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Report on the International Surveys of Herring Larvae in the North Sea and Adjacent Waters in 1970/71.

by

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1. Introduction: The international surveys 1970/71, on which this paper reports, are the fourth in a series which started in 1967 (Saville 1970, Boëtius and McKay 1970, Wood 1970). These surveys were initiated by a recommendation of the ICES Herring Committee in 1966, which urged countries with herring fisheries in the North Sea to combine their efforts to assess the annual herring larval production in that area. Larval production was thought to provide a guide to the relative size of the spawning stocks and to changes in the stocks. As such past time larval abundance estimates have been used in the Report of the North Sea Herring Assessment Working Group (Anon, 1970). Saville (this meeting) gives a more general discussion of the surveys, their objectives and value in North Sea herring research.

2. Material and methods.

Seven countries participated in the 1970/71 surveys: Denmark with R.V. "Dana", England with R.V. "Corella", Germany with R.V. "Anton Dohrn", the Netherlands with R.V.'s "Tridens" and "Willem Beukelsz", Norway with R.V. "Johan Hjort", Scotland with R.V.'s "Clupea" and "Scotia" and Sweden with R.V. "Thetis".

All ships applied for sampling in principle the same gear (a modified Gulf III-sampler) and handling operation, the Norwegian vessel used in addition a Clark-Bumpus sampler and a Juday net. Sampling gear and its operation have been described by Saville (1968).

The areas surveyed were:

I. North-Western North Sea (north of 57°30' N).
II. Central North Sea (between 53°30' NL - 57°30' NL).
III. Downs area (between 53°30' NL - 57°30' NL).
IV. Skagerak-Kattegat.

The surveys started on 18th August 1970 and were completed by 30th January 1971. In this period a total of some 1300 stations were sampled, of which distribution

in time and area is shown in table 1 and in charts 1-22.

Table 1. Periods and distribution of surveys in 1970/71 over the areas, by countries, with the number of stations sampled.

Country	Area	Period	Number of stations fished	
Scotland	North-western North Sea	18/8-11/9, '70	43	257
Scotland	"	11/9-29/9, "	109	
Scotland	"	30/9-11/10, "	54	
Germany	"	5/10-11/10, "	51	
Scotland	Central North Sea	26/8-10/9, '70	73	330
Scotland	"	14/9-21/9, "	71	
Scotland	"	10/10, "	3	
Netherlands	"	8/9-15/9, "	96	
Netherlands	"	6/10-12/10, "	87	
England	Downs area	7/12-17/12, '70	97	572
England	"	5/1-13/1, '71	110	
England	"	20/1-30/1, "	82	
Netherlands	"	7/12-23/12, '70	156	
Netherlands	"	5/1-22/1, '71	127	
Denmark	Kattegat	24/10-27/10, '70	48	153
Denmark	Kattegat	4/11-7/11, "	49	
Norway	Skagerak-Kattegat	13/10-17/10, "	42	
Sweden	Kattegat	13/10-15/10, "	14	

The results of the surveys, shown in charts 1-22, were as usual recorded as numbers of larvae below one square meter of surface at each station, divided in three size groups (<10 mm, 10-15 mm, >15 mm). In cases where more than one haul was made on a station within a period, the highest number of larvae has been shown. The size of the charts did not allow the drawing of contour lines. For the calculation of larval abundance estimates, larger-scale charts (Appr. $\frac{1}{1.000.000}$ to $\frac{1}{2.000.000}$) have been used. On these charts contour lines were drawn at 1, 5, 25 and 100 larvae/sq. meter levels and subsequently planimetered.

Charts 1-22 do not present all material available, charts with no or very few larvae have been omitted.

3. Results:

I. North-western North Sea.

The north-western North Sea was sampled in three periods: late August - early September, second half of September and the first half of October (see table 1). Sampling was light in the first period, as shown in figures 1-2 and mainly concentrated in the Buchan area. Practically no larvae were found.

In the second period (11th - 29th September) the coverage was much more complete and included the areas east of Scotland (Buchan) and east and west of the Orkneys (Figures 3-5). The Shetland region, however, which was sampled in September 1967, 1968 and 1969, was not covered. Larvae of all size groups were present in the area west of the Orkneys, in numbers up to 452/sq. meter for the small larvae (<10 mm), 363/sq. meter for size group 10-15 mm and 56/sq. meter for the large larvae (>15 mm). Smaller numbers of larvae were found in the Clythness area and south of Fair Isles. These may have been transported from west of the Orkneys through the Pentland Firth and the Channel between Fair Isles and Orkneys. Finally, a well defined but very restricted area with only small larvae (<10 mm) was encountered in the south-eastern corner of the Moray Firth, close to the coast. The highest numbers here were 46/sq. meter.

In the third period (30th September - 11th October) the coverage was better than in September in that the Shetland region was sampled (Figures 6-8). Less stations, however, were fished around the Orkneys and east of the Scottish mainland. Small larvae (<10 mm) were found in relatively low numbers west of the Orkneys and Shetlands. Larger larvae were widely distributed both east and west of Orkneys and Shetland with highest numbers over 100/sq. meter for middle-sized larvae (10-15 mm) and over 30/sq. meter for large-sized larvae (>15 mm).

II. Central North Sea.

The central North Sea was surveyed in about the same periods as the north-western North Sea (see table 1). From 26th August to 10th September the northern part of the area, north of 55°30' N, was sampled by the Scottish vessel "Clupea" (Figures 1-2). Small larvae, below 10 mm, were found on the southern edge of the sampled area, in the Longstone-North-East Bank area, in numbers up to 311/sq. meter.

In the second period (8th-21th September) the station net sampled was much more extensive (Figures 3-5). Small larvae were abundant along the whole English north-east coast, with two clear concentrations, one in the Longstone area and the other just north of Flamborough Head. In both concentrations the highest numbers of larvae exceeded 300/sq. meter. Larger larvae were still rather scarce in the area in this period.

In the third period (6th - 12th October) a good coverage of the southern part of the area was attained (Figures 6-8). Small larvae were still present in the two concentrations mentioned before, but now the southern area, around Flamborough Head, was of major importance with highest numbers over 150/sq. meter. A third, very limited concentration of small larvae, already present in the second period, occurred in the Dowsing area (53°40' N, 1° E). No larvae were found in the Dogger region. Larger larvae were rather numerous, in particular those of the size-group 10-15 mm (highest numbers over 60/sq. meter) and were caught over a wide area, but not on the eastermost stations.

III. Downs area.

The surveys in the Downs area covered also three periods: December 1970, early January 1971 and late January 1971 (Table 1). Because of difficulties in combining the English and Dutch data the surveys have been shown separately (Figures 9-18).

The December surveys of both the English and Dutch ships showed two distinct concentrations, one in the Southern Bight and another in the eastern part of the English Channel. Only larvae up to 15 mm were present in any numbers (Figures 9-10 for England, Figures 11-12 for the Netherlands). The larval abundance estimates for the Southern Bight concentration agree quite well for the two surveys, but in the Channel the Dutch found much higher larval numbers than the English (Table 5). In the Southern Bight numbers up to about 7/sq. meter were found for small larvae and up to about 20/sq. meter for middle-sized larvae. Large larvae (>15 mm) were hardly present. In the Channel highest numbers as recorded by the English were up to 14/sq. meter for small larvae and 1/sq. meter for middle-sized larvae, for the Dutch 28/sq. meter for small larvae and about 90/sq. meter for middle-sized larvae. We will return to this question in section 4 (Discussion).

