International Council for the
Exploration of the Sea

C.M. 1971/H:10
Pelagic Fish (Northern) Committee

REPORT OF THE WORKING GROUP ON NORTH SEA HERRING LARVAL SURVEYS

At the 58th Statutory Meeting of the Council a resolution was passed (C.Res. 1970/2:11) that the Working Group on North Sea Herring Larval Surveys should meet from 21 to 23 April 1971.

This meeting was held in IJmuiden with the following participants:

Mr. O. J. Østvedt (Norway) - part time
Mr. K. Popp Madsen (Denmark)
Mr. K. H. Postuma (Netherlands)
Mr. A. Saville (Scotland) - Chairman
Dr. D. Schnack (Germany)
Mr. R. J. Wood (England)
Mr. J. J. Zijlstra (Netherlands)

It was noted with regret that Mr. H. Ackefors (Sweden) was unable to attend due to ill health.

Because of the short time available it was decided that the main objective of the Group should be to discuss, in the light of the results of the surveys carried out in 1967-70, how future surveys could be improved with the objective of giving more reliable measures of larval production in each of the major centres of spawning of the autumn-spawning stocks of the North Sea. This was done under three main headings, (1) sampling gear and ancillary equipment, (2) gear and sample handling, and (3) the planning and timing of surveys to give the most efficient utilisation of research vessel time.

Sampling Gear and Ancillary Equipment

It was agreed that the gear currently in use was satisfactory and that it was undesirable to make modifications in the quest for minor gains in efficiency because of the problems this raised in the comparison of abundance before and after these innovations. However, it was also agreed that the minor differences in the samplers used by the different countries did not have any significant effect on their relative catching powers.

There was considerable discussion of the need for more sophisticated ancillary equipment which could provide direct deck readings of depth and filtration. It was agreed that such equipment could make an appreciable contribution to the accuracy of abundance estimation, but that, at the present stage of development, the use of such instruments could not yet be recommended.

Gear and Sample Handling

The available evidence suggests that inter-ship variation in abundance estimates is small and it was felt that variations in the way the samplers were handled probably contributed much more to this variation than did differences in the samplers, per se. Some experiments have been carried out in the past, between pairs of countries, to investigate the comparability of their sampling but more work of this nature is required - particularly between English and Scottish vessels. It was agreed that all data collected in the past for inter-ship comparison of larval sampling should be sent to the Marine Laboratory, Aberdeen, for analysis, with particular emphasis on getting measures of between ship and within ship variances, as a guide to planning more efficiency between ship experiments in future.

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A major cause of the differences in sampling by different countries probably arises from differences in the depth to which sampling is carried out, this arises from variations in the confidence with which different countries predict the proximity of their sampler to the bottom. A recommendation was made concerning the maximum distance from the bottom at which sampling should start and on methods of monitoring this.

The differences in numbers of small larvae caught when countries fish with varying closeness to the bottom are probably largely due to differences in the efficiency with which yolk-sac larvae are sampled. These - except in areas of strong turbulence extending to the bottom - are normally restricted to a narrow depth stratum close to the bottom. To obviate this problem it was agreed that, in future estimates of abundance of small larvae, yolk-sac larvae should be omitted.

Planning of Surveys

A major part of the time available was spent in discussing the efficiency with which the surveys carried out to date had attained their basic aim of providing estimates of variations in larval abundance from year to year within each spawning area, and estimates of relative larval production between spawning areas. It was agreed that such data as were available strongly suggested that the production of larvae approximated to a normal curve with little variation in the timing of the mode. Under these circumstances the objectives of the surveys would be met with reasonable accuracy by two estimates made close to the mode within each spawning area. However, it was felt that a better estimate of total production would be obtained if three surveys could be done during the period of production of larvae, as this would define exactly the normal curve.

To investigate the feasibility of increasing sampling to this extent, all the past larval data was examined to find out the minimum number of samples which would be required in each area on each survey. The criterion accepted in doing this was that only squares, 10 miles by 10 miles in area, which had on at least one occasion given samples of more than 10 larvae, less than 10 mm long, were relevant to the total larval production estimate. These are shown plotted by months in Figures 1-6. This gave estimates of 137 stations in the Shetland, Orkney and Buchan area, 62 in the Whitby-Dogger area and 43 in the southern North Sea and Channel area. These figures suggest that considerable effort has in the past been dissipated in sampling areas which made no appreciable contribution to the estimates of abundance.

On this basis plans were made to improve the sampling pattern in 1971 utilising the ships of countries which were already committed to participation in the larval surveys. The ships' time available in 1971 was not thought adequate to allow of more than two surveys in each area. It was agreed, however, that a sampling scheme should be drawn up for 1972 to permit of three surveys in each area in the hope that those countries which currently take a major part of the North Sea herring catch, and do not make a commensurate contribution to the larval surveys, could be persuaded to make more research vessel time available for this purpose. This is attached as an appendix, and it is hoped that the feasibility of putting this into operation in 1972 can be discussed between the present participants and prospective participants during the 59th Annual Meeting.

