INTERNATIONAL COUNCIL FOR THE
EXPLORATION OF THE SEA

C.M. 1975/H : 11
Pelagic Fish (Northern) Committee.

YOUNG HERRING SURVEYS IN THE IRISH SEA

by

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1. Introduction.

Stock assessment of the Celtic Sea herring has been hampered so far by a lack of information on the recruiting year classes. For this reason the ICES Herring Assessment Working Group in 1969 recommended that attempts were made to develop a scheme for young herring surveys in the area (Anon, 1970).

The first task in setting up a regular scheme of surveys was to locate the distribution area of the young herring. In the Celtic Sea, very few young herring are found and the nearest concentrations occur in the Irish Sea (fig. 1). Some of these herring may be Celtic Sea recruits (Symonds, 1964), but they are probably mixed with juveniles from the Mourne population (Molloy, 1973), the Manx stock, and the Clyde spring spawning stock (Saville et al, 1966). However, the Irish Sea is not the only possible nursery area for Celtic Sea herring. Young herring, similar to Celtic Sea spawners in vertebral count, have also been located in Bantry Bay on the south-west coast of Ireland (Molloy, 1968).

In order to obtain further information on the distribution of Celtic Sea recruits, several exploratory surveys have been made by Irish and Dutch research vessels in the years 1972 - 74. It was also investigated whether trawl surveys are a practical method of measuring abundance of I-group herring in this area. The results of both Irish and Dutch research cruises are presented in this report.

2. Material and Methods.

A table of survey periods, ships and fishing gears is given below:

country / year	Ireland	Netherlands
1972	period: 27 June - 11 July October ship: "Cú Feasa" gear: 57 ft bottom trawl Cod end mesh 12 mm	no survey made
1973	period: 5 - 13 June ship: "Cú Feasa" gear: 40 ft bottom trawl Cod end mesh 12 mm	period: 12 - 27 June ship: "Tridens" (180 ft research vessel) gear: 72 ft bottom trawl and pelagic trawl, 1200 meshes 40 cm mesh size (front)
1974	period: 24 June - 7 July ship: "Resolution" (65 ft chartered commercial vessel) gear: 40 ft bottom trawl Cod end mesh 12 mm	period: 14 - 29 May ship: "Tridens" gear: pelagic trawl, 1200 meshes 40 cm mesh size (front)

In 1973 R.V. "Tridens" was equipped both with a bottom trawl and a pelagic trawl. However, the bottom trawl could only be used in a few small areas because of very rough grounds in most of the Irish Sea. An experimental comparison of both gears showed the pelagic net to be much more efficient than the bottom trawl (see section Results). Therefore, only a pelagic trawl was used in 1974.

Attempts were also made to locate schools of young herring by acoustic methods. During the 1974 survey, R.V. "Tridens" used sonar for this purpose. Normally however, trawl sets were made random positions, without using information from the acoustic equipment.

3. Results.

The results from the various cruises by Irish and Dutch research vessels have been combined in figures 2a - 4c. For each year, charts have been made showing the distribution of trawl stations, abundance of I-group herring, its mean length and mean vertebrae counts (except for 1974).

1972

In June and July, R.V. "Cú Feasa" covered the coastel zône from Bantry Bay on the south-west coast of Ireland to the area north of Dublin. Off the south coast the bottom was very rough and only 14 hauls could be made. Only one of the hauls produced asubstantial number of young herring. These herring had a rather low mean VS of 56.56 and were not considered to be typical winter spawners of the Celtic Sea stock. In the southern section of the Irish Sea only one haul was made because of the very unsuitable bottom in this area. No herring were obtained in this haul. Two good catches of juvenile herring were made in the northern section of the Irish Sea. Most of these herring were I-group, with a mean length of about 18 cm and a mean VS of 56.78 and 56.51 respectively. Some 0-group herring with a mean length of 10 - 12 cm also occurred in these catches. Five other hauls in this area failed to produce any herring.

In October a second survey was made in the coastal zône off Dublin and further north. By this time, the I-group herring had been replaced by 0-group with a mean length of 14 - 17 cm, and a mean VS ranging from 56.63 to 56.83.

1973

R.V. "Cú Feasa" fished the waters off the east and southeast coast of Ireland. As in the previous year, no herring were captured off the southeast coast.

In the northern Irish Sea herring were located in the same areas as in 1972. The greatest abundance of herring was found inside the 20 fathom line. These fish had a mean length of 17 - 18 cm, and a mean vertebrae count of 56.69 - 56.96. In contrast to the previous year, no 0-group herring were caught.

R.V. "Tridens" covered most of the Irish Sea in June. I-group herring were found both on the eastern and western side of the Irish Sea. Good catches were made in Cardigan Bay, Caernarvon Bay, Liverpool Bay, and also in the waters off the Irish Coast. Along the English coast, I-group herring had a mean length of 17 - 20 cm, and a mean vertebrae count of 56.47 - 56.63. The same age group caught along the Irish Coast was slightly larger (19 - 21 cm), and had a higher mean vertebrae count (56.65 - 56.89).

Some hauls were also made along the south coast of Ireland. In most of the hauls a small number of I-group herring was found, with a very high length (23 cm) and a high mean vertebrae count (57.00).

1974

In June and July, M.F.V. "Resolution" surveyed the north-western section of the Irish Sea, where I-group herring had been consistently found in the previous two years. More hauls were made than in either 1972 or 1973, but the catches of juvenile herring were considerably less. The highest number of I-group herring caught in one hour was 296. No mean vertebrae counts for I-group herring were obtained from this survey.

R.V. "Tridens" worked in the area one month ealier, but she had even less succes. Twenty pelagic hauls were made in the Irish Sea, but only 7 out of these contained any I-group herring. Catches in the whole area were extremely low; the largest number of I-group caught during the survey was 112 per hour fishing.

After the "Tridens" had surveyed the Irish Sea, the ship set course for the waters to the north of Ireland. Eight hauls were made in this area, but none of them contained any I-group herring.

During the 1974 cruise, R.V. "Tridens" also tried to locate schools of young herring by using sonar. Within the Irish Sea, the operation of the sonar was hampered by shallow water and a very rough bottom. No herring schools could be located by this method, but this may have been due to the general absence of juvenile herring from the area, as was evident from the trawl results.

Comparison between catch rates of bottom trawl and pelagic trawl

As the bottom in most parts of the Irish Sea was found to be very rough, "Tridens" had to use a pelagic trawl during most of the 1973 survey, and throughout the whole 1974 survey. This pelagic trawl was always fished as close to the bottom as possible.

In order to compare the catch rate of the pelagic trawl with the one from a normal bottom trawl, a series of comparative hauls was made by "Tridens" in 1973. The experiment took place in the Liverpool/Morecambe Bay area, where a suitable ground was found for bottom trawling. The number of I-group herring caught by the two gears in successive hauls is given below:

Haul No.	Bottom trawl	Pelagic trawl
1	3	6960
2	59	50
3	21	202
4	0	1595
5	114	528
6		208

Under the conditions which existed in the area at that time, the pelagic trawl obviously had a much higher fishing power than the bottom trawl.