The early January surveys gave a better agreement between the English and Dutch data (Figures 13-14 for England, Figures 15-16 for the Netherlands). Both showed again the two concentrations in the Southern Bight and the English Channel, with practically only larvae larger than 9 mm. The middle-sized larvae were most abundant, the highest concentrations were found by both countries R.V.'s in the Channel. (Highest numbers up to 25/sq. meter). The largest larvae (>15 mm) appeared to be more abundant in the Dutch data than in the English, in particular in the Southern Bight area. Highest numbers in the English survey were up to 4/sq. meter, in the Dutch survey 9/sq. meter. The distribution of the middle-sized larvae in the two surveys showed also a better agreement than in the large-sized ones.

The late January survey, carried out by the English R.V. "Corella", gave good

coverage for the Southern Bight, but was incomplete for the Eastern Channel area (Figures 17-18). Small larvae were virtually absent, the large larvae were the most abundant group. The highest numbers were found in the Channel, up to 6/sq. meter for 10-15 mm larvae, and up to 17/sq. meter for large larvae.

IV. Skagerak-Kattegat.

In this area surveys were made in two periods: in the second half of October and in early November (Table 1).

The October survey, shown in figures 19-20, included not only the Kattegat (Kobbergrund) but also the Jutland Bank, which was worked by the Norwegian R.V. "Johan Hjort". From the Norwegian data only hauls carried out with the Gulf-III-sampler have been considered in the figures and the subsequent abundance calculations, for reasons of comparability. Due to the small numbers caught no conclusions could be drawn about the comparability of the different types of nets used by the Norwegian vessel.

As in all surveys in the recent past no larvae were found in the Jutland Bank area.(Haraldsvik 1967, Postuma 1966, Saville 1970, Boëtius and McKay 1970, Wood 1970). In the Kattegat area small and middle-sized larvae were found in low numbers. The highest numbers occurred in the north-eastern part of the Kattegat and were up to 20/sq. meter for small larvae and 4/sq. meter for middle-larvae.

The Noverber survey, shown in figures 21-22, concerned only the Kattegat. Numbers of larvae were very low and included mainly specimen of the small and middle-sized groups. Highest numbers found were 3/sq. meter for larvae $<$10 mm, and 4/sq. meter for larvae between 10-15 mm.

Discussion.

As stated in the introduction the main objective of the international herring larval surveys is an assessment of annual larval abundance and hence spawning stock size in spawning areas, which in the past proved to be the major spawning grounds of autumn spawners in the North Sea and adjacent waters. Table 2 shows the larval abundance estimates for the three size categories of herring larvae, by spawning areas and survey periods.

Wood (1970) mentions as a problem the material concerning the north-western North Sea, in particular that west of the Orkneys and Shetlands. The presence of high numbers of newly hatched larvae west of 4° L. (outside the North Sea) in that region and the fact, that off Cape Wrath and off Lewis (Hebrides) large concentrations of spawning herring or newly hatched larvae have been recorded in the past (Clark 1933, Wood 1971), led him to separate the larval abundance

estimates in area VIa from those in the north-western North Sea (area IVa). As the problem arose again with the 1970-material, Wood's exemple was followed. One should realize, however, that the larval distribution west of the Orkneys and even around the Orkneys, shows, at least in 1970, a more or less coherent pattern in which it is difficult to distinguish more than one area of concentration. The 1970-material holds furthermore the slight suggestion that the small larvae are more numerous towards the west, the larger ones in the eastern part of the area, which could point to transport in a generally eastern direction. In a similar way the larvae just east of the Orkneys seem to be connected with the west-Orkney concentration, with a possible transport though the Pentland Firth and the Orkney-Fair Isle channel. The assumption, that this whole concentration is connected and that the major spawning grounds are found, at least partly, outside the North Sea, in the Hebrides area, the larvae drifting into region IVa (north-western North Sea), seems therefore reasonable.

In table 2 the abundance of larvae in area VIa is shown for two periods. The number of stations worked was low (14 in September and 4 in October) and the westward edge of the concentration was not determined, so that the figures given are probably considerable underestimates. Nothwithstanding the incomplete coverage of the area larval abundance was high when compared with the North Sea regions. That the estimates are higher than those of the 1969-season could be explained by the somewhat larger region surveyed.

Herring larval estimates for the north-western North Sea, which means mainly the other part of the continuous distribution starting in region VIa, are shown for the second and third survey period in table 2. No estimates could be given for the first period (18th August - 11th September), but from the information available the numbers would seem to be small. Considering that in the second period (11th - 29th September) the Shetland area was not sampled, the larval abundance estimates appear to be relatively high when compared with the three preceding seasons. This is less so for the small larvae as for the middle-sized and large groups, as shown in table 3.

Table 3: Larval abundance estimates (numbers $\times 10^{-9}$) in the north-western North Sea, showing newly hatched and larger larvae in September and October.

Year	September		October	
	<10 mm	>9 mm	<10 mm	>9 mm
1967	243.6	518.5	600.4	288.4
1968	162.2	293.0	28.9	98.8
1969	348.1	409.7	74.9	105.3
1970	384.1	1231.2	73.8	940.7

The third survey period offers also problems of comparison with the former surveys, because the 1970 October-survey was more complete than those in 1967-69. Table 3 suggests that in October small larvae were not particularly numerous, but the larger ones would certainly seem to be more abundant. One wonders, whether the increase of larger larvae in the north-western North Sea in 1970 with no great changes in the small larvae could have been caused by an large influx of larvae from the west, from area VIa. Alternatively, the survival rate or the growth rate of the larvae in 1970 could have been high in 1970. Considering only the small larvae as an index for spawning stock size, as was done in the Report of the North Sea Herring Assessment Working Group, there is no clear suggestion of a recovery of the northern North Sea herring stock since its decline in 1966 (Anon, 1970). Noteworthy in the 1970 situation is the suggestion of a reappearance of a small larval concentration in the Buchan area, in the south-eastern corner of the Moray Firth.

Larval abundance estimates for the central North Sea have been shown for three periods in table 2. The timing of the first survey allows no comparison with similar surveys in former years. Larval abundance indices in September - October (second and third surveys in 1970) are shown in table 4 for the years 1967-70.

Table 4: Larval abundance estimates (numbers $\times 10^{-9}$) in the central North Sea in the period 1967-70, for newly hatched and larger larvae, in September - October.

Year	September		October	
	<10 mm	>9 mm	<10 mm	>9 mm
1967	395.0	5.5	154.3	51.5
1968	37.0	13.2	19.5	8.5
1969	8.4	3.0	12.7	172.1
1970	591.7	107.2	182.2	401.2

It appears, that both small and larger larvae were more numerous in the central North Sea in 1970 than in the three preceding years. It seems unlikely that this is an effect of sampling intensity. The increase in larval abundance is most pronounced, considering all four years, for the larger larvae, as in the north-western North Sea.

The distribution of the larvae was again coastal in 1970, there was no sign of a recovery of the old Dogger larval patch. A new development in the area is the appearance of a strong larval patch in the Longstone region, which coincided with good catches of spawning herring in that area (Burd, personal communication).

Table 2 gives for the Downs area larval abundance estimates for five different surveys. As mentioned in section 3 there is a discrepancy between the results of the December surveys of England and the Netherlands. The Dutch survey gave far higher larval numbers in the English Channel than the English, as appears from table 5.

Table 5. December-surveys in Downs area, all size groups. (numbers $\times 10^{-9}$).

	Southern Bight	English Channel
England	47.3	14.0
Netherlands	52.0	154.6

A possible cause for the discrepancy could be the timing of the two surveys. The English survey took place from 7th - 14th December, the Dutch survey form 11th - 17th December. From fisheries information it would seem that the spawning of the herring in the Channel started around 25th of November 1970 so that the English survey might just have missed the appearance of the larvae. However, the possibility exists, that the cause of the disagreement is the occurrence of other Clupoid larvae (pilchard larvae) in that area. In the 1969/70 surveys a similar discrepancy occurred, then in January and again in the English Channel, when the Dutch recorded about six times as many larvae than the English (Wood, 1970). Then, too, the timing of the surveys could have been responsible, but the question needs further attention.

