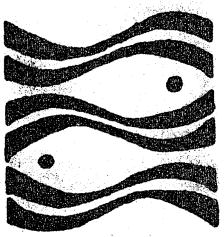

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Surveys for herring larvae off the northwest and west coasts of Ireland in 1982 and 1983

BY

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Fishery Leaflet No 124 1985

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Fishery Leaflet 124 (1985), Department of Fisheries and Forestry, Dublin 2

This Leaflet describes the methods used in sampling and gives the results of the 1982 and 1983 surveys 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 Inishowen Head to Loop Head and thus includes the entire new assessment area for this herring stock. It was first surveyed for herring larvae in 1981 (see Fisheries Leaflet 117).

As in 1981, these surveys showed spawning to move progressively southwards during the season in October and November. There are three main spawning areas: the north Donegal coast, the west coast of Donegal and the west coast of Mayo. Larval abundance was over 10% higher in 1983 than in 1982.

When the survey has been in progress for a few more years it will be possible to make an improved annual assessment of the herring stock in the region. This 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 weight of the parent stock (the spawning stock biomass).

Herring spawn at about the same time and in the same areas each year on gravel substrate. The eggs of most commercial fish drift in the water but those of the herring 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 predominantley autumn-spawners, spawning between September and November, though a small proportion of winter-spring-spawning fish is taken in the catches. The winter/spring spawning was not covered by these surveys.

The management area for herring off the northwest and west coasts is now ICES Divisions V1a south and V11b (52°30' to 56°00'N and 7°00 to 12°00'W) or roughly from Inishowen Head to Loop Head. Assessment of this stock is based largely on larval survey results. Up to 1981 this depended on Scottish surveys which covered only a small part of the area and were carried out only at the beginnin of the spawning season. Since 1981 surveys by the Department of Fisheries have covered almost all the management area at two week intervals in October and November. Some larval production takes place in September off the north Donegal coast and this has been surveyed by Scottish vessels. Therefore since 1981 herring spawning off the northwest and west coasts has been comprehensively monitored. The 1981 survey was carried out on the MFV Johnamlin (Skipper John O'Connell) and the results presented in Fisheries Leaflet 117.

The vessel used in 1982 was the MFV Iuda Naofa (skipper George Doherty) and in 1983 was the MFV Shay Og (skipper Jim Murrin) This leaflet gives the results of the 1982 and 1983 surveys.

Methods

The sampling method conformed as far as possible to agreed international standards. The survey grid consisted of sampling stations at about 18km 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 2m 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 4% formaline in seawater. Later all herring larvae were identified and measured for total length.

The number of larvae below each square metre of sea surface was calculated (numbers/m^2 = numbers/m^3 X water depth) for each of three size groups (<10mm, 10-15 mm and > 15mm) at each station. The number/m^2 was then multiplied by the area of sea represented by that station (generally 399km^2 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

Figures 1-3 give the distributions found for two size categories of larvae on the three surveys of 1982. The highest densities of small larvae (<10mm) were found between Achill Island and Inishturk in mid October (Figure 1a) and near the north shore of Donegal Bay in early November (Figure 2a). By late November small larvae were becoming scarce (Figure 3a)

The first survey of 1983 was seriously curtailed by severe weather but it did shown high concentrations of small larvae west of Aranmore (Figure 4a). Complete coverage was achieved on each of the three following surveys (Figures 5 to 7) and these showed a high abundance of small larvae in mid-October off west Donegal,

which subsequently declined, and a continuous high concentration off the west Mayo coast. At the southern end of the grid, there is some evidence of larvae drifting from the spawning grounds off the Shannon Estuary (Figures 4 and 5).

The distribution of larvae seen in both years taken with the high abundances found in September off north Donegal by Scottish surveys are generally consistent with the conclusion from the 1981 surveys that spawning moves southwards as the season progresses.

