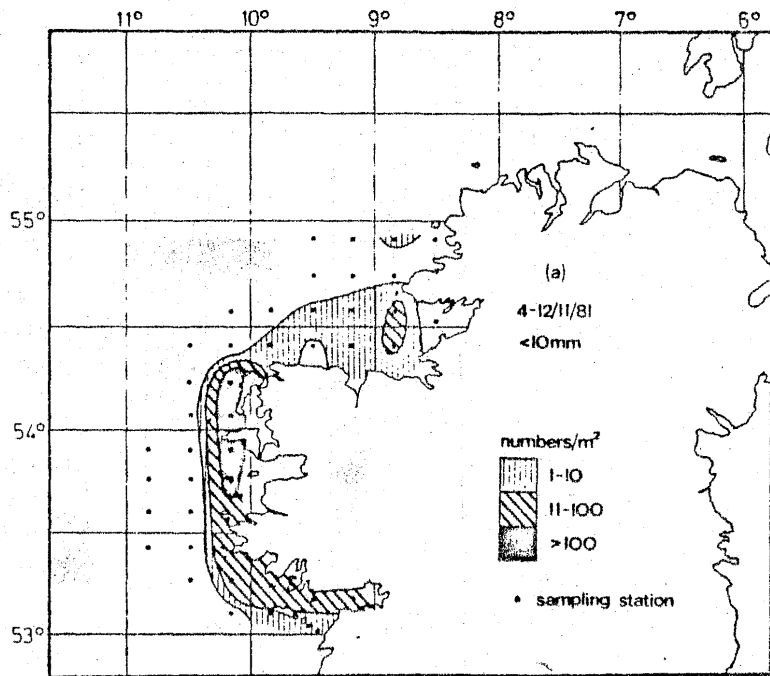




Figure 4: Distributions of (a), (b) medium and (c) large larvae.  
Dots represent sampling stations.