Comparing the 1970 Downs surveys with those of former years, taking straight means of larval abundance estimates for December and January, as was done in the North Sea Herring Assessment Working Group Report (Anon, 1970) the following estimates were found in the period 1960/61-1970/71 (Table 6):

Table 6. Larval abundance estimates (all size-groups, numbers $\times 10^{-9}$) in the Downs area average for December and January.

1960/61	61/62	62/63	63/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71
16	56	29	7	6	5	?	40	6	87	127

More than words this table illustrates the probable rate of recovery of the Downs stock in the last few years. As stated for the 1969-season, the recovery started in the Channel component of the Downs stock. In 1970, however, it would seem that also the Southern Bight component improved compared with 1969.

Estimates of the numbers of larvae in the Kattegat (Kobbergrund) are given for two periods in table 2. A comparison with larval abundance estimates in 1967-69 is shown in table 7.

Table 7. Larval abundance estimates (numbers $\times 10^{-9}$) in the second half of October in the Kattegat (Kobbergrund) in the years 1967-1970.

Year	<10 mm	>9 mm
1967	59.5	--
1968	9.2	2.3
1969	28.1	1.1
1970	30.5	9.7

From table 7 it would seem that larval abundance, in particular of small larvae, was rather steady in the area since 1967. In 1970, however, the area surveyed was larger than in any other year. Considering the highest numbers of small larvae found under one square meter of sea surface in the north-eastern Kattegat in the four years (1967: 300, 1968: 7, 1969: 48, 1970: 20), larval abundance in 1970 could have been the one but lowest in the series.

5. Summary.

Larval abundance estimates in the north-western North Sea for small larvae (<10 mm) were probably of the same order or somewhat higher than in the years 1967-69, but larger larvae were far more numerous. Most of the larvae occurred in the area west of the Orkneys. Large numbers of larvae, both small and large, were found in an incompletely sampled area west of 4° L, north of Scotland (Cape Wrath region), in connection with the concentration west of the Orkneys.

In the central North Sea larval numbers were higher than in 1967-69, in particular those for larger larvae. Newly hatched larvae were found in two well-defined areas close to the English north-east coast. (Longstone-area, Flamborough Head area).

Larval abundance in the Downs area was the highest recorded in all seasons after 1960/61. Numbers were relatively high both in December and January, the southern spawning area in the English Channel had the highest larval abundance.

In the Kattegat (Kobbergrund) larval abundance was probably poor compared with that in the years 1967 and 1969 and possibly of the same order of magnitude as in 1968.

6. References.

1. Anon 1970 "Report of the North Sea Herring Assessment Working Group", ICES, CM 1970, H:6 (Mimeo).

2. Boëtius, J. and McKay, D.W. 1970 "Report on the international surveys of herring larvae in the North Sea in 1968", ICES, Coop. Res. Rep. Series A, 19: 18-30.

3. Clark, R.S. 1933 "Herring larvae. The mixing of the Broods in Scottish Waters". Rapp. P.-V. Réun. Cons. perm. int. Explor. Mer., 85 (3): 11-18.

4. Haraldsvik, S. 1967 "Herring larvae survey in the Skagerak, autumn 1966". ICES, CM 1967, H:27 (Mimeo).

5. Postuma, K.H. 1966 "On the spawning of the West and Jutland Banks". ICES. CM 1966, H:6 (Mimeo).

6. Saville, A. 1968 "A report on the international surveys of herring larvae in the North Sea 1967". ICES, CM 1968, H:20.

7. Saville, A. 1970 "Report on the International Surveys of Herring Larvae in the North Sea in 1967", ICES, Coop. Res. Rep. Series A, 19: 2-17.

8. Wood, R.J. 1970 "Report on the International Surveys of Herring Larvae in the North Sea and Adjacent Waters in 1969/70". ICES, CM 1970, H:4 (Mimeo).

9. Wood, R.J. 1971 "Autumn spawning grounds of herring to the west of Scotland", Rapp. P.-V. Réun. Cons. perm. int. Explor. Mer, 160: 65-73.

Table 2: Estimates of larval abundance (three size groups) by areas and survey periods.

AREA OR STOCK	SURVEY	ABUNDANCE OF HERRING LARVAE $\times 10^{-9}$			
		< 10 mm	10-15 mm	>15 mm	Total
Cape Wrath	23th-24th Sept. 1970	385.8	996.9	134.7	1517.4
(Region VIa)	8th Oct. 1970	--	163.3	66.6	229.9
North western North Sea	11th-29th Sept. 1970	384.1	1011.2	220.0	1615.3
(Region IVa)	30th Sept.-11th Oct. 1970	73.8	612.0	328.7	1014.5
Bank	26th Aug.-10th Sept. 1970	100.4	2.1	--	102.5
	8th-21th Sept. 1970	591.7	107.2	--	698.9
	6th-12th Oct. 1970	182.2	267.3	133.9	583.4
Downs (England)	7th-18th Dec. 1970	23.4	37.9	--	61.3
" (Netherlands)	7th-24th Dec. 1970	69.8	136.6	4.2	210.6
" (England)	5th-14th Jan. 1971	2.3	98.9	32.5	133.7
" (Netherlands)	5th-23th Jan. 1971	--	88.0	60.6	148.6
" (England)	20th-30th Jan. 1971	0.4	25.3	47.9	73.6
Kattegat (Kobbergrund)	13th-27th Oc . 1970	30.5	9.3	0.4	40.2
	4th-7th Nov. 1970	4.4	21.8	--	26.2

Fig. 1 NUMBERS OF LARVAE < [illegible] m.m. BELOW 1 sq. metre
WESTERN NORTH SEA - 18 aug. - 11 sept. 1970