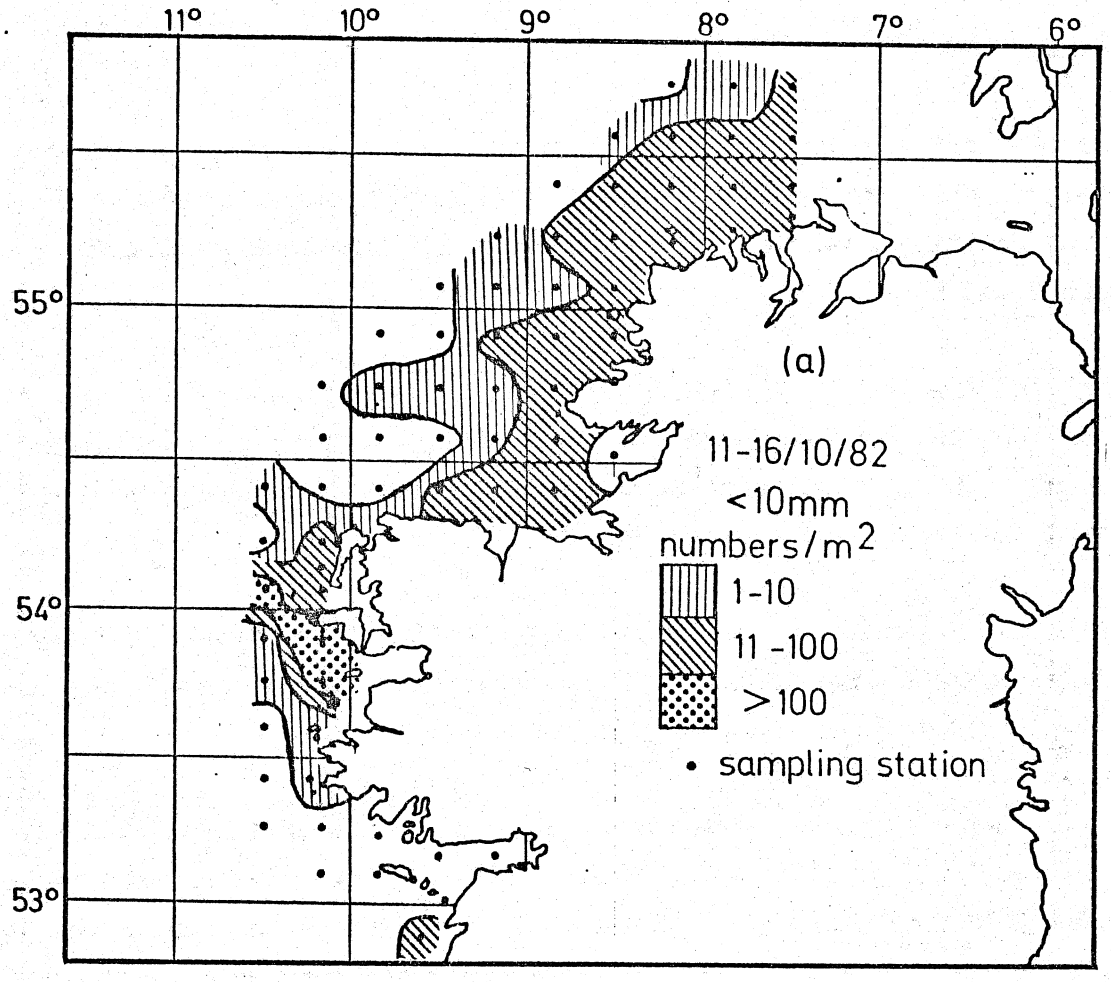
Distribution of larvae in the length range 10-15mm (i.e. those over two weeks old) show the same general patterns as the younger larvae though they are more widely distributed (Figures 1b - 7b).

It will be several years before the relationship between larval abundance in this whole area and parent stock size is established allowing stock size to be estimated from these surveys. However, it is possible to compare the abundances of small larvae from year to year provided only stations which were consistently sampled in corresponding months are considered. When this was done for the last two seasons, larvae were found to be over 10% more abundant in 1983 than in 1982.

When there are sufficient years larval data available for the whole management area to allow direct estimation of spawning stock size from larval surveys, the assessment of this stock should be very significantly improved.

Acknowledgement

The authors are extremely grateful to the skippers, George Doherty and Jim Murrin, and their crews for their help and co-operation at sea, often in bad weather conditions.