Conclusions and Recommendations

(1) In view of the current prohibition on fishing for herring in the North Sea during the spawning period of two of the major stocks the continuance of the North Sea Herring Larval Surveys is of great importance as they provide the only means of measuring the effects of these measures on the spawning stocks. Data on larval abundance estimates have proved of great value in recent assessment work on herring in this area (C.M. 1970/H:6) and is likely to be of increasing value in future in view of the increasing difficulties in using catch and effort statistics in these fisheries. The data derived from larval surveys have also proved invaluable in interpreting the results of the International Young Herring Surveys in the North Sea. In the light of all of these considerations the Working Group stress that future assessment work on North Sea Herring is going to be largely dependent on the provision of reliable estimates of larval production in the various spawning areas of the North Sea and strongly recommend that they be continued and intensified.

(2) (a) As far as possible it is recommended that all countries continue to use the Gulf III sampler, or some modification of it, for herring larval sampling. Where it is necessary to modify the sampling gear it is essential that a reliable conversion from the old to the new gear is obtained before discarding the former.

(b) All countries should attempt to develop a direct deck reading depth and flow meter system and report progress on such a system to the Working Group.

(3) (a) Some experiments have been carried out to measure inter-ship variation in sampling herring larvae, but more work of this nature is required - particularly between English and Scottish vessels. Meantime all available data on inter-ship comparisons should sent to the Marine Laboratory, Aberdeen, for anlysis of between ship and within ship variation.

(b) In past surveys there has been considerable variation in the proximity to the bottom of the sampling of different countries. In future all countries should sample from not more than 5 metres from the bottom to the surface by oblique hauls fishing equal time intervals in each 10-metre depth stratum. Either a bathythermograph or depth angle warp measurements should be used to monitor the depths attained.

(c) Because of the difficulties of obtaining efficient quantitative sampling of yolk-sac larvae in some areas, in future estimates of larval abundance yolk-sac larvae should be omitted from the <10 mm size category. In view of the larger size at hatching of larvae in the Southern Bight and Channel areas this size category should be increased to <11 mm and the other size categories adjusted accordingly in these areas.

(4) Although the existing estimates of larval abundance, which are normally based on only two surveys in each spawning area, probably give reasonably reliable estimates of year to year variations in larval production, and of the relative sizes of the spawning stocks, this can only be verified by increasing the number of surveys in each area. The Group strongly recommend that countries with a major interest in the North Sea herring fisheries, which are not currently participating in the International Herring Larval Surveys to any major extent, should reconsider their position with a view to providing sufficient research vessel time to permit three surveys to be done in each area in 1972.

APPENDIX

Plans for Larval Surveys in 1972/73

As discussed in the main body of the Report the aim in 1972/73 should be to carry out three surveys in each spawning area (Shetland-Orkney, Buchan, Whitby-Dogger, Southern Bight-Channel, and Kobbergrund-Skagerrak).

The timing of these surveys in each area should be as follows:

Shetland-Orkney (78)	15-31/8, 1-15/9, 15-30/9/72
Buchan (57)	15-31/8, 1-15/9, 15-30/9/72
Whitby-Dogger (77)	1-15/9, 15-30/9, 1-15/10/72
Southern Bight-Channel (55)	1-15/12, 15-30/12/72, 1-15/1/73
Kobbergrund-Skagerrak (50)	1-15/10, 15-30/10, 1-15/11/72

The numbers of stations which require to be sampled in each of these areas are given in brackets above and their positions are shown in Figure 7.

Estimates from various countries of the number of stations sampled on previous larval surveys would suggest than an average value is about 50 stations per week although the variance of this mean is high. This would suggest that to carry out the Shetland-Orkney and Whitby-Dogger surveys would require 1½ weeks of research vessel time and each of the other areas could be done in one week. Thus to do three surveys in each of these areas would require 19 weeks of research vessel time. Past experience has shown that it is of considerable value to have some capacity in reserve to cover such eventualities as ship defects and weather hazards and it is suggested that a reserve of three weeks would be desirable for this purpose.