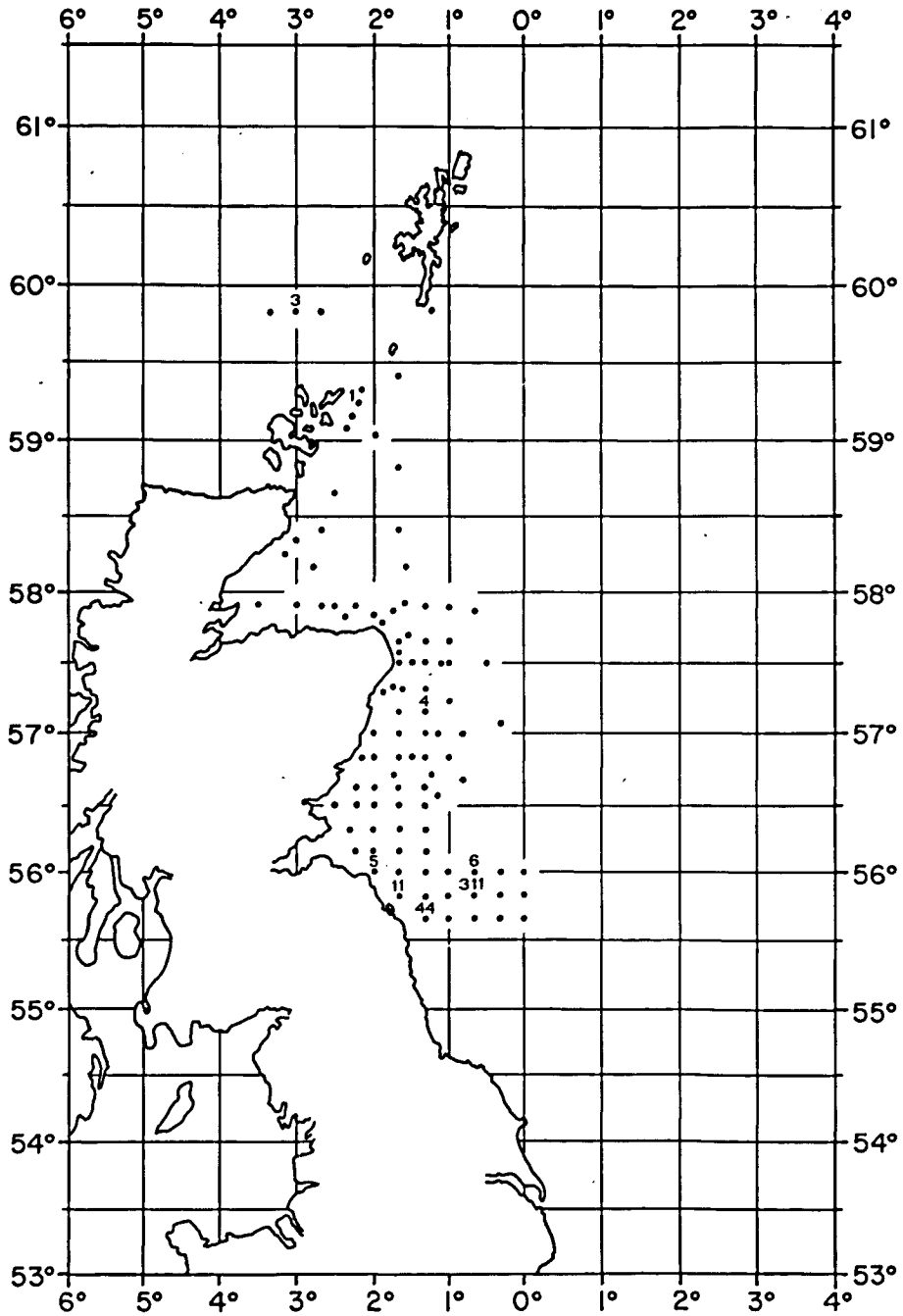

Fig. 2 NUMBERS OF LARVAE 10-15 m.m. BELOW 1 sq. metre
WESTERN NORTH SEA - 18 aug. - 11 sept. 1970

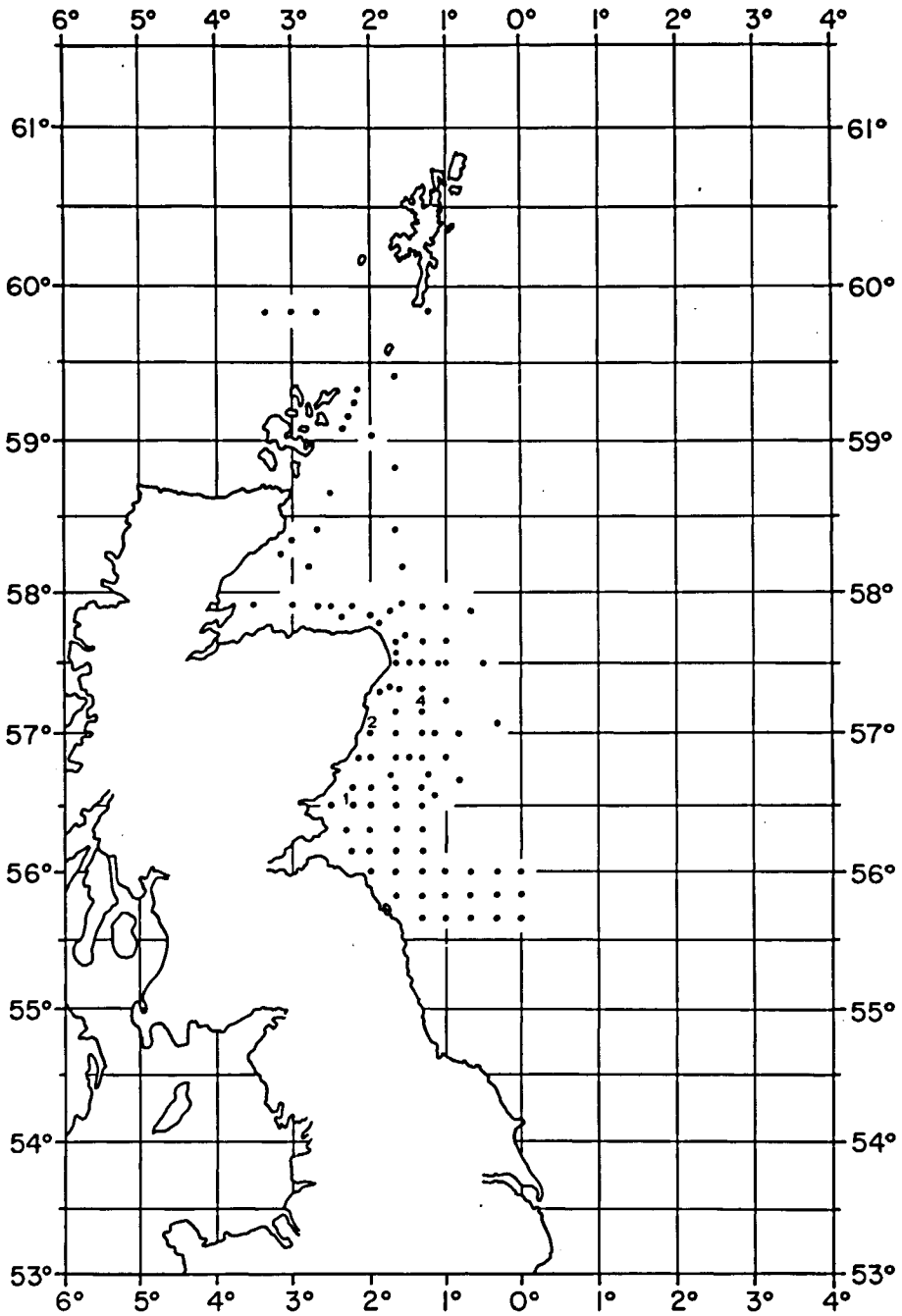

Fig. 3 NUMBERS OF LARVAE < [illegible] m.m. BELOW 1 sq. metre
WESTERN NORTH SEA - [illegible] 29 sept. 1970