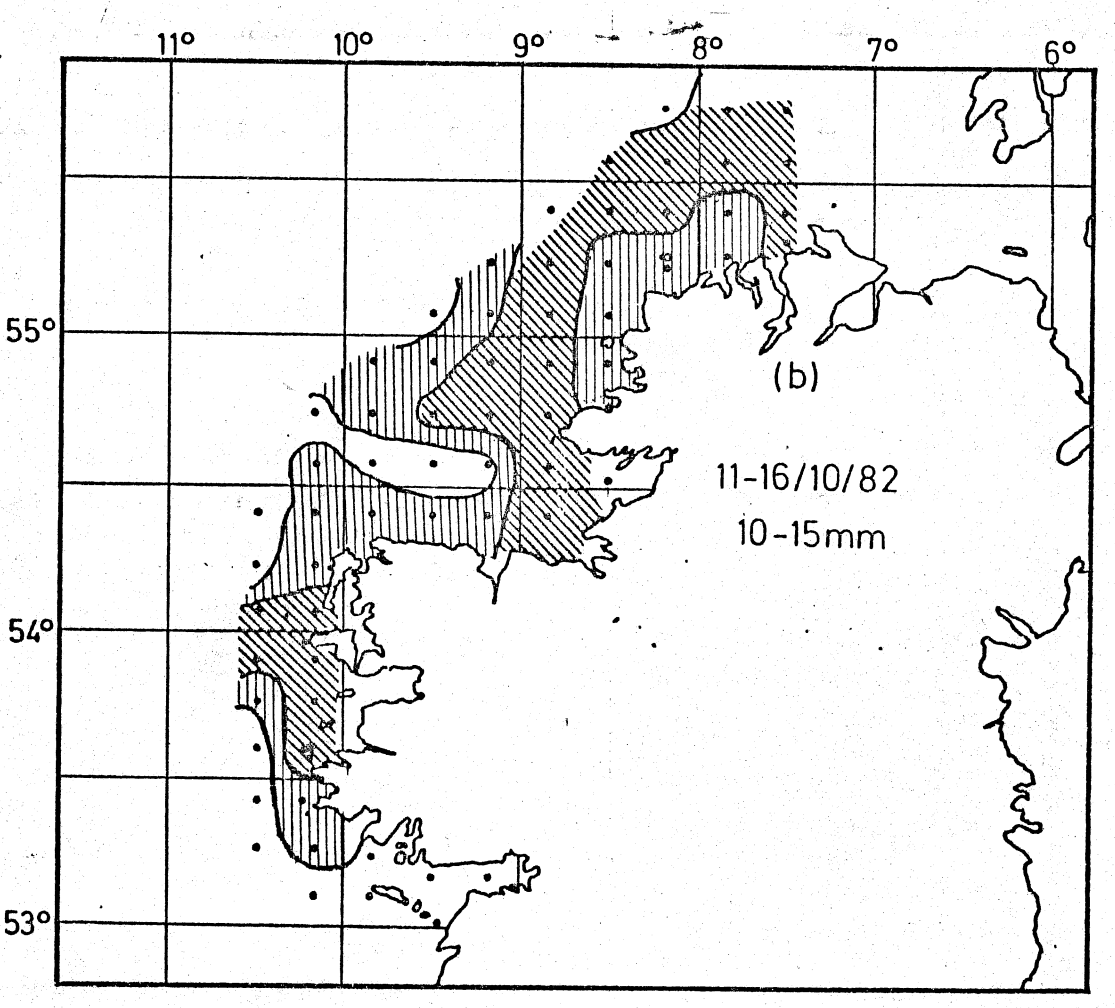
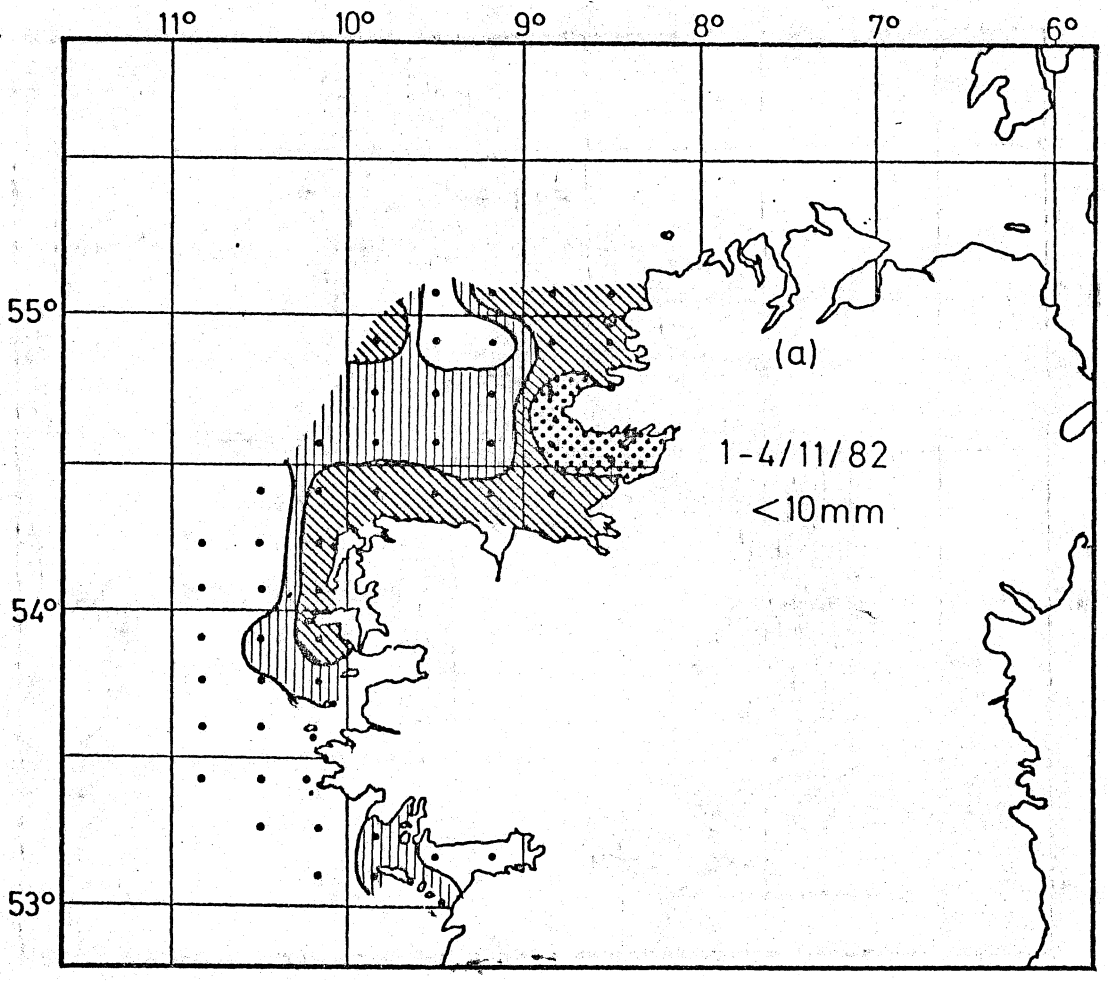


Figure 1. Distributions of (a) small, (b) medium larvae. Dots represent sampling stations.