Thus to be reasonably confident of attaining the objectives set would require a total allocation of 22 weeks research vessel time. From the past allocation by countries to these surveys and their forecasts for 1972/73, it would appear that from the current participants the situation in that year is likely to be: England - 4 weeks; Netherlands - 5 weeks; Norway - 1 week; Scotland - 5 weeks; Sweden - 1 week. Germany is unlikely to be able to participate at all in 1972/73 because of the disruption caused at the relevant time by the withdrawal of an existing research vessel and the commissioning of a new one. It would appear, therefore, that the allocation by present participants is likely to be about 16 weeks, leaving a short-fall of about 6 weeks. The Group urges all countries which are not making any, or only a minor contribution, to try and fill this gap by allocating more research vessel time to this vital project. It would appear probable that the major deficiency in sampling capacity is likely to arise in the Shetland-Orkney and Buchan areas but it is hoped to call a meeting of all interested countries during the 1971 Council Meeting to discuss what additional ships' time can be obtained and its allocation to specific surveys.

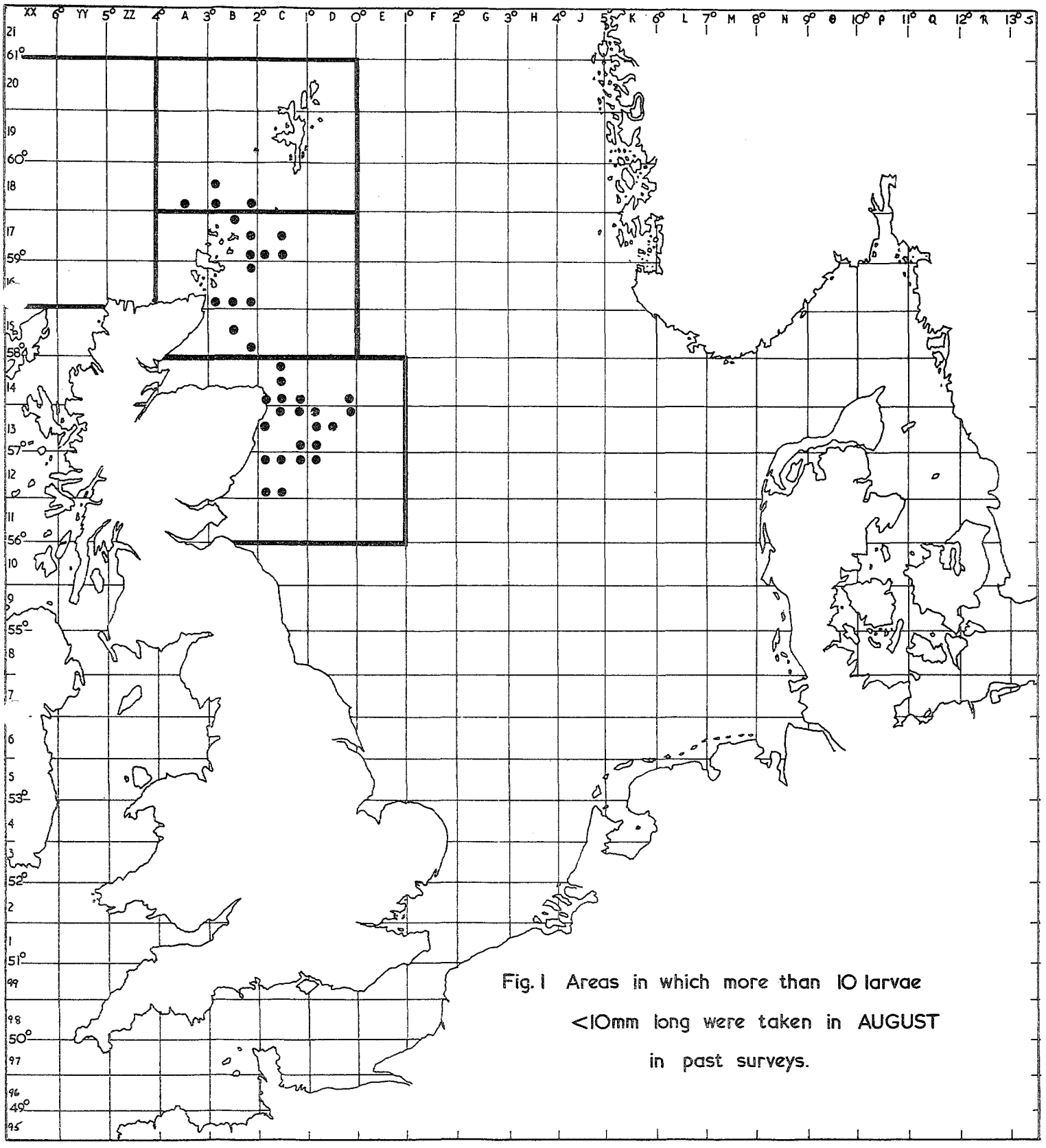

Fig. 1 Areas in which more than 10 larvae <10mm long were taken in AUGUST in past surveys.