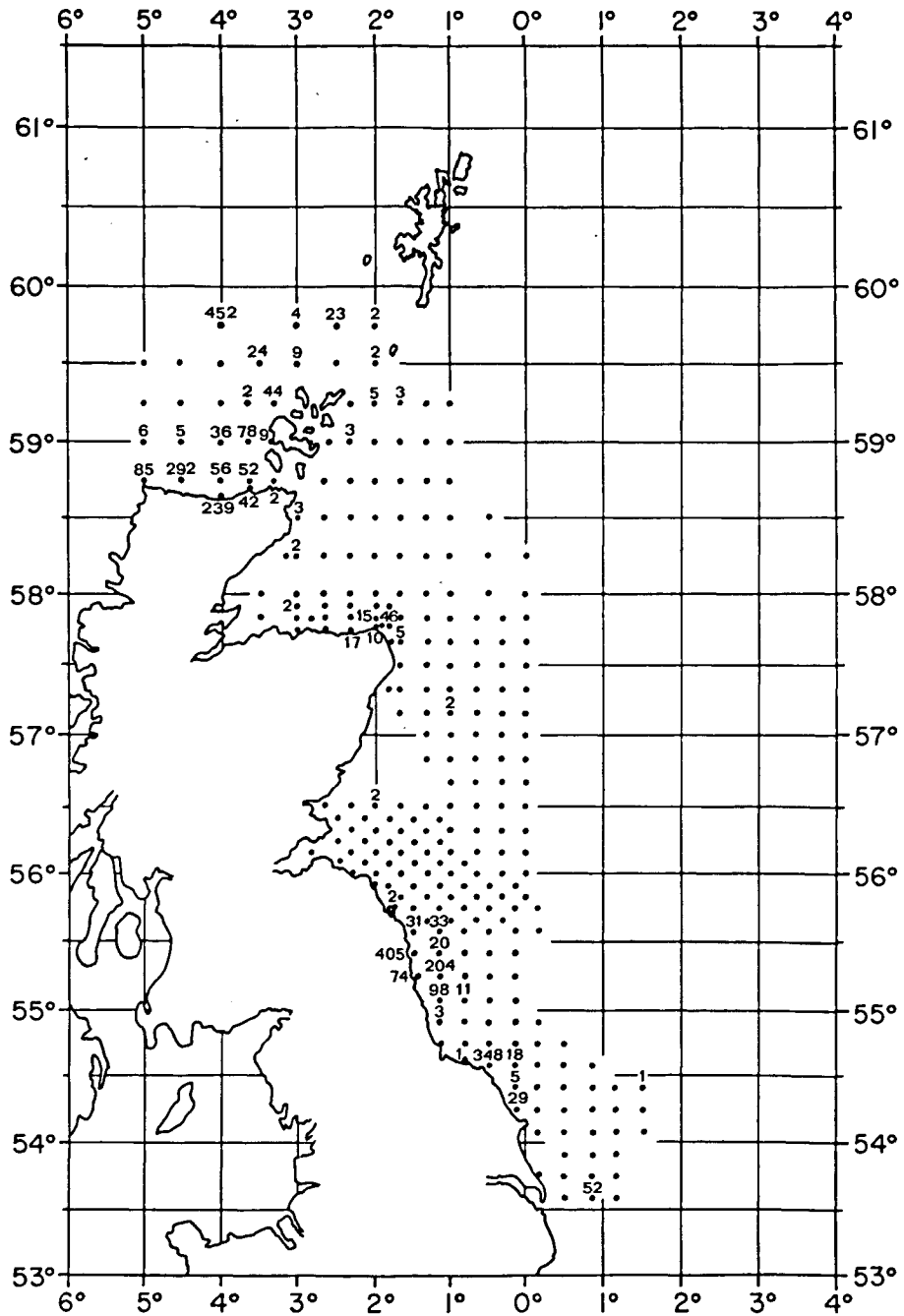

Fig. 4 NUMBERS OF LARVAE 10-15 m.m. BELOW 1 sq. metre
WESTERN NORTH SEA - 8 - 29 sept. 1970

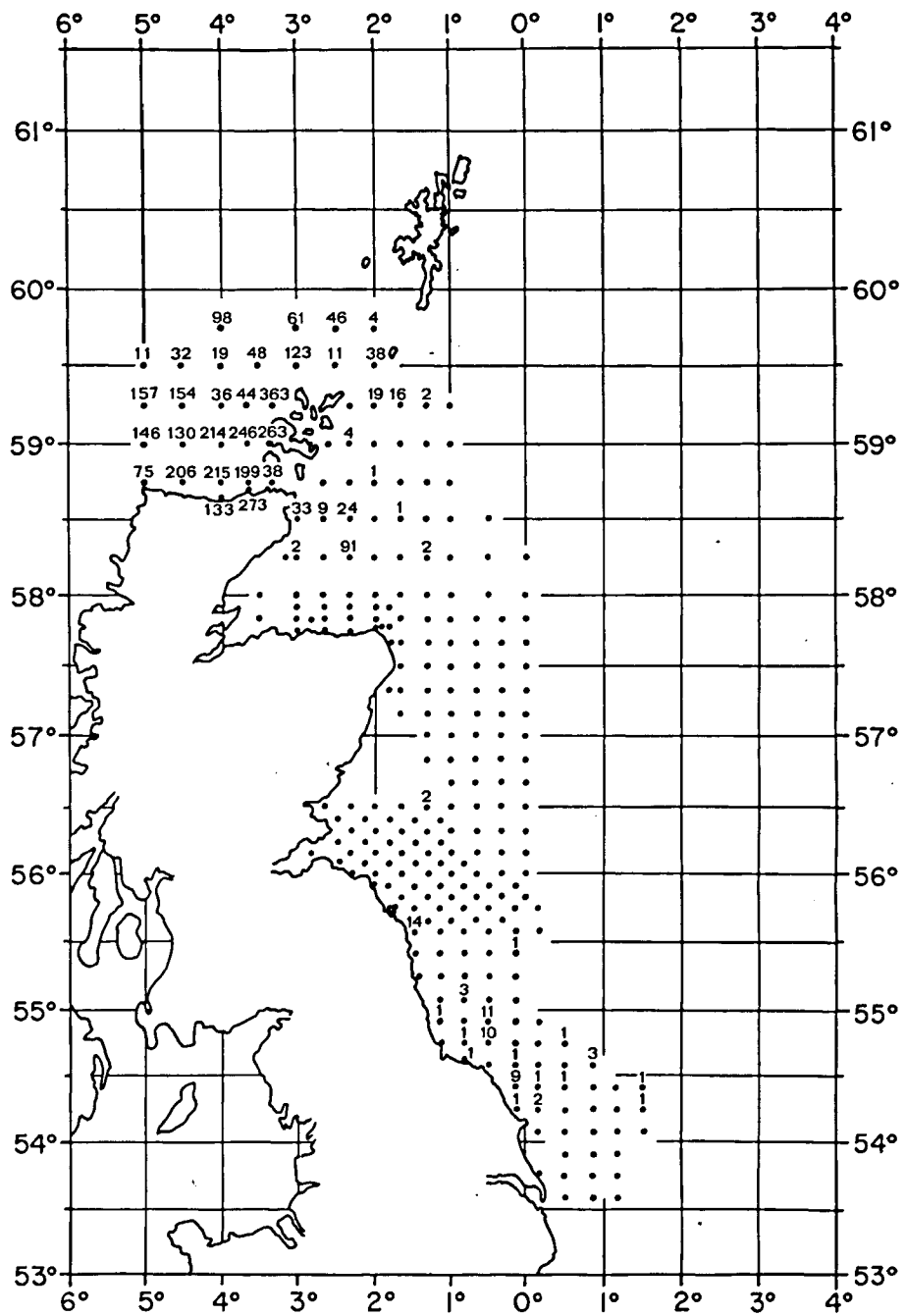

Fig. 5 NUMBERS OF LARVAE >[illegible]m.m. BELOW 1 sq. metre
WESTERN NORTH SEA - [illegible] 29 sept. 1970