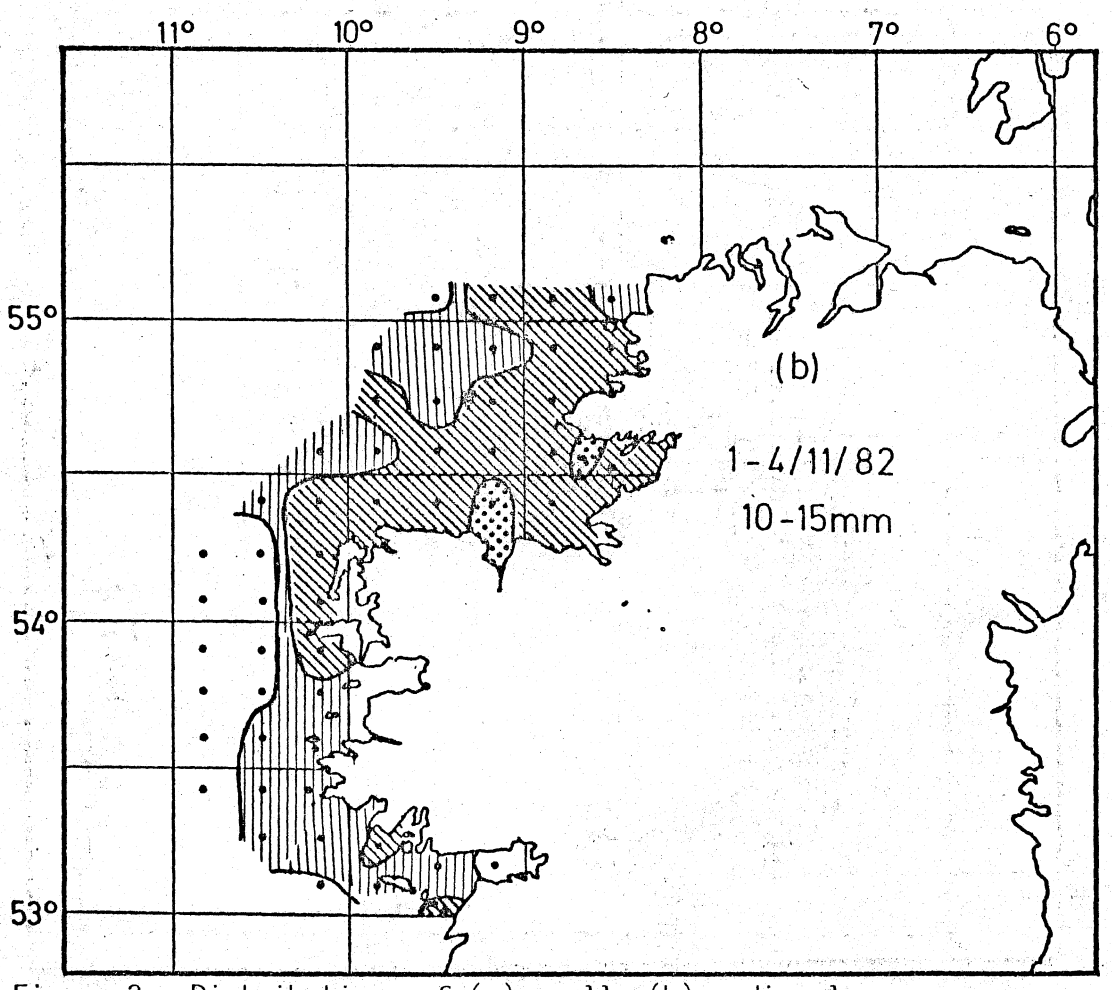


Figure 2. Distributions of (a) small, (b) medium larvae. Dots represent sampling stations.