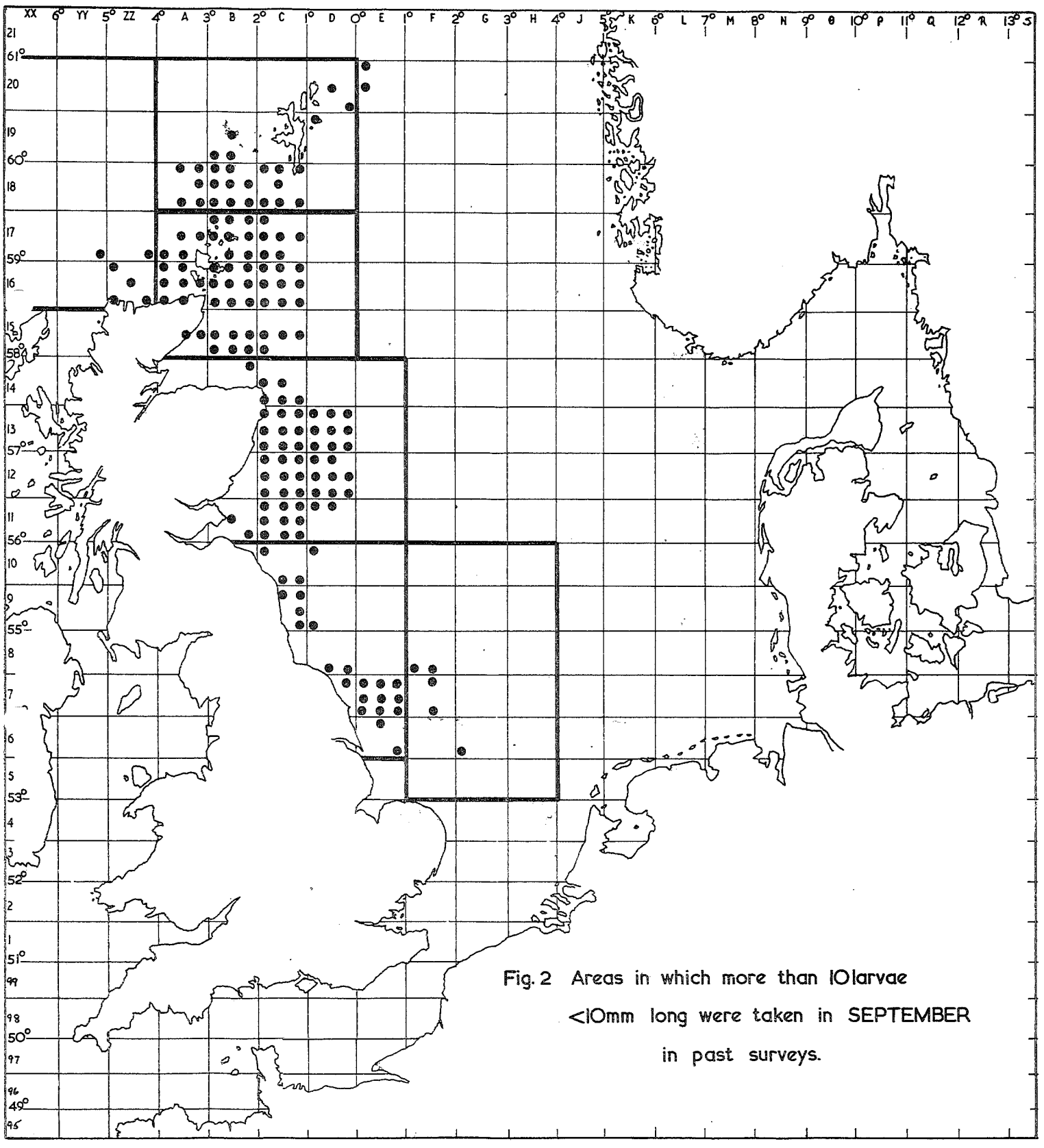

Fig. 2 Areas in which more than 10 larvae <10mm long were taken in SEPTEMBER in past surveys.