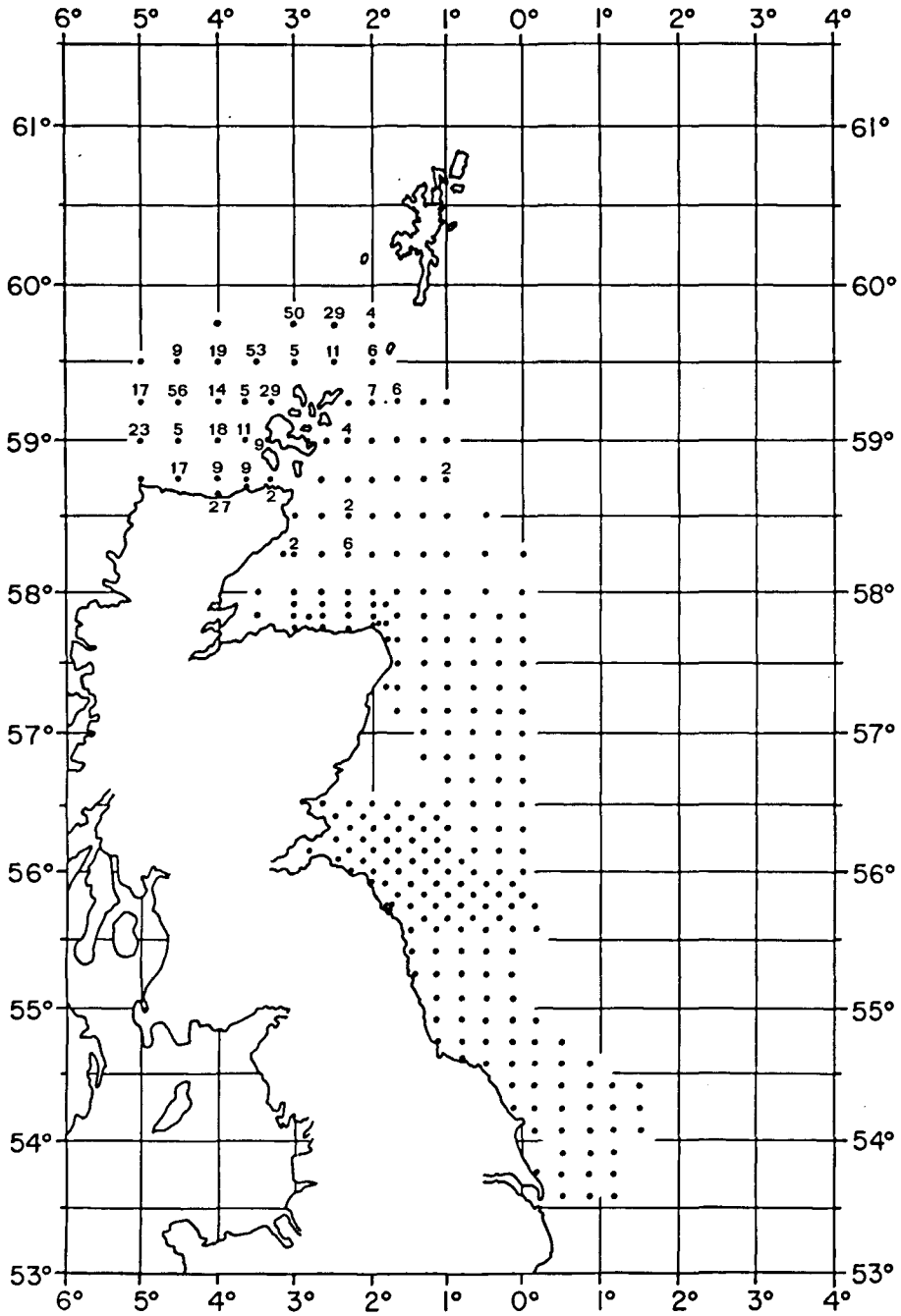

Fig. 6 NUMBERS OF LARVAE <10 m.m. BELOW 1 sq. metre
WESTERN NORTH SEA - 29 sept. - 13 oct. 1970

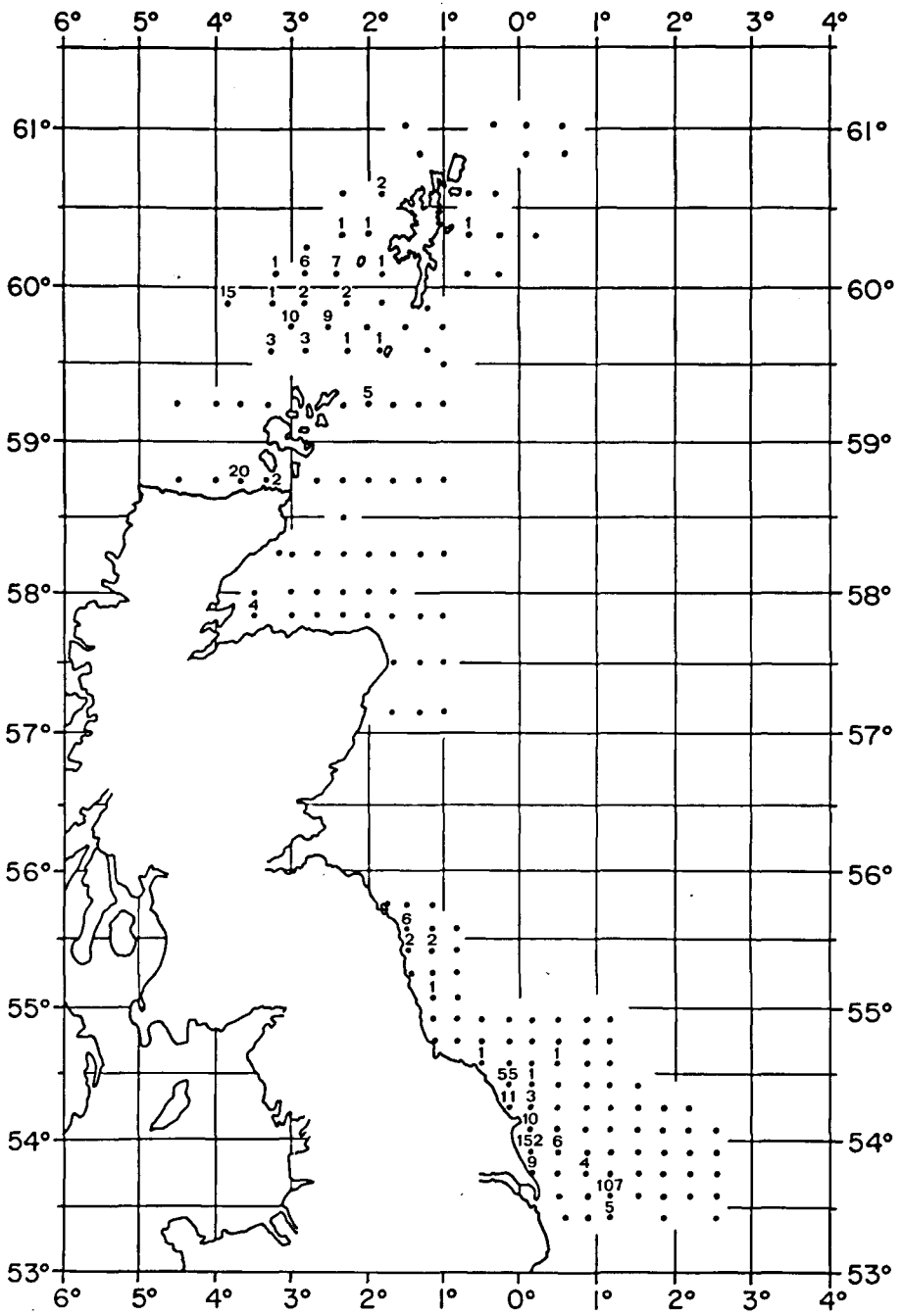

Fig. 7 NUMBERS OF LARVAE [illegible]5 m.m. BELOW 1 sq. metre
WESTERN NORTH SEA - 29 sept. - 13 oct. 1970