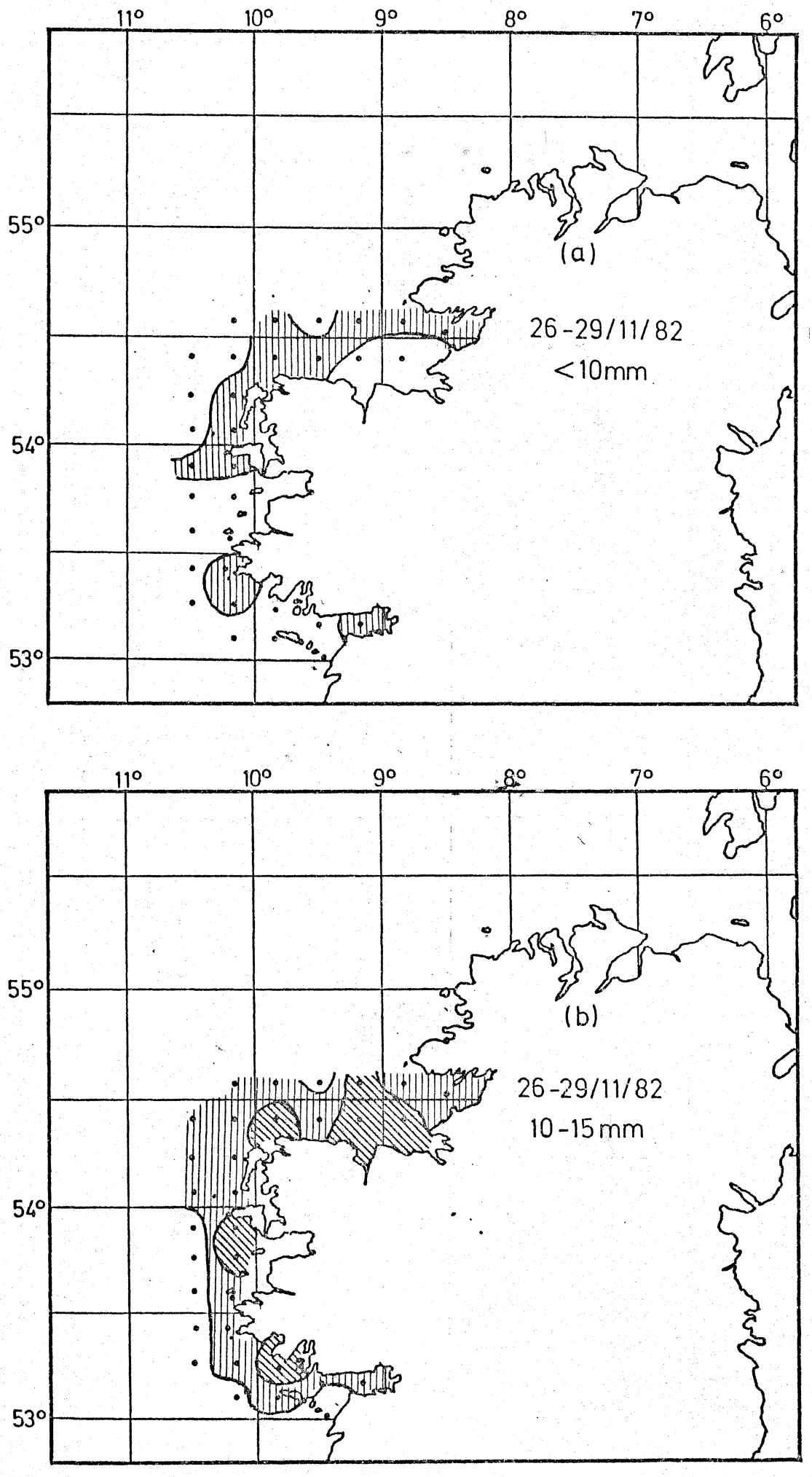


Figure 3. Distributions of (a) small, (b) medium larvae. Dots represent sampling stations.