4. Discussion

4.1 Identity of juvenile herring in the Irish Sea

Juvenile herring in the Irish Sea may recruit to the Celtic Sea stock, but also to other spawning populations in the neighbourhood. The most important populations in this area are:

	mean VS	mean annual catch (tons)
Isle of Man autumn spawners	56.46	15,000 (1969 - 73)
Mourne autumn spawners	56.73	3,500 (1969 - 73)
Clyde spring spawners	56.92	2,500 (1968 - 71)
Celtic Sea winter spawners	56.83	35,000 (1969 - 73)

The Celtic Sea stock is the largest one, followed by the Isle of Man stock. The mean VS of these two populations is quite different: 56.83 and 56.46 respectively. The populations of Mourne and Clyde spawners are relatively small; their mean VS resembles that of Celtic Sea spawners.

The mean VS in samples of juvenile herring from the Irish Sea ranged from 56.43 to 56.96. Therefore, these fish must constitute a mixture of future recruits to different spawning populations.

Obviously, one racial character is insufficient to split a mixture of several components, but when looking at the mean VS in different parts of the Irish Sea, it is possible to draw some general conclusions.

The samples obtained in the Liverpool/Morecambe area had relatively low vertebrae counts (56.43 - 56.63). Therefore, these fish must contain a large proportion of Manx spawners, which is in agreement with the results obtained by Wood (1975).

Juvenile herring along the Irish coast had a mean VS between 56.62 and 56.96. Although these schools will contain some Manx spawners, their main proportion must belong to one of the stocks with a higher VS, e.g. the Mourne, Clyde, or Celtic Sea stock. Considering the relative sizes of these three populations, it seems likely that most of these juveniles will recruit to the Celtic Sea stock. However, it could also be argued that because the Mourne population has itself an intermediate vertebrae count, all the young herring in this area could belong to it, with little or no mixture from other stocks. This problem has to be solved in future, either by a comparison of year class strengths, or by a tagging experiment.

4.2 Forecasting recruitment to the Celtic Sea stock

From the results discussed above, it seems likely that the waters off the Irish east coast are (one of) the main nursery area(s) for Celtic Sea spawners. If this is true indeed, recruitment to the Celtic Sea stock could be forecasted by sampling this relatively small area. The best area for a yearly survey would be the coastal zône off Dublin and further north, where some suitable grounds for bottom trawling can be found.

Yearclasses could be sampled either as 0-group in the autumn of their first year of life, or as I-group in the summer of their second year.

5. Summary

A survey for juvenile herring was made in the Irish Sea and in the waters to the south of Ireland during the years 1972 - 74. In the summer of the first two years, fairly large numbers of I-group herring were found in different parts of the Irish Sea, but not in the waters south of Ireland. In the autumn of 1973, 0-group herring had replaced the I-group in the coastal zône off Dublin. During 1974, the abundance of juvenile herring in the Irish Sea was much lower than in the previous two years. A study of mean vertebrae counts indicated that juvenile herring in the Irish Sea constitute a mixture of different populations. In general, juveniles along the Irish coast had a relatively high mean vertebrae count, suggesting that most of them would recruit to the Celtic Sea stock.

In the eastern parts of the Irish Sea, juvenile herring had a lower mean vertebrae count, and most of these fish must belong to the population that spawns east of the Isle of Man. It is suggested that a yearly trawling survey in the coastal zône north of Dublin may provide a reasonably good forecast of recruitment to the Celtic Sea stock.

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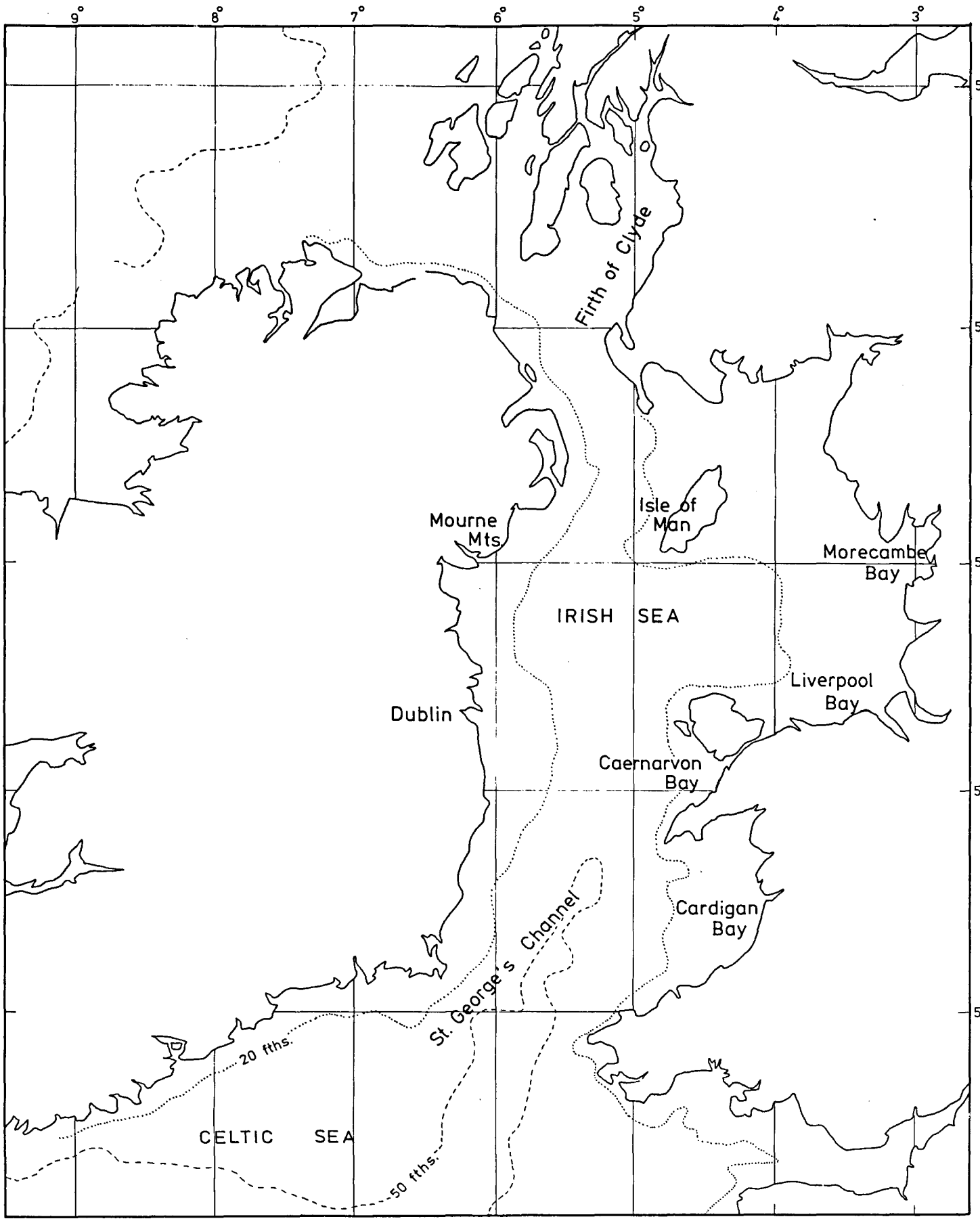

Fig. 1. Geografical names mentioned in text.