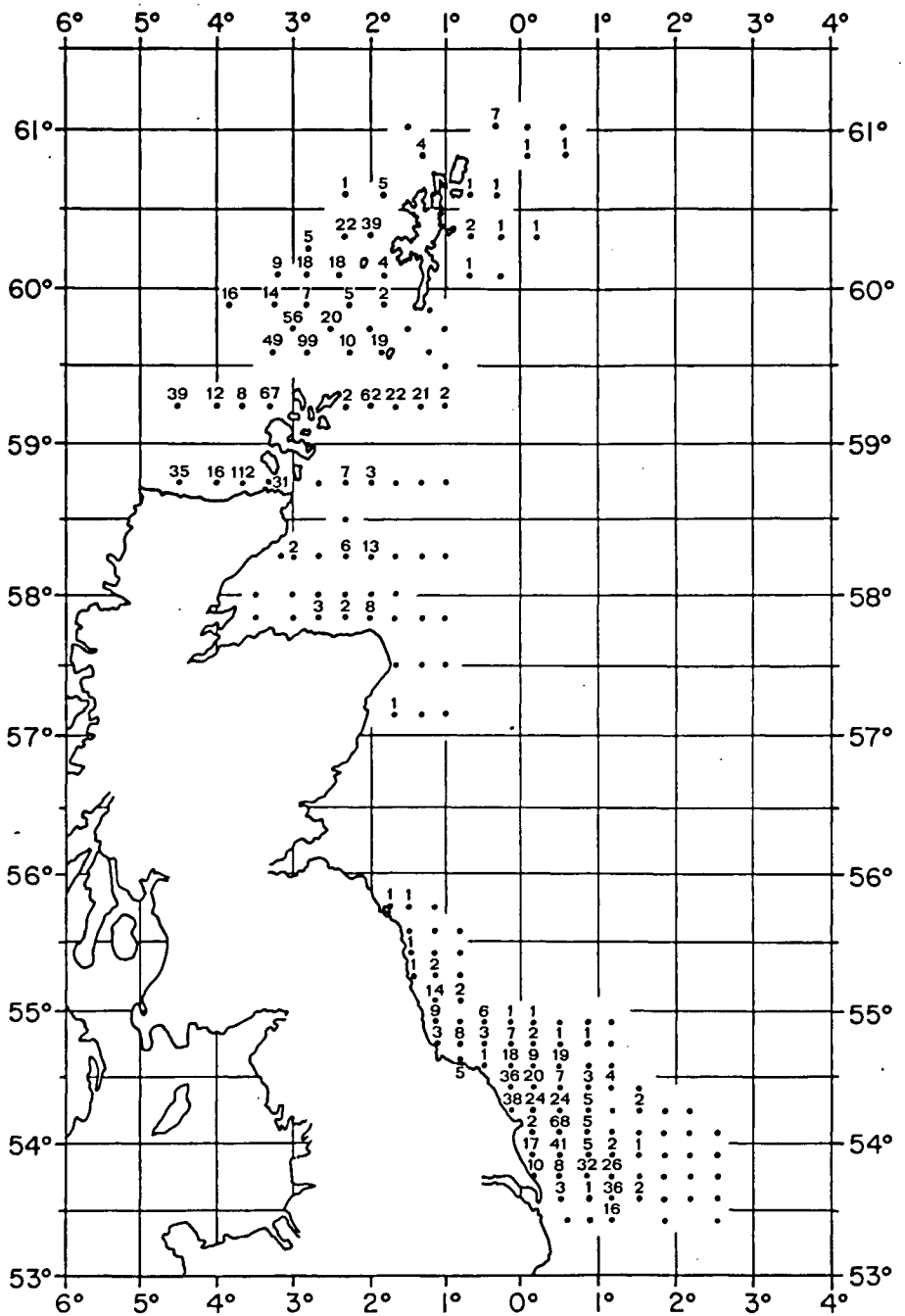

Fig. 8 NUMBERS OF LARVAE >15 m.m. BELOW 1 sq. metre
WESTERN NORTH SEA - 29 sept. - 13 oct. 1970

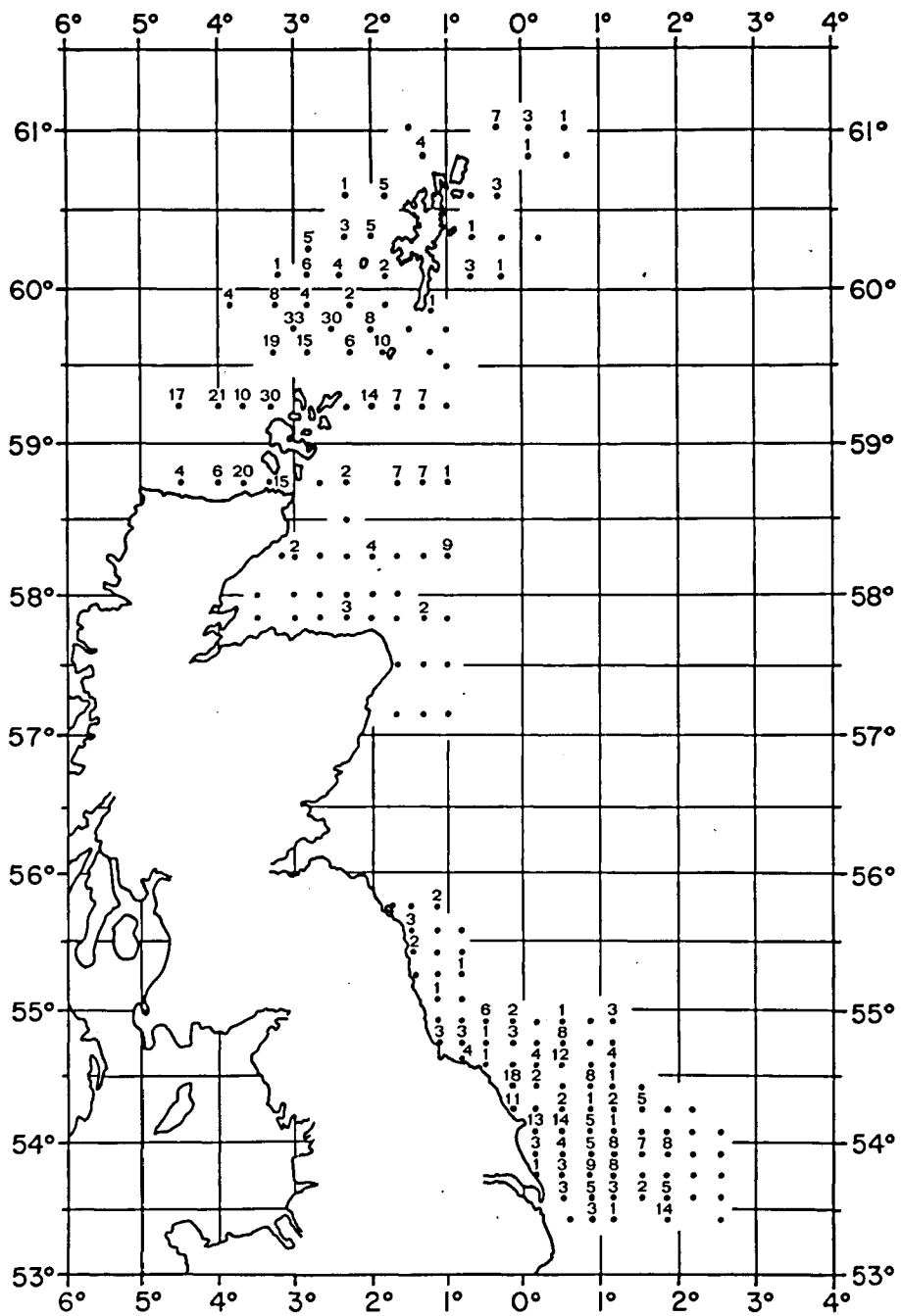

Fig. 9 NUMBERS OF LARVAE <10 m.m. BELOW 1 sq. metre
SOUTHERN NORTH SEA & ENGLISH CHANNEL - 7 - 18 dec. 1970
(England)