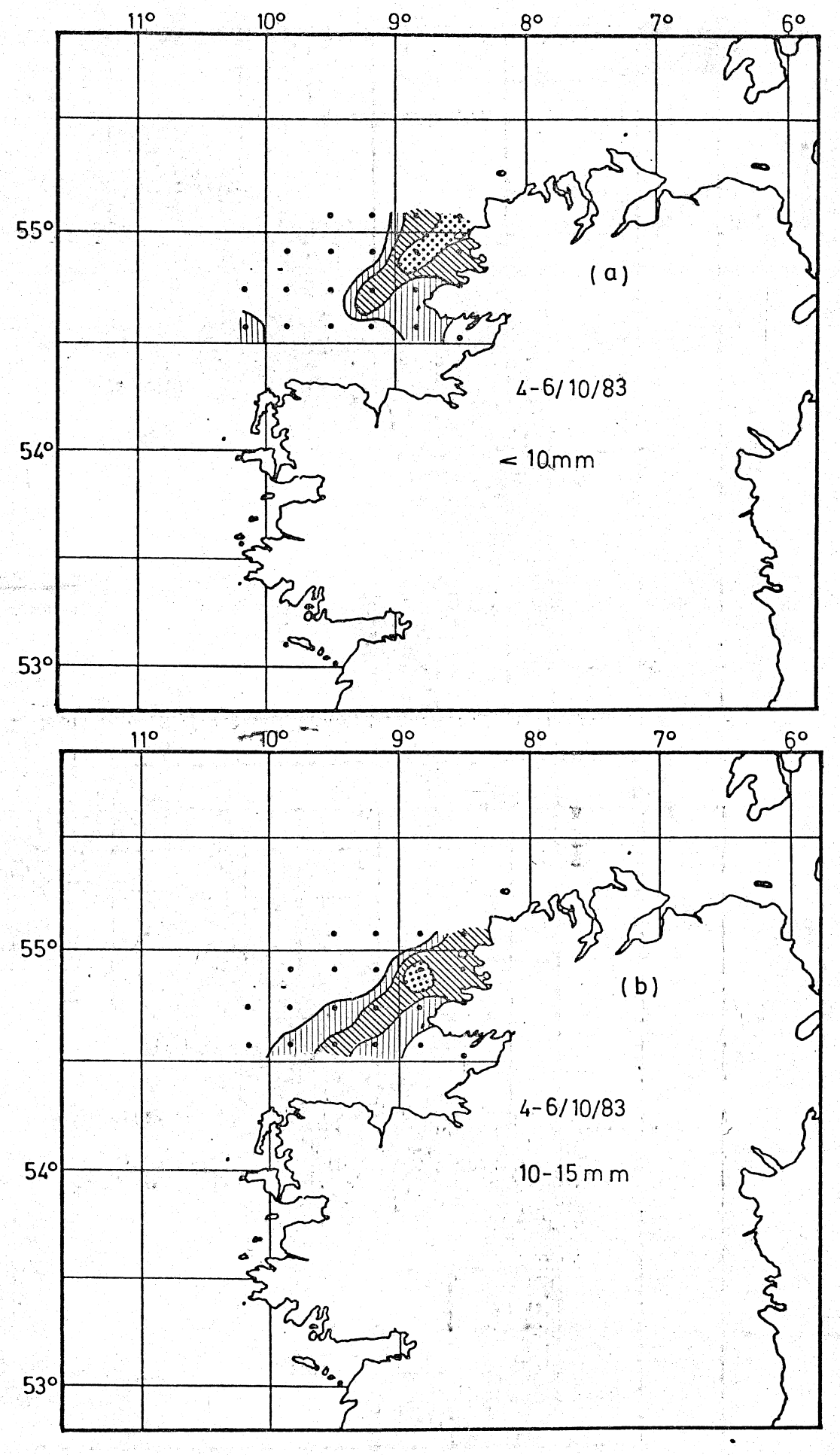
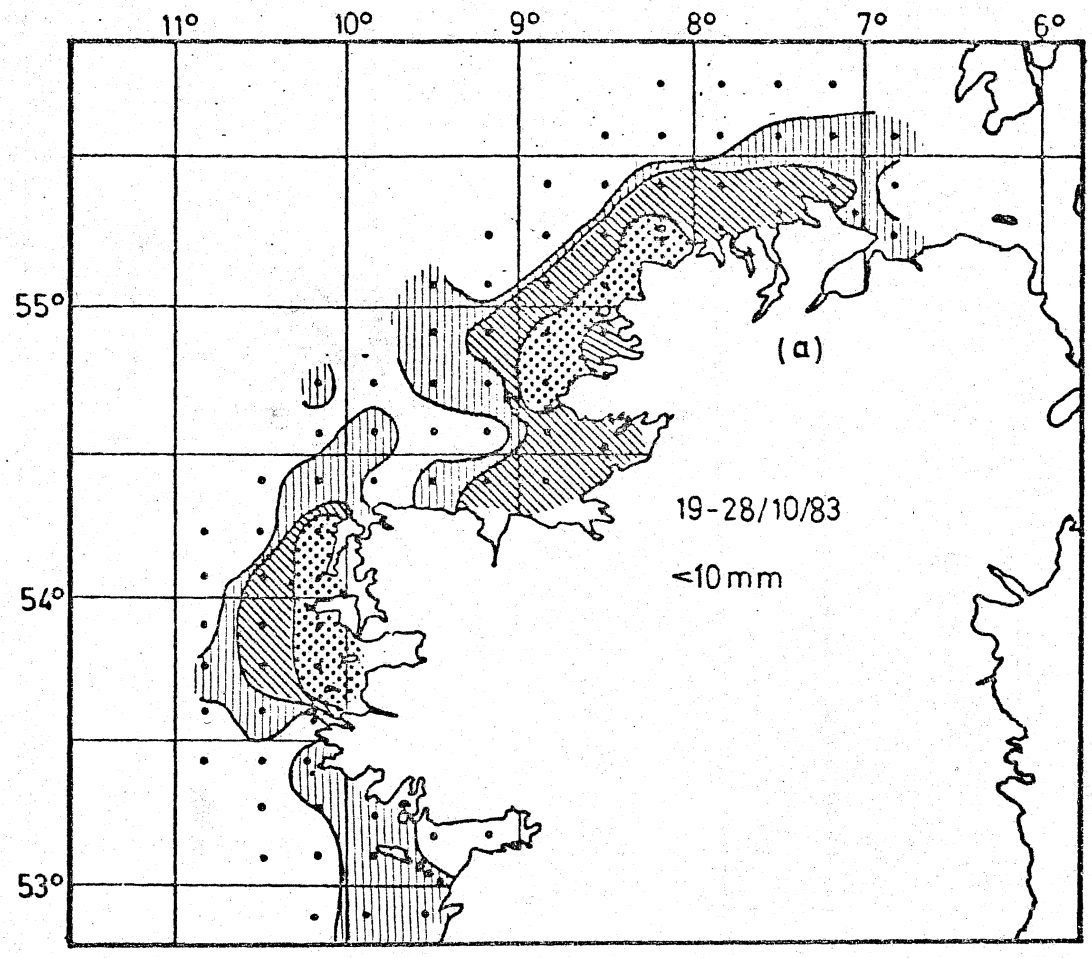