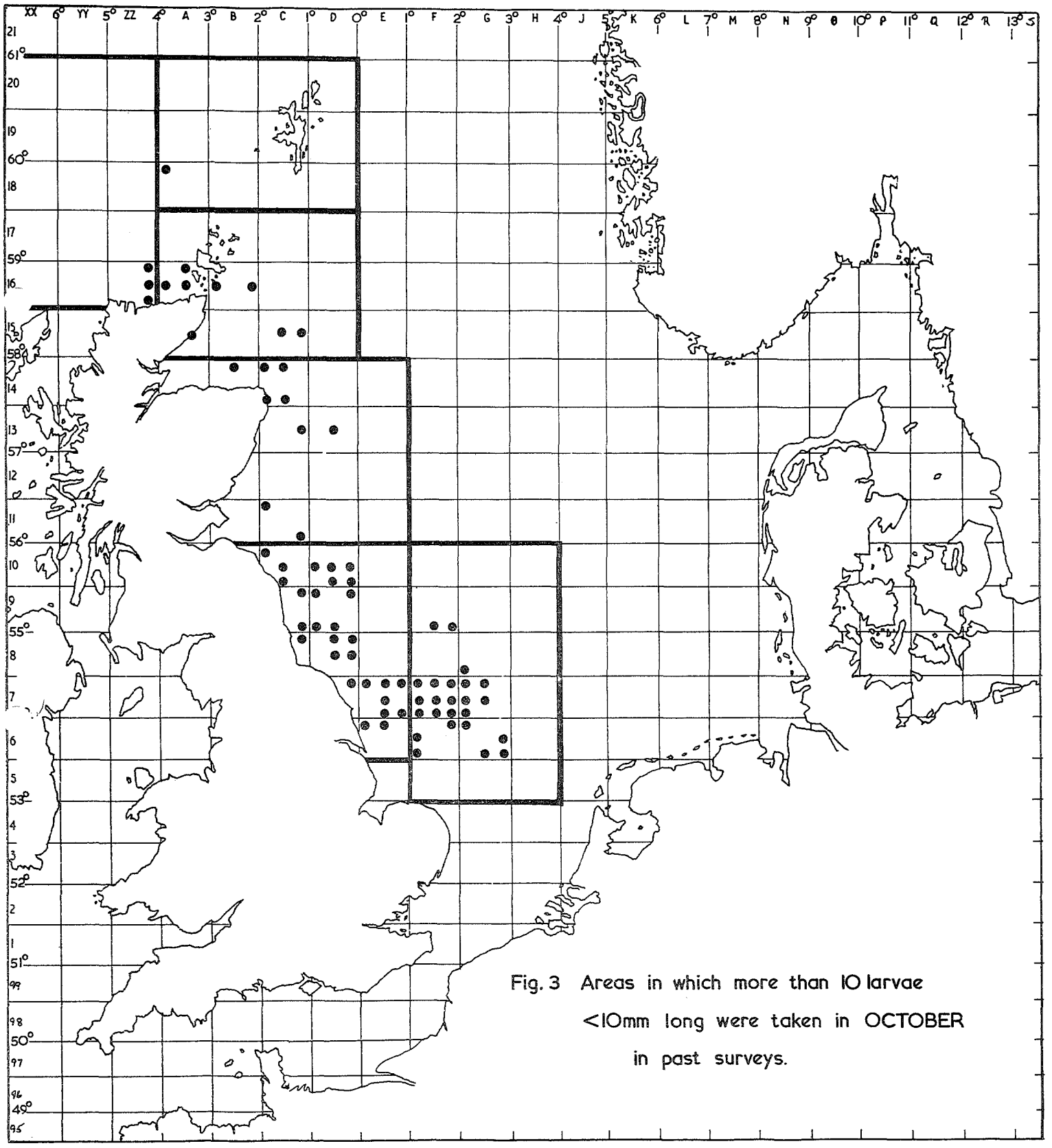

Fig. 3 Areas in which more than 10 larvae <10mm long were taken in OCTOBER in past surveys.