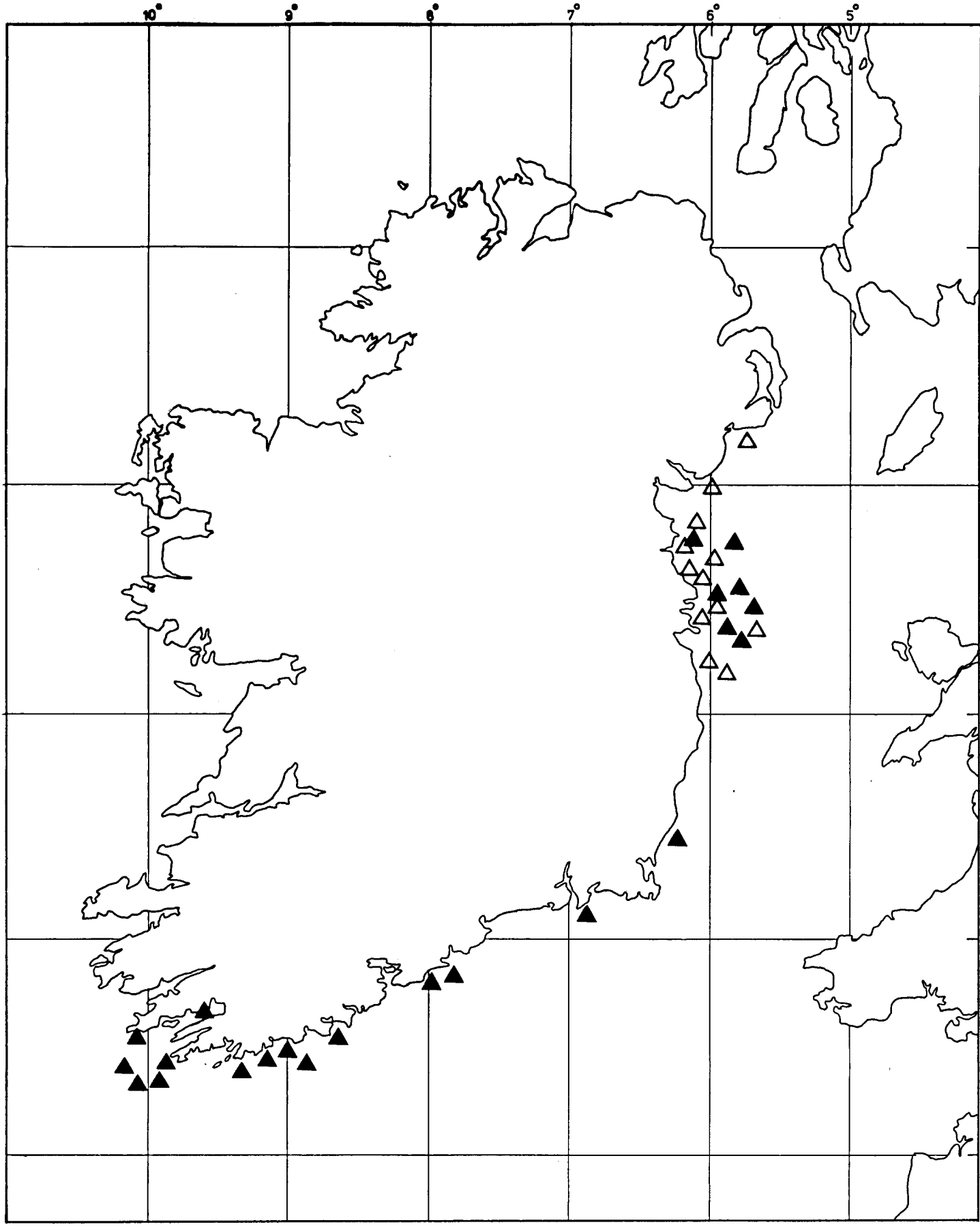

FIG. 2A. TRAWL STATIONS IN 1972. "CU FEASA" JUNE - JULY : ▲

OCTOBER : △

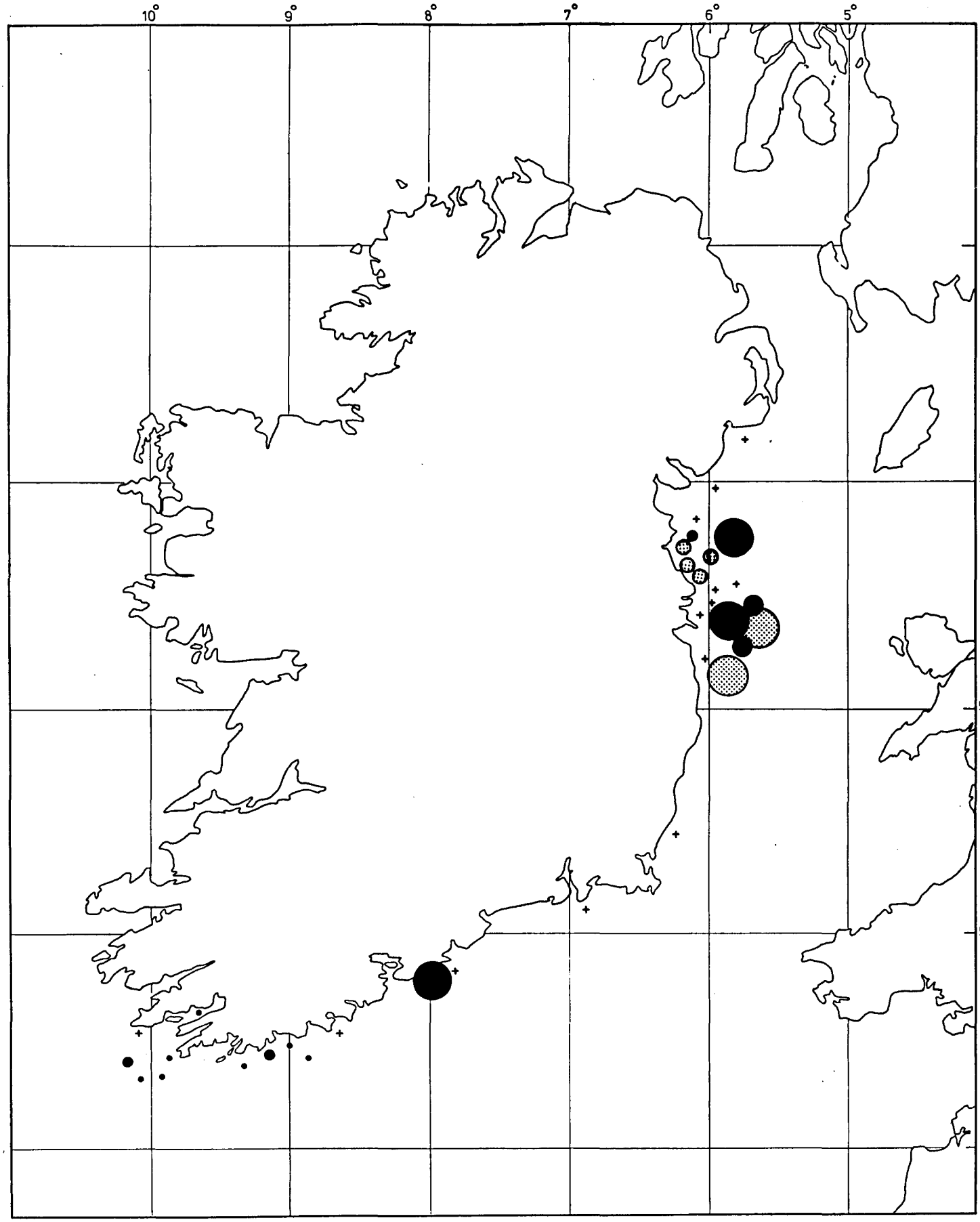

FIG. 2b. ABUNDANCE IN 1972

Catches in numbers / hour

black : I-group in June - July