Figure 4. Distributions of (a) small, (b) medium larvae. Dots represent sampling stations.



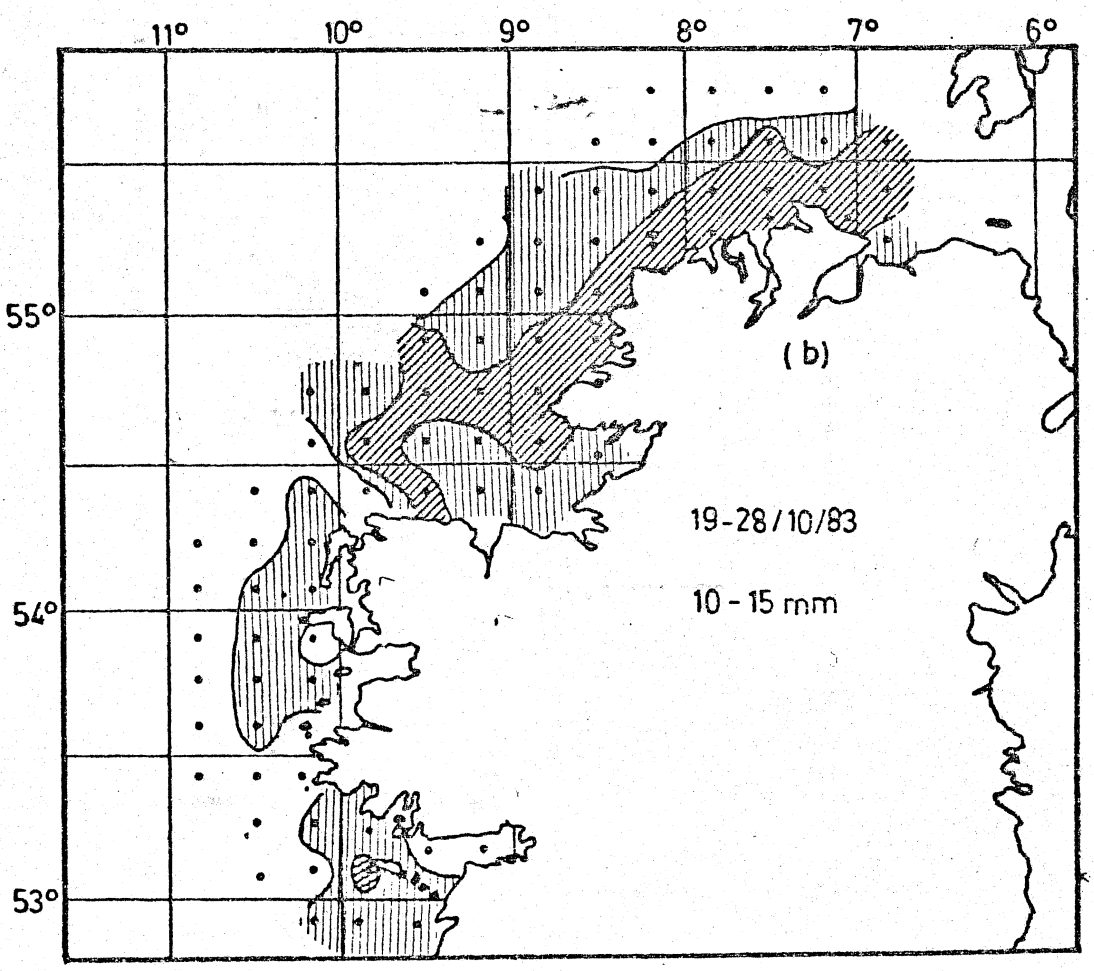
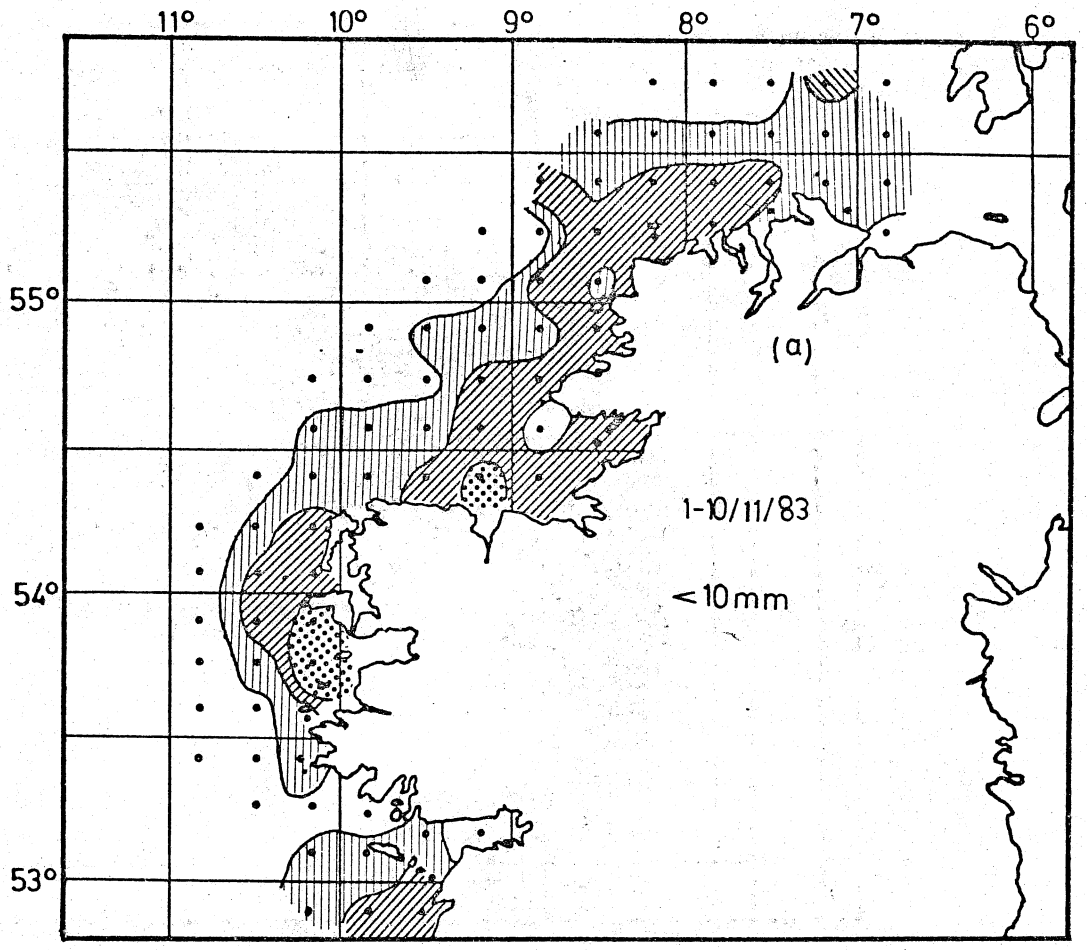


Figure 5. Distributions of (a) small, (b) medium larvae. Dots represent sampling stations.