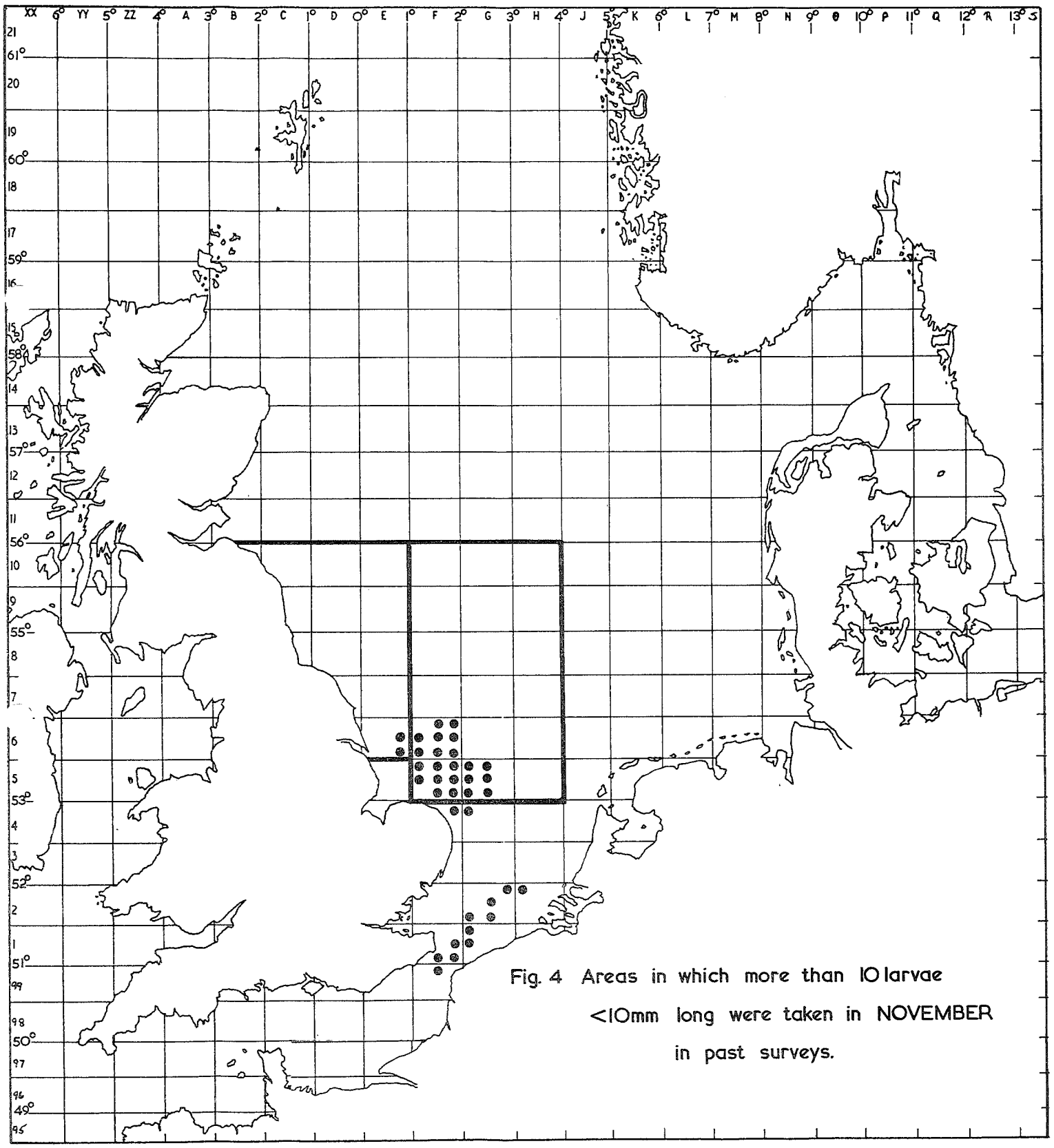

Fig. 4 Areas in which more than 10 larvae <10mm long were taken in NOVEMBER in past surveys.

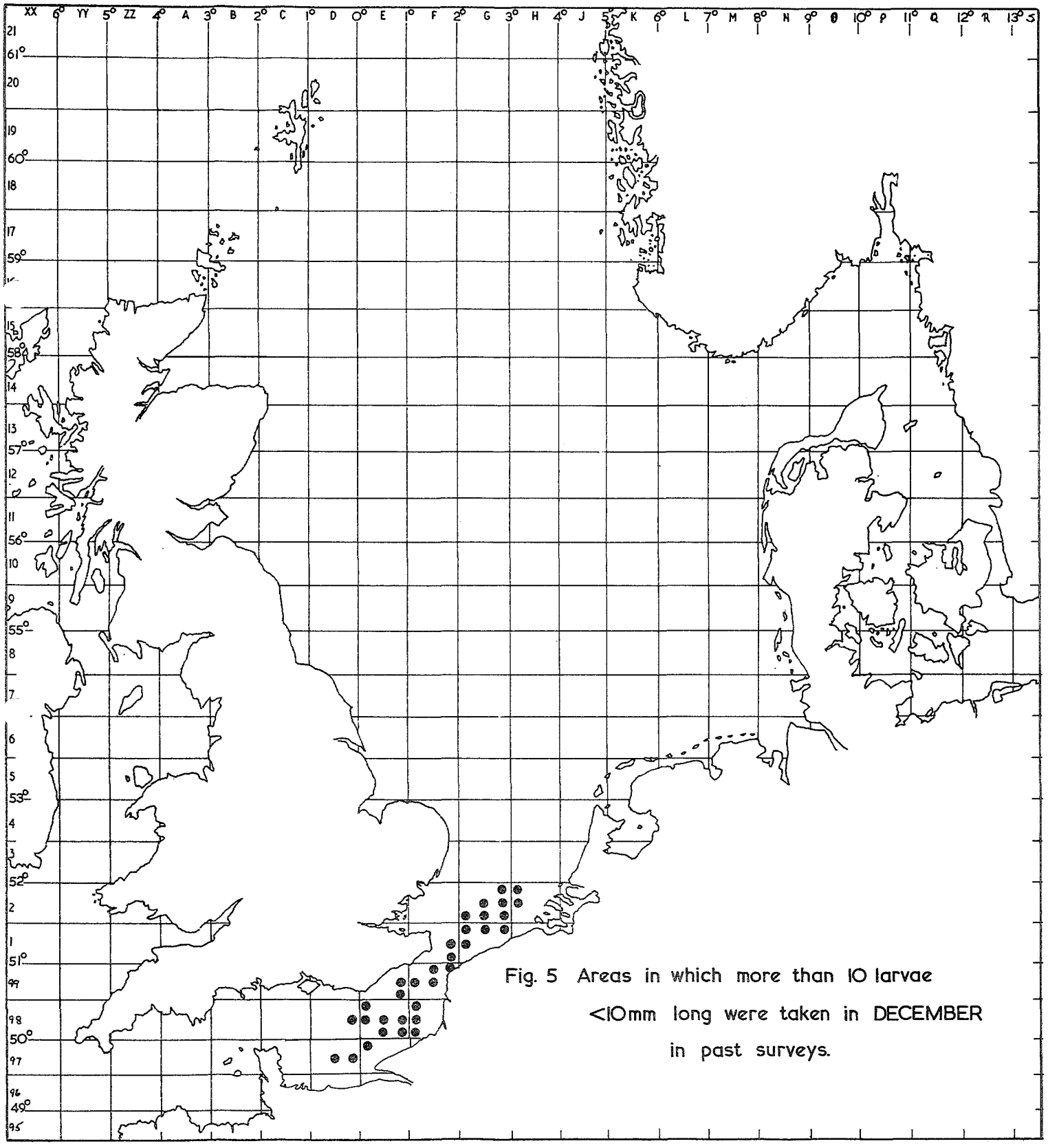

Fig. 5 Areas in which more than 10 larvae <10mm long were taken in DECEMBER in past surveys.