grey : 0-group in October

+ 0

• 1 – 10

● 11 – 100

● 101 – 1000

● > 1000

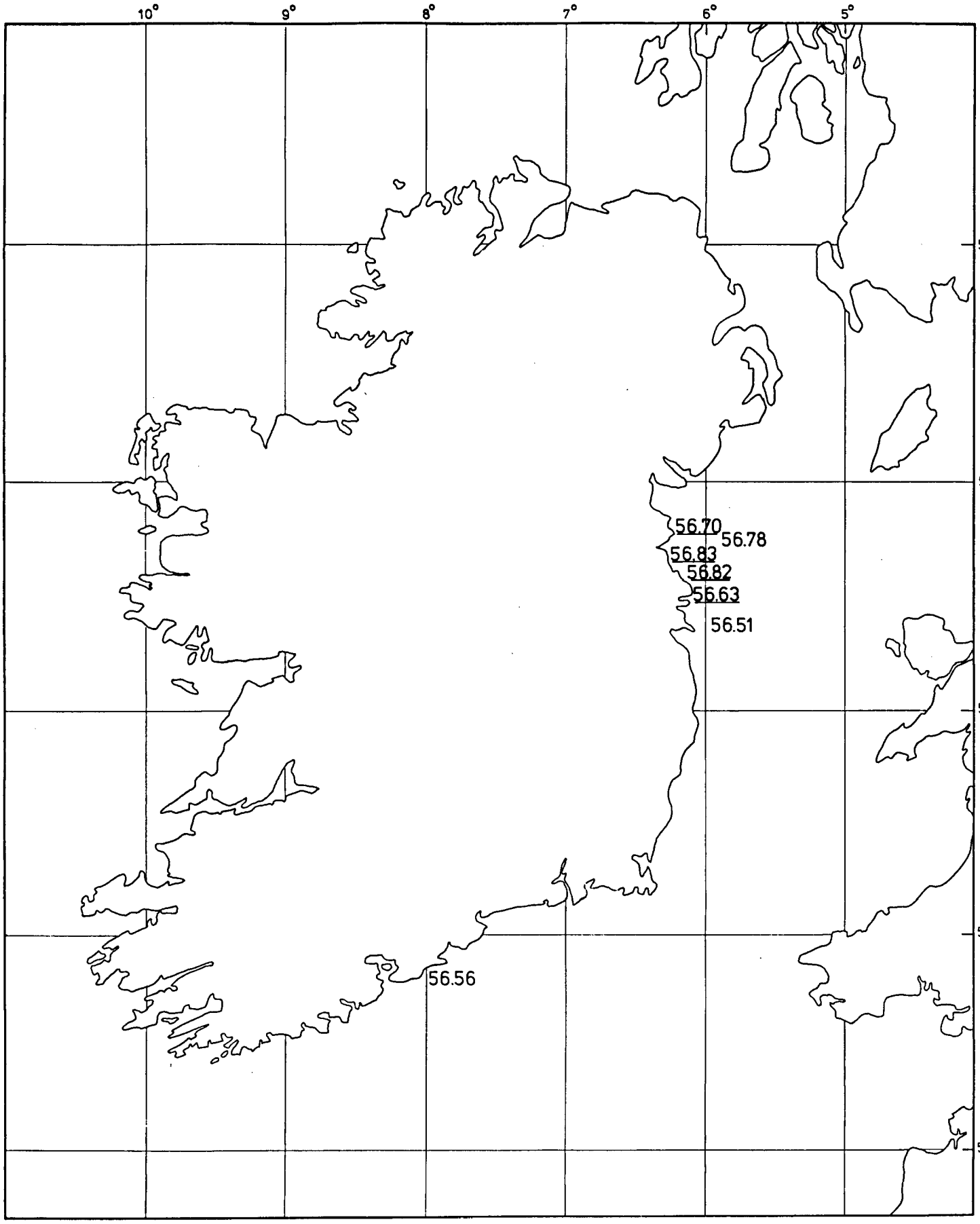

FIG. 2c. MEAN VERTEBRAE COUNTS IN 1972. I-group in June - July
Mininimum 25 measurements 0-group in October (underlined)