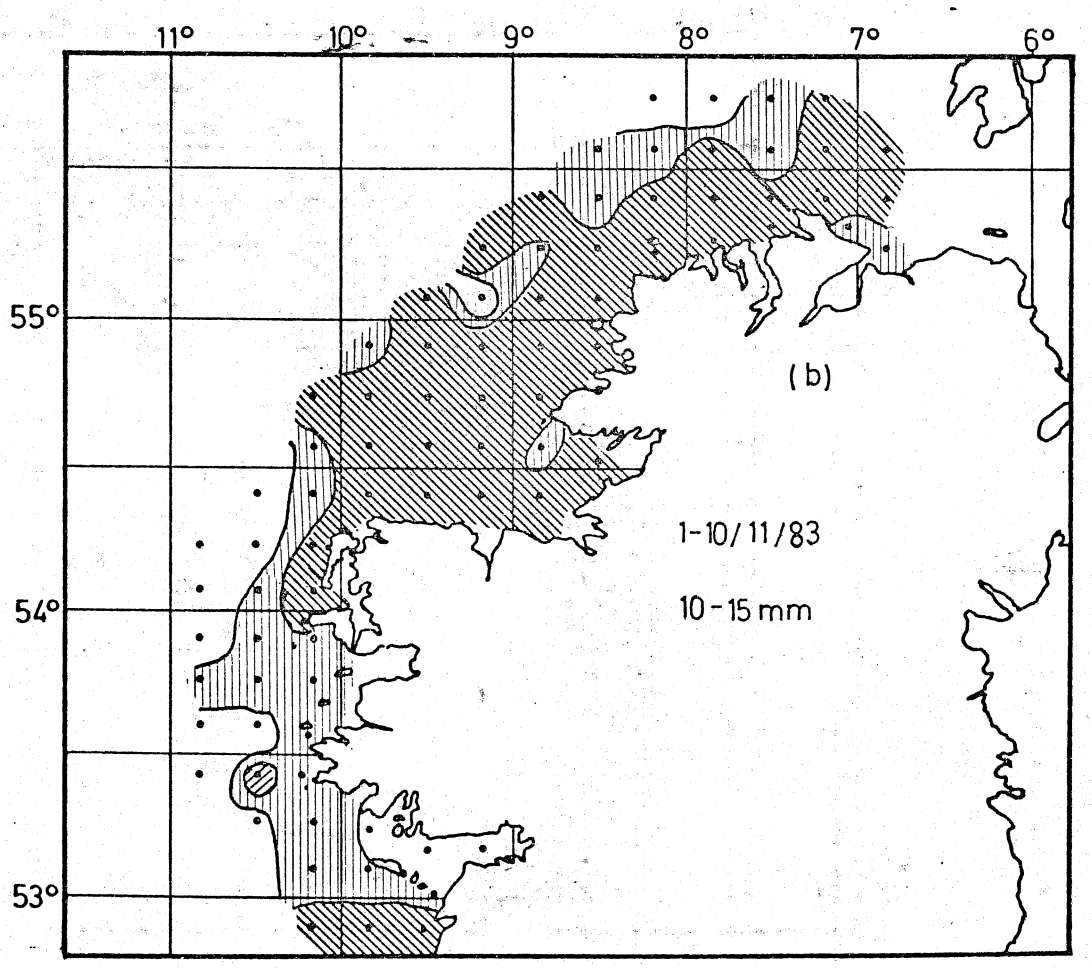


Figure 6. Distributions of (a) small, (b) medium larvae.
Dots represent sampling stations.

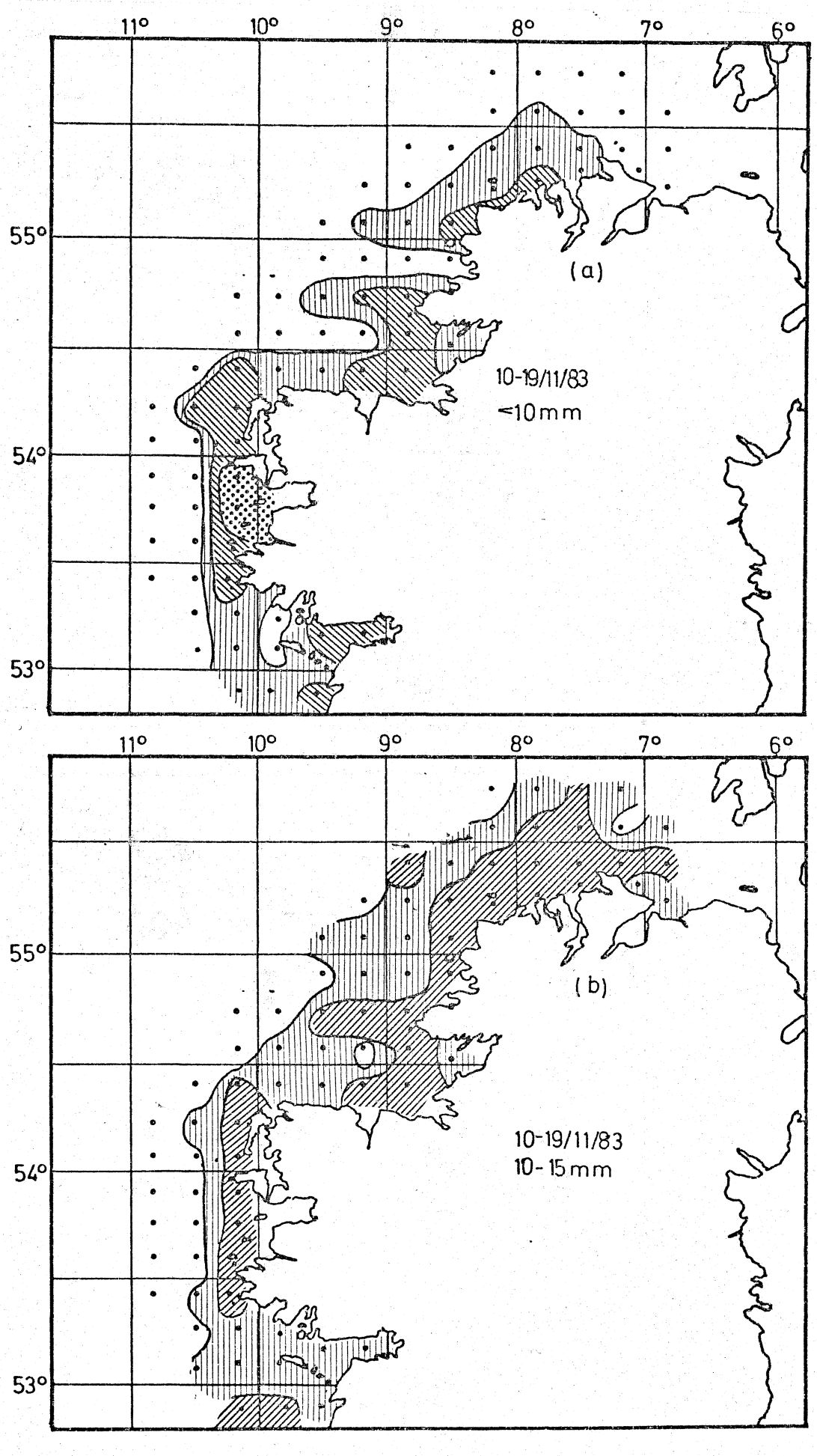


Figure 7. Distributions of (a) small, (b) medium larvae. Dots represent sampling stations.