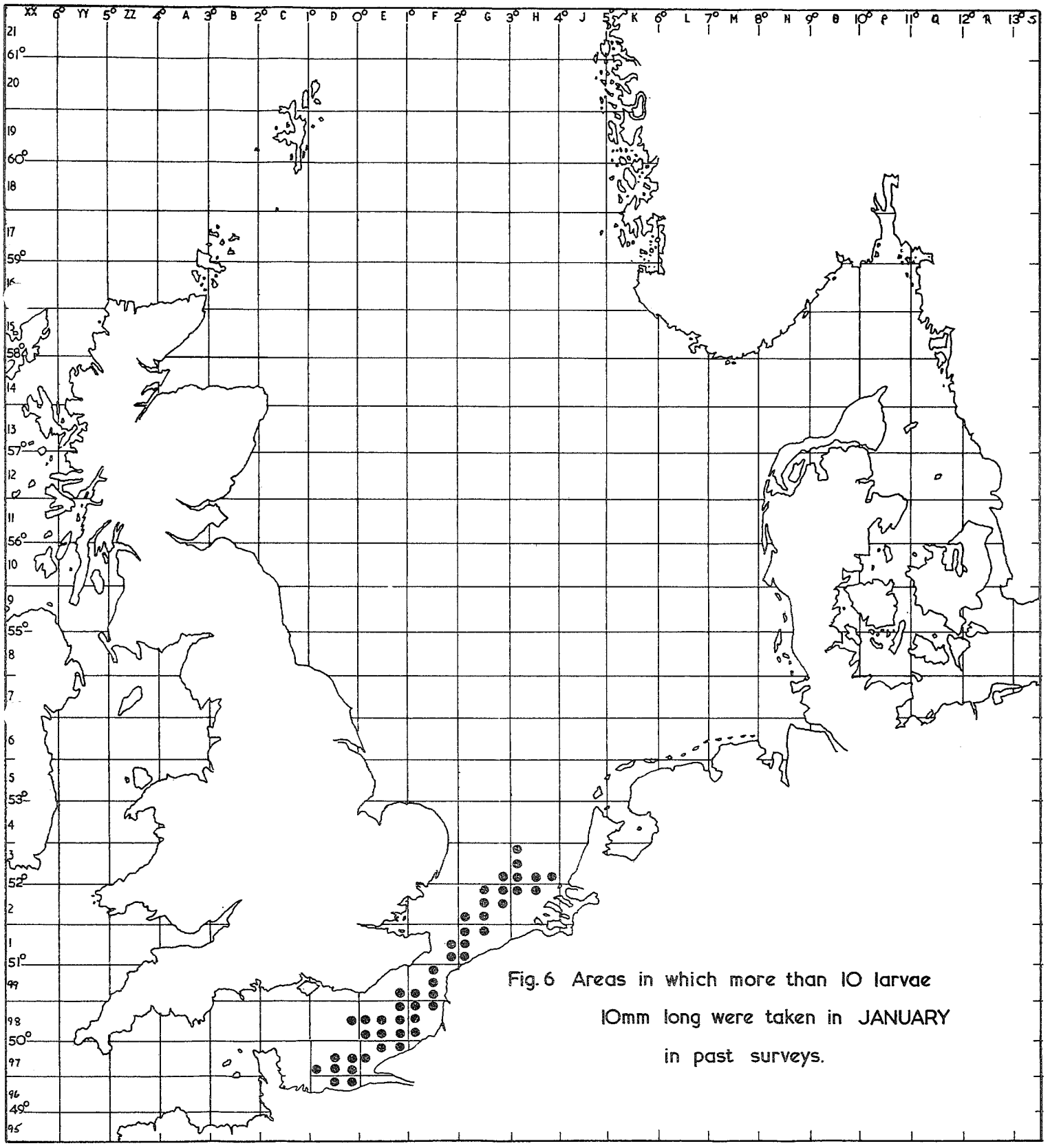

Fig. 6 Areas in which more than 10 larvae 10mm long were taken in JANUARY in past surveys.

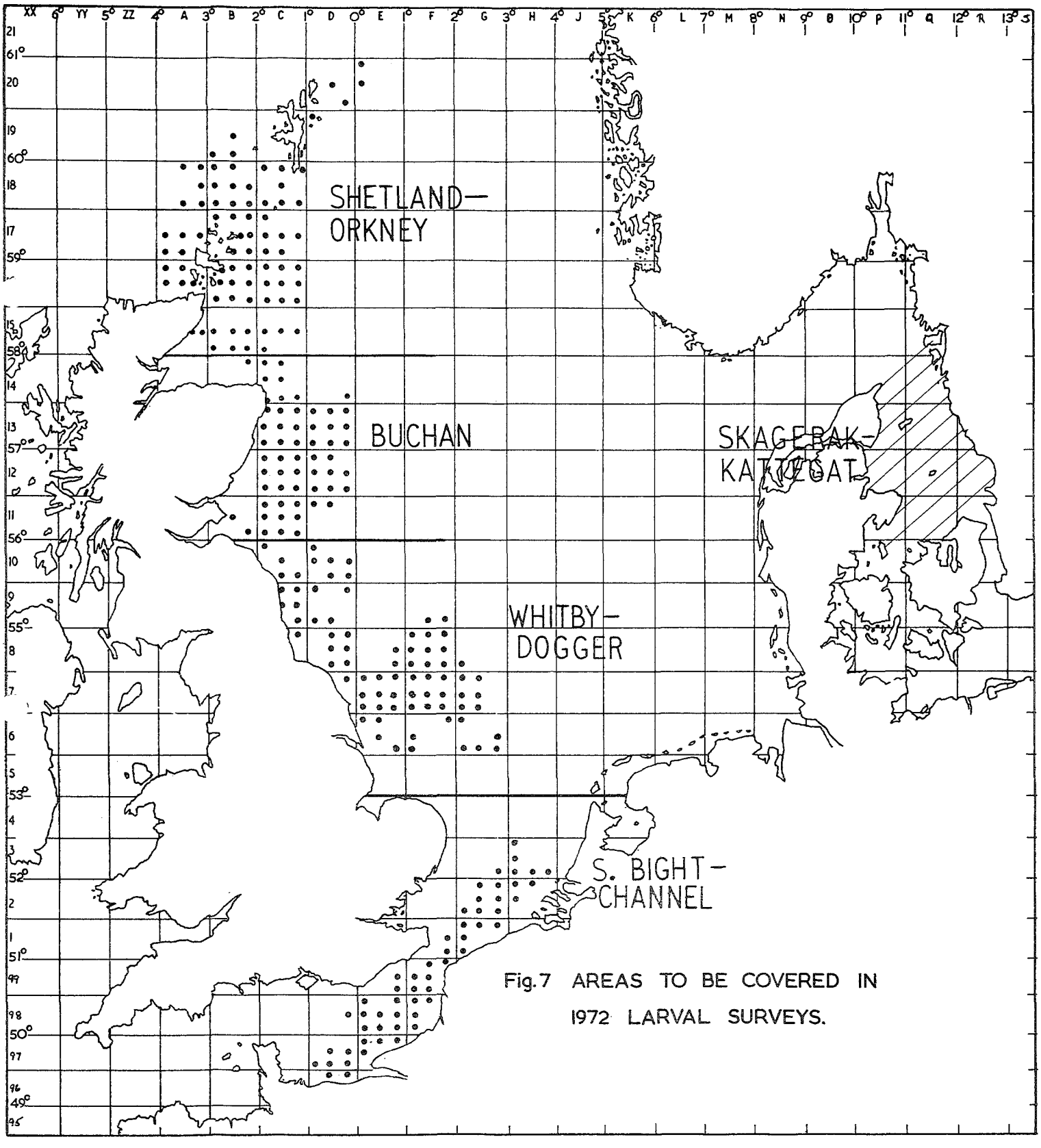

Fig.7 AREAS TO BE COVERED IN 1972 LARVAL SURVEYS.