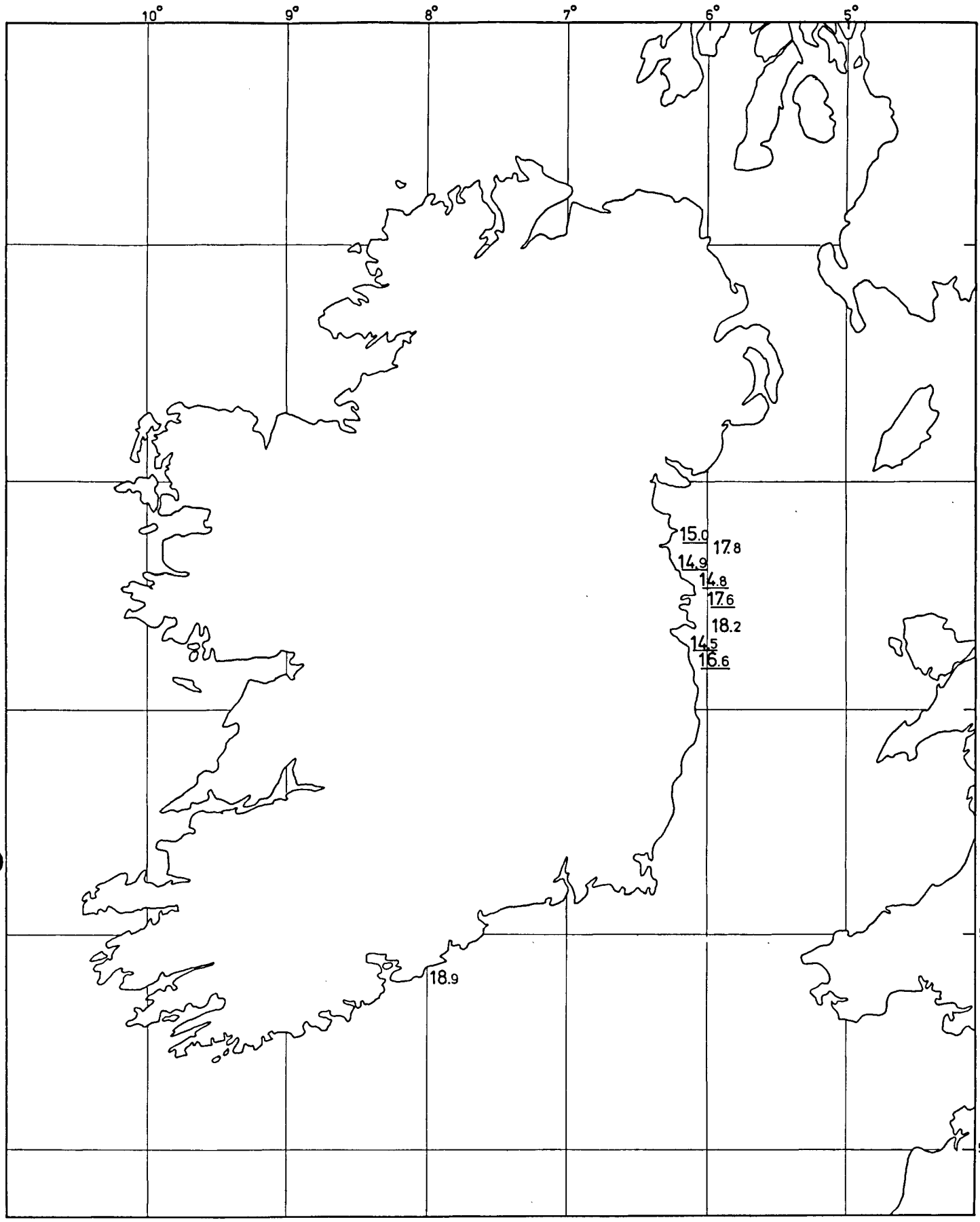

FIG. 2d. MEAN LENGTH IN 1972
Minimum 25 measurements

I-group in June - July
0-group in October (underlined)

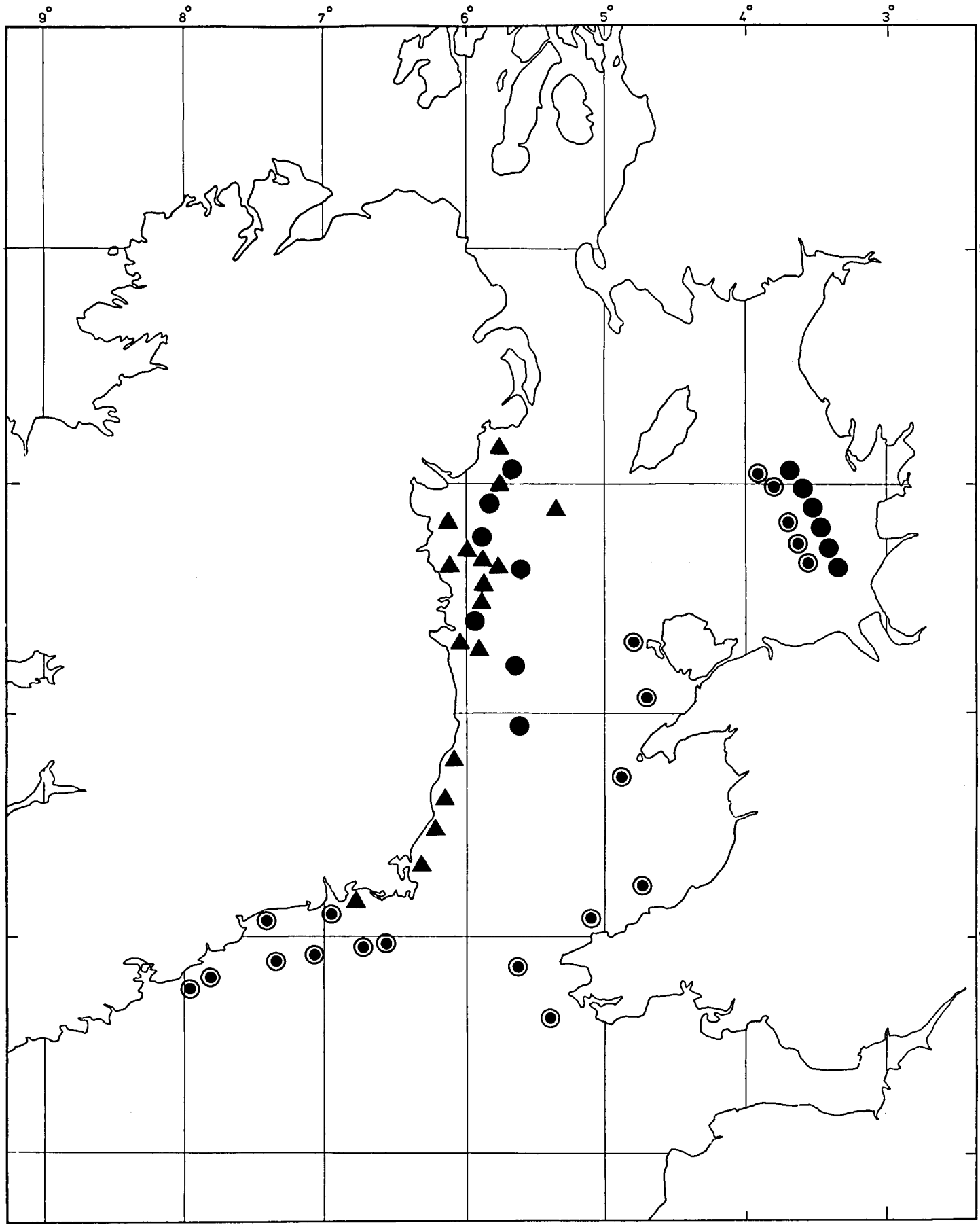

Fig. 3a. TRAWL STATIONS IN 1973.

"Cu Feasa" - bottom trawl ▲
"Tridens" - bottom trawl ◉
"Tridens" - pelagic trawl ●