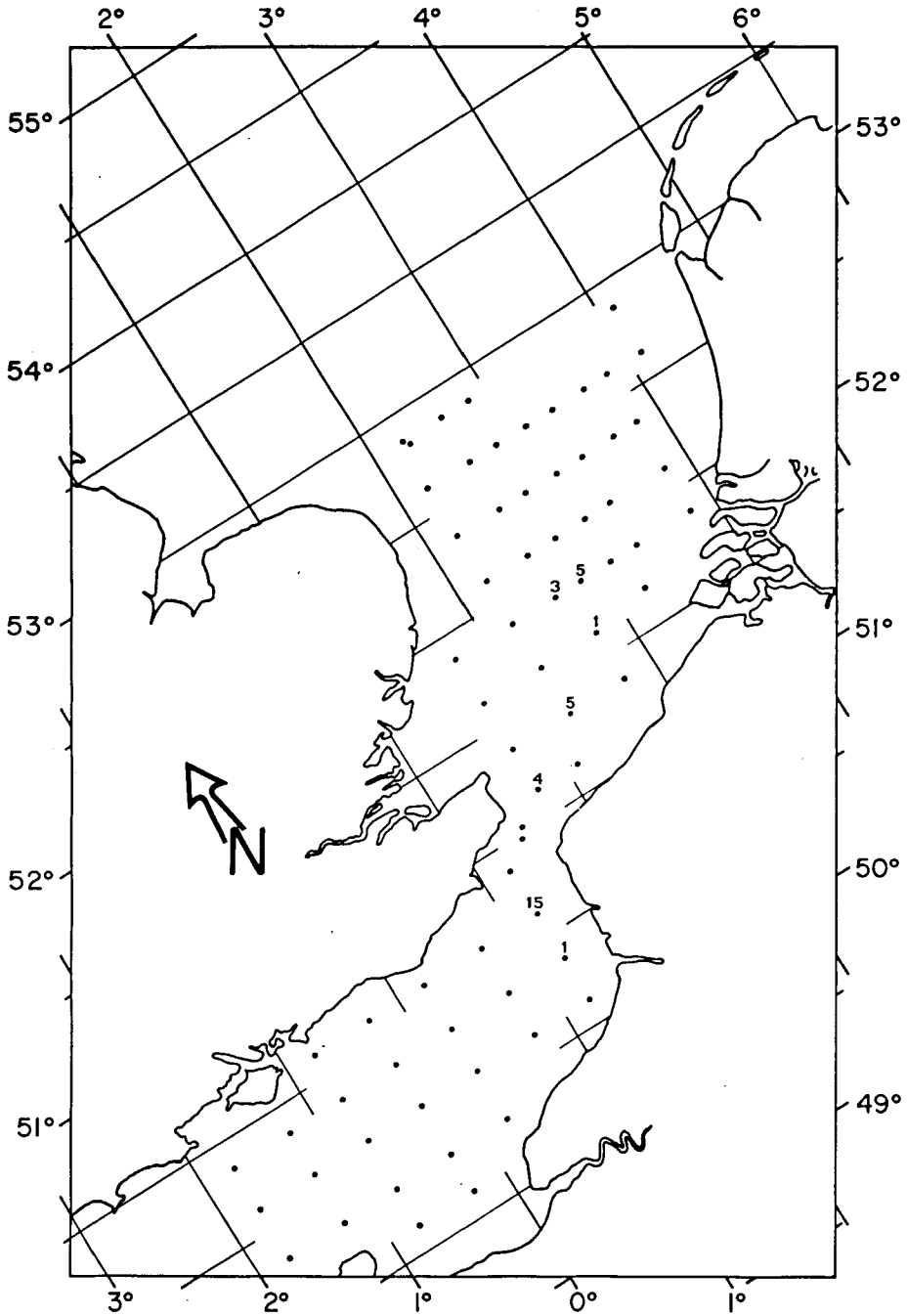

Fig. 10 NUMBERS OF LARVAE 10-15 m.m. BELOW 1 sq. metre
SOUTHERN NORTH SEA & ENGLISH CHANNEL - 7 - 18 dec. 1970
(England)

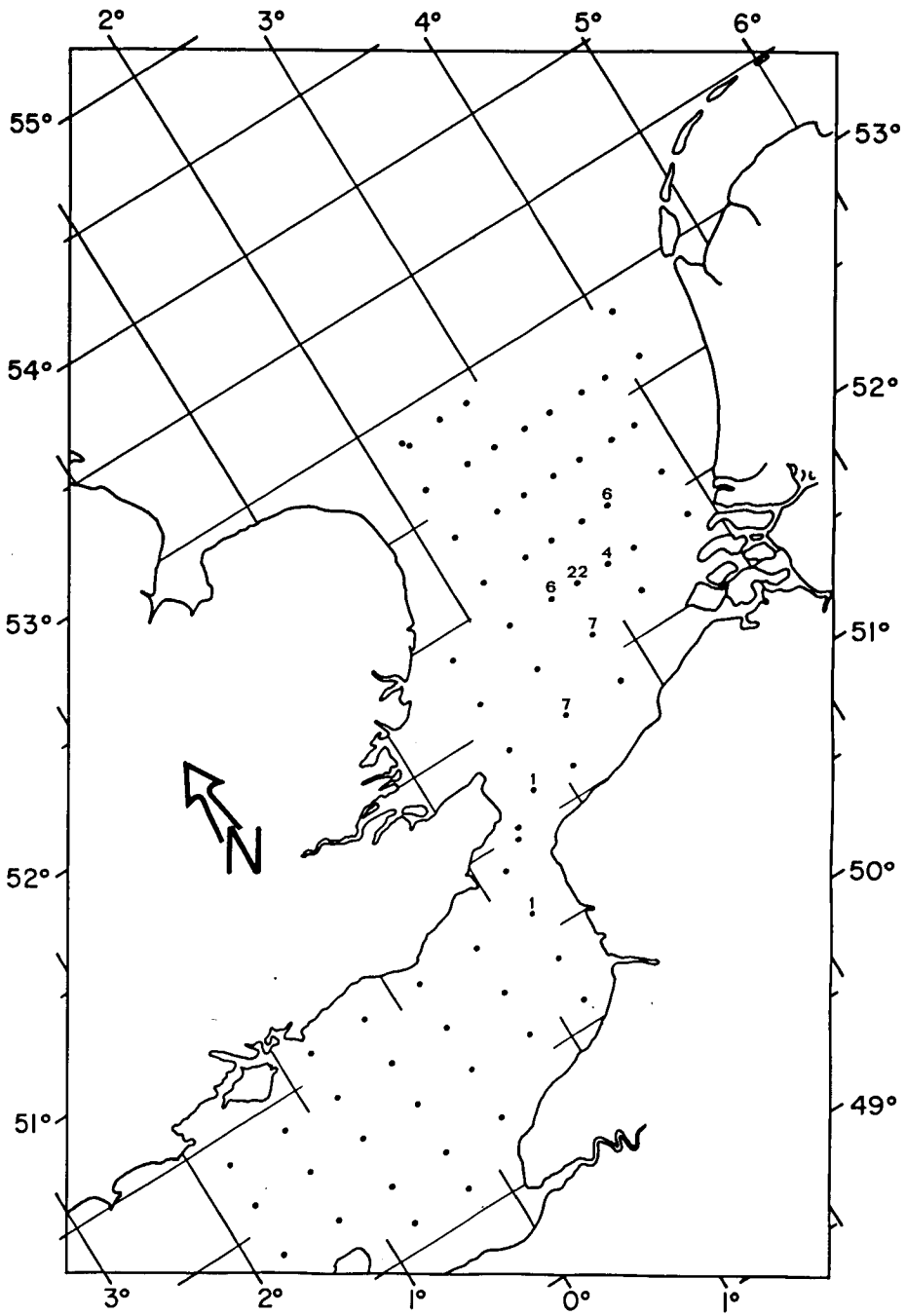

Fig. 11 NUMBERS OF LARVAE <10 m.m. BELOW 1 sq. metre
SOUTHERN NORTH SEA & ENGLISH CHANNEL - 7 - 24 dec. 1970
(Holland)