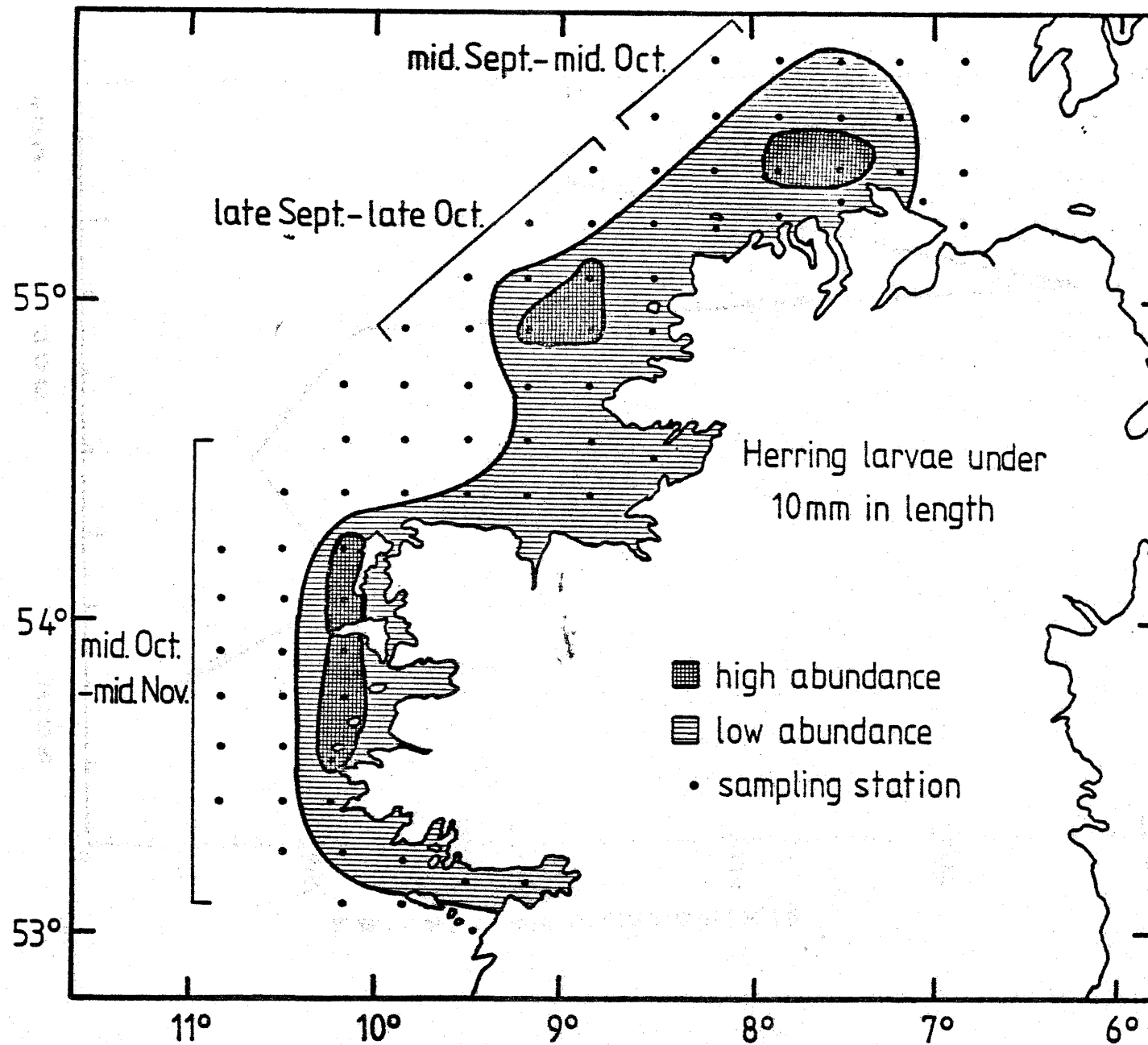


Figure 5: Summary of the distribution of small larvae throughout the 1981 season as determined by Scottish and Irish Surveys.

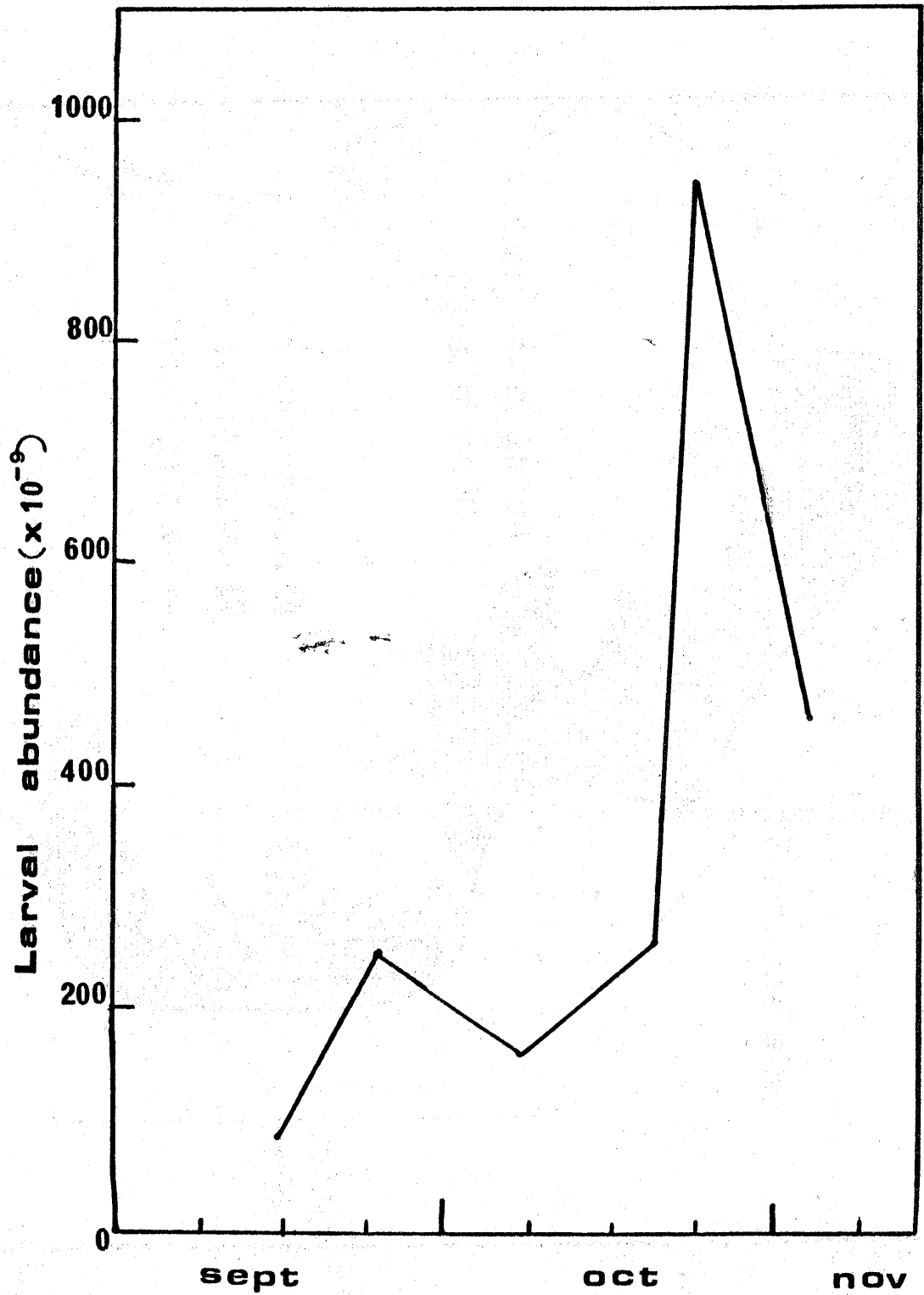


Figure 6: Abundance of small (< 10mm) larvae throughout the 1981 season as determined by Scottish and Irish surveys.