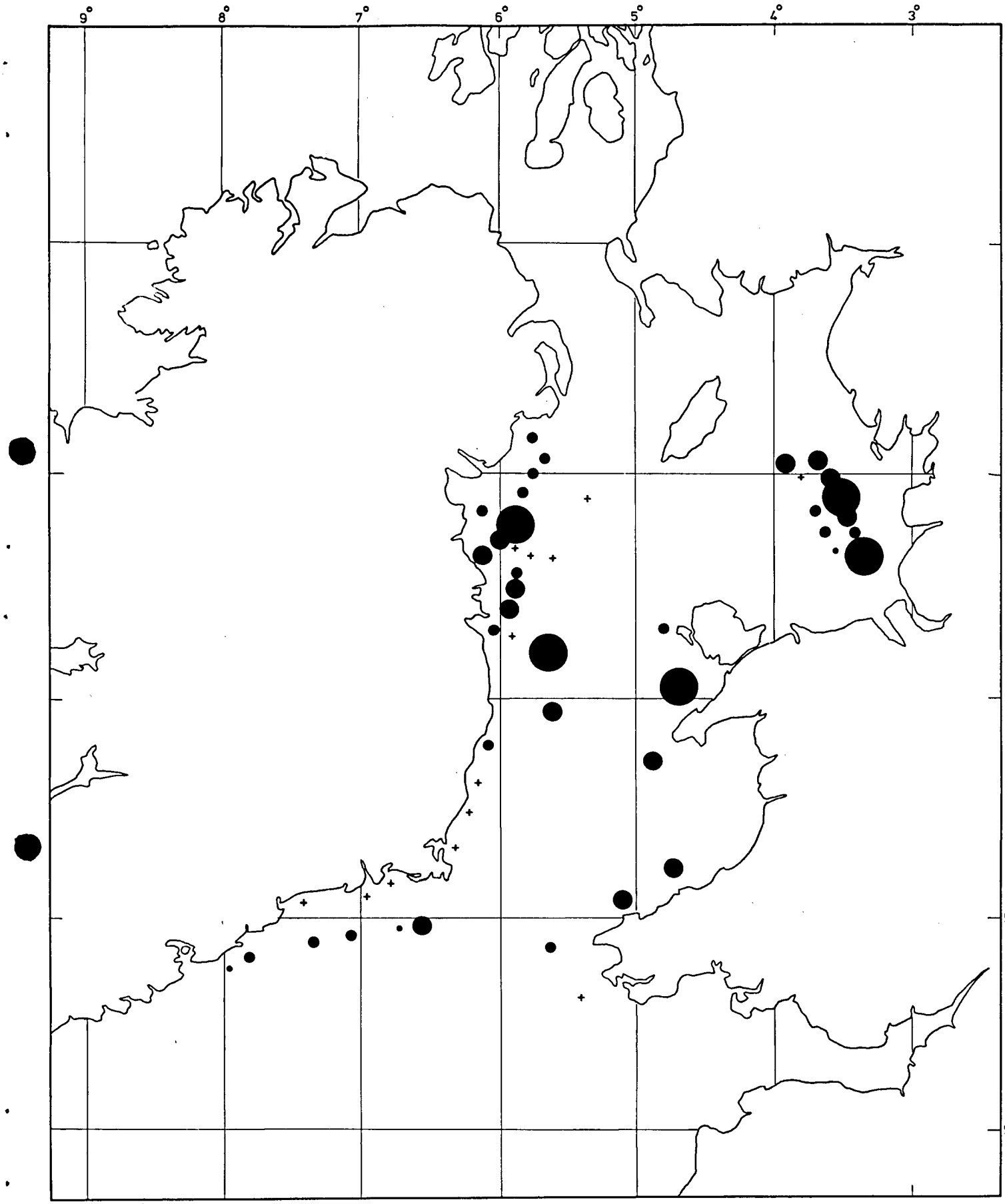

Fig. 3b. ABUNDANCE I-GROUP IN 1973
Catches in numbers per hour

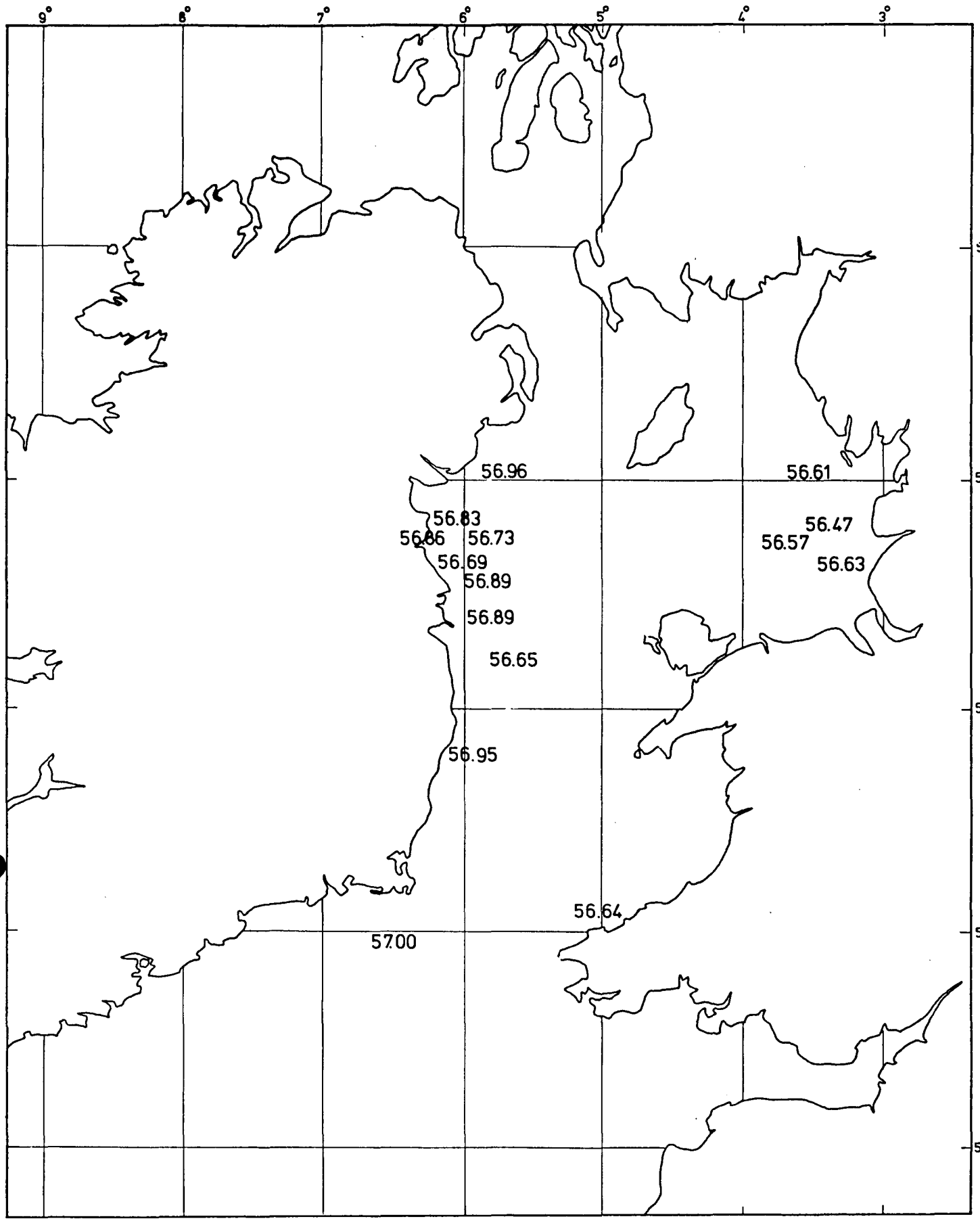

Fig. 3c. MEAN VERTEBREA COUNTS IN 1973, only I-group.
Minimum 25 measurements

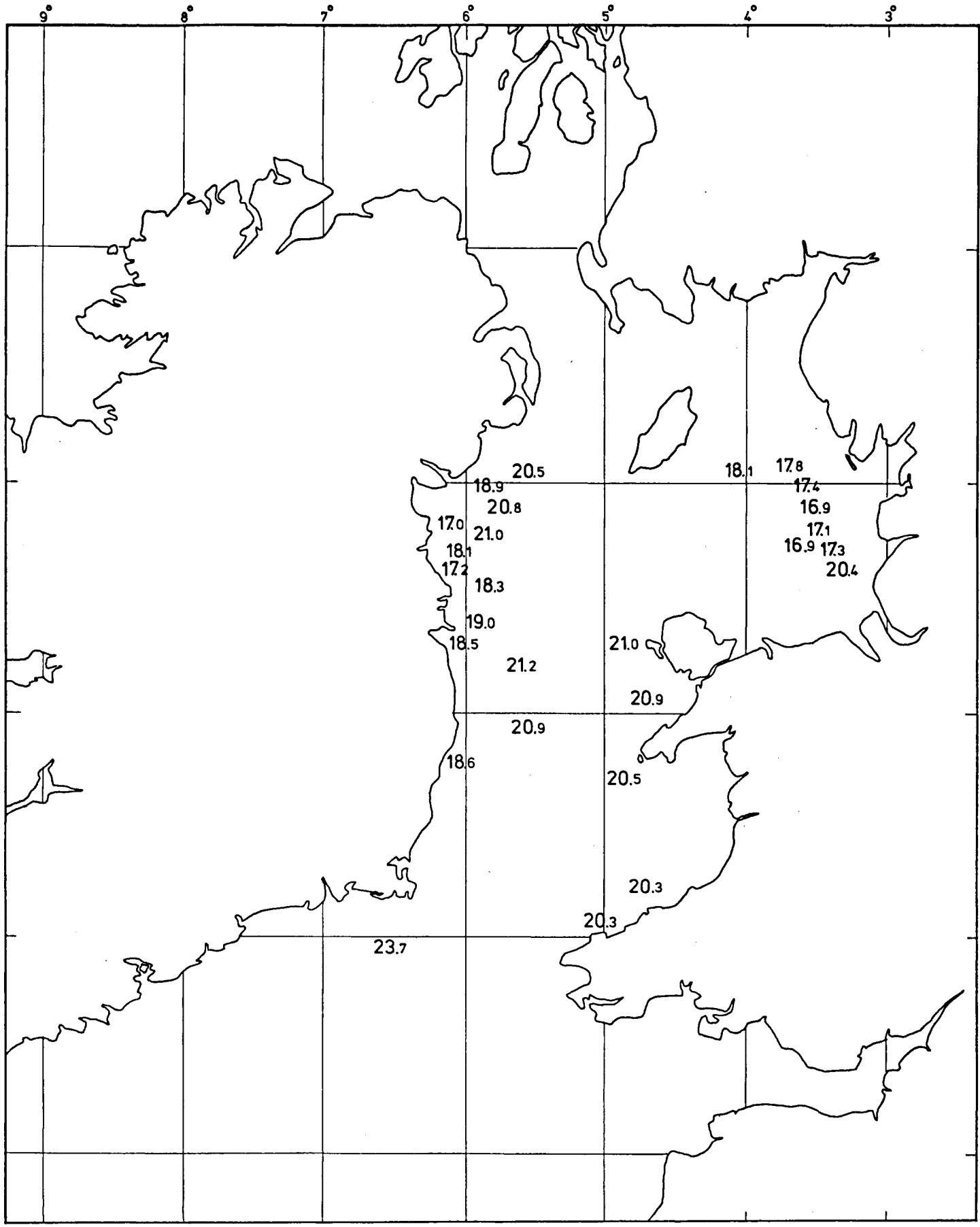

Fig. 3d. MEAN LENGTH IN 1973, only I-group.
Minimum 25 measurements

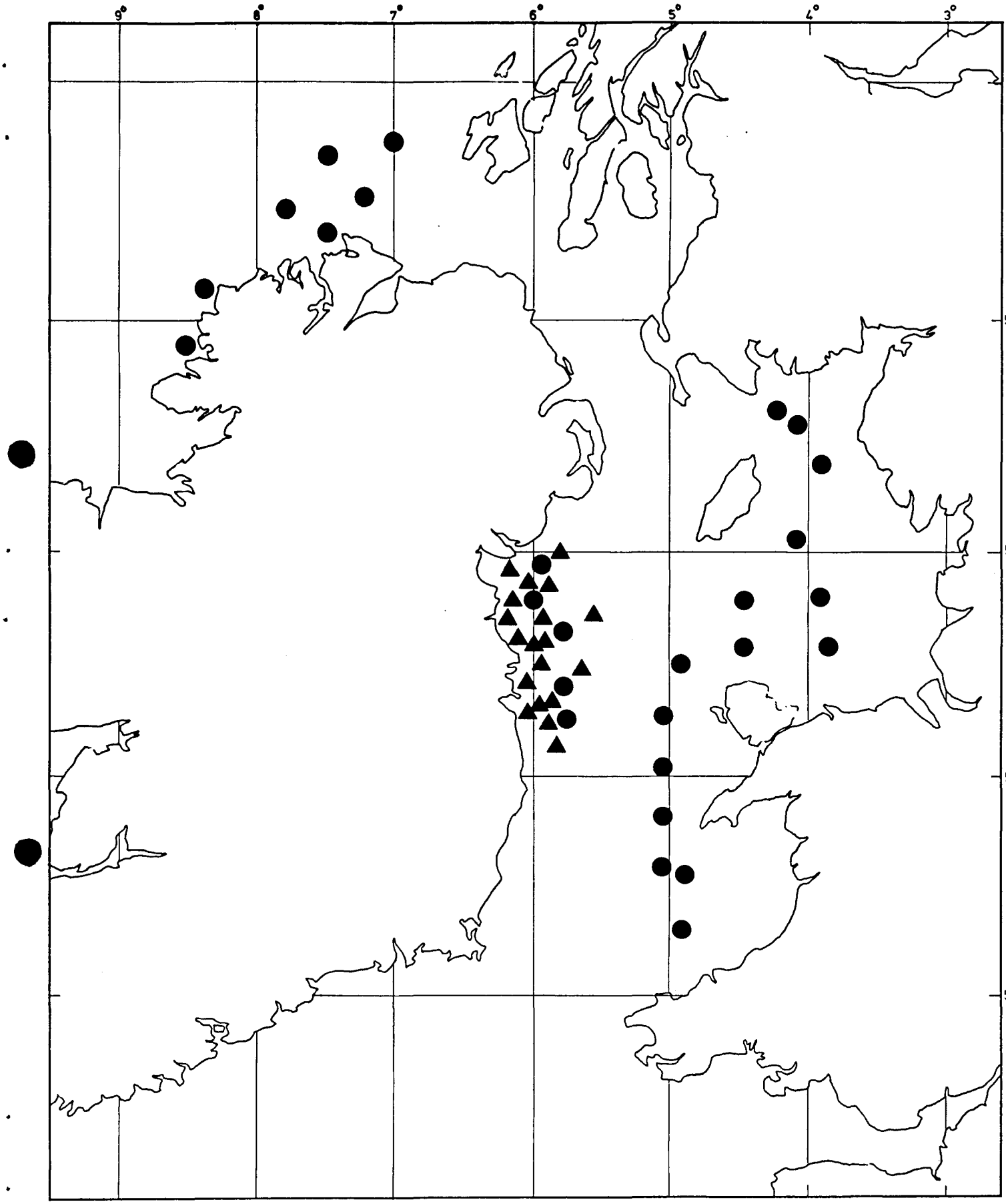

Fig. 4a. TRAWL STATIONS IN 1974. "Resolution" - bottom trawl ▲
"Tridens" - pelagic trawl ●

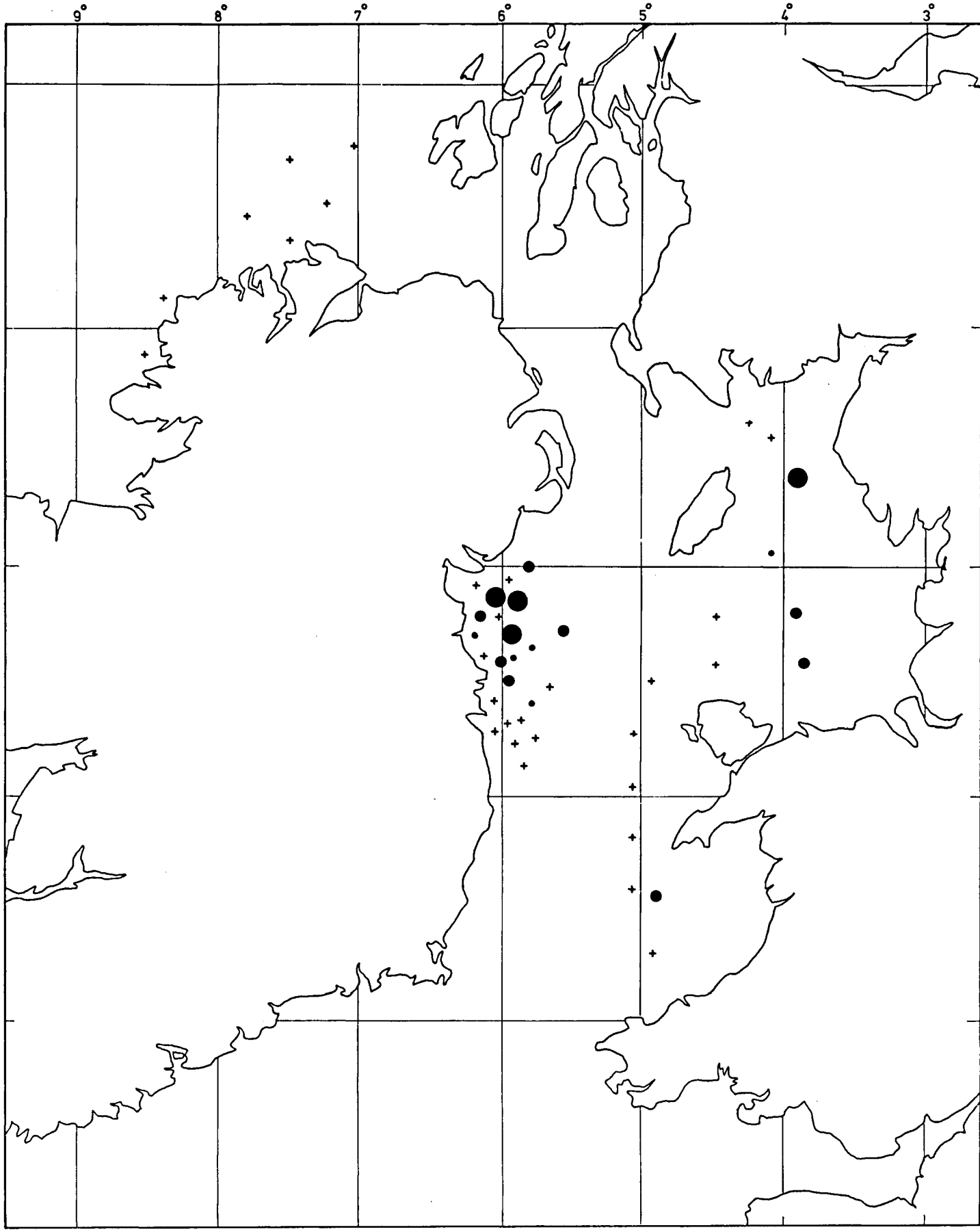

Fig. 4b. ABUNDANCE I-GROUP IN 1974
Catches in numbers per hour

+ 0
• 1 – 10
● 11 – 100
● 101 – 1000

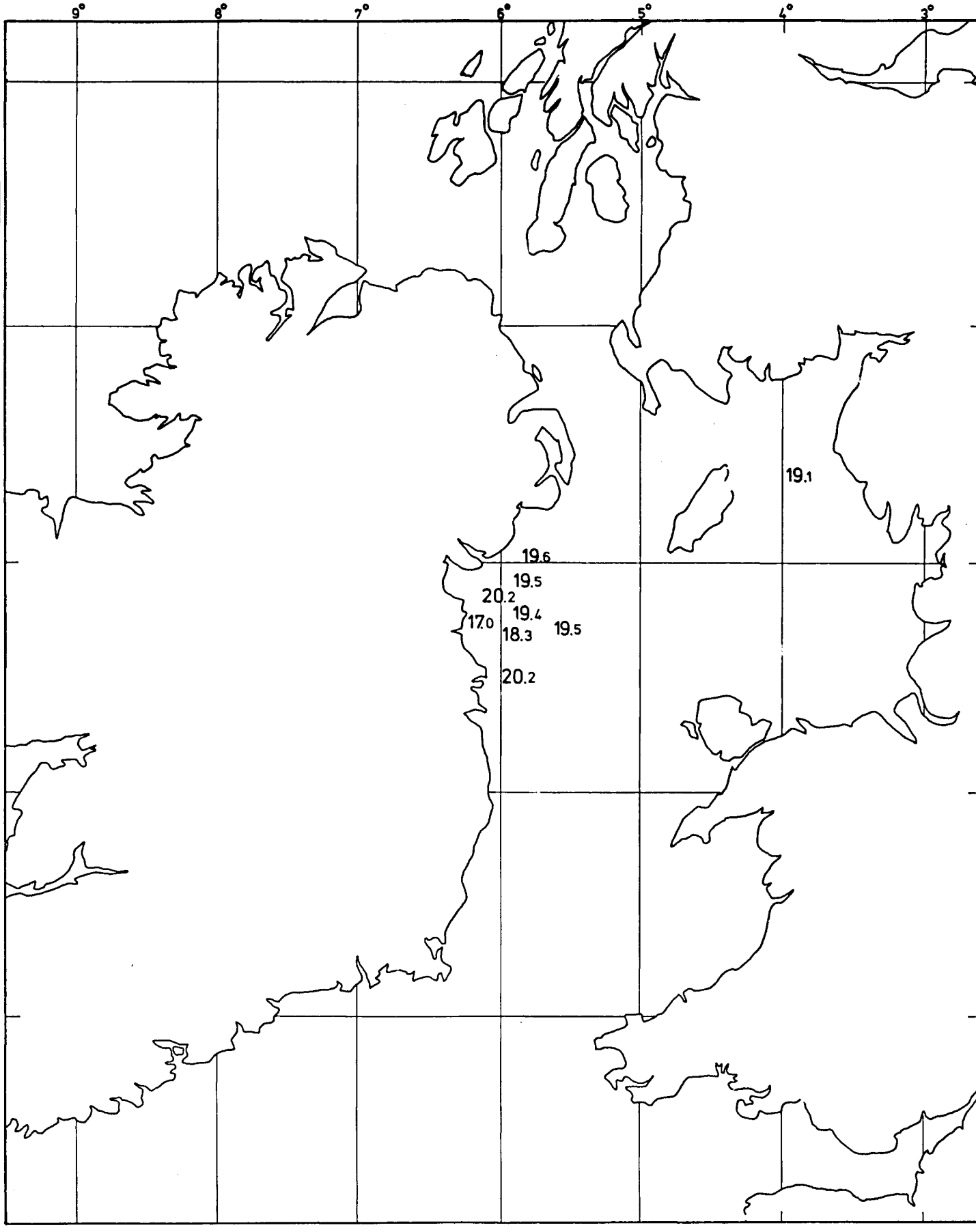

Fig. 4c. MEAN LENGTH I-GROUP IN 1974.
Minimum 25 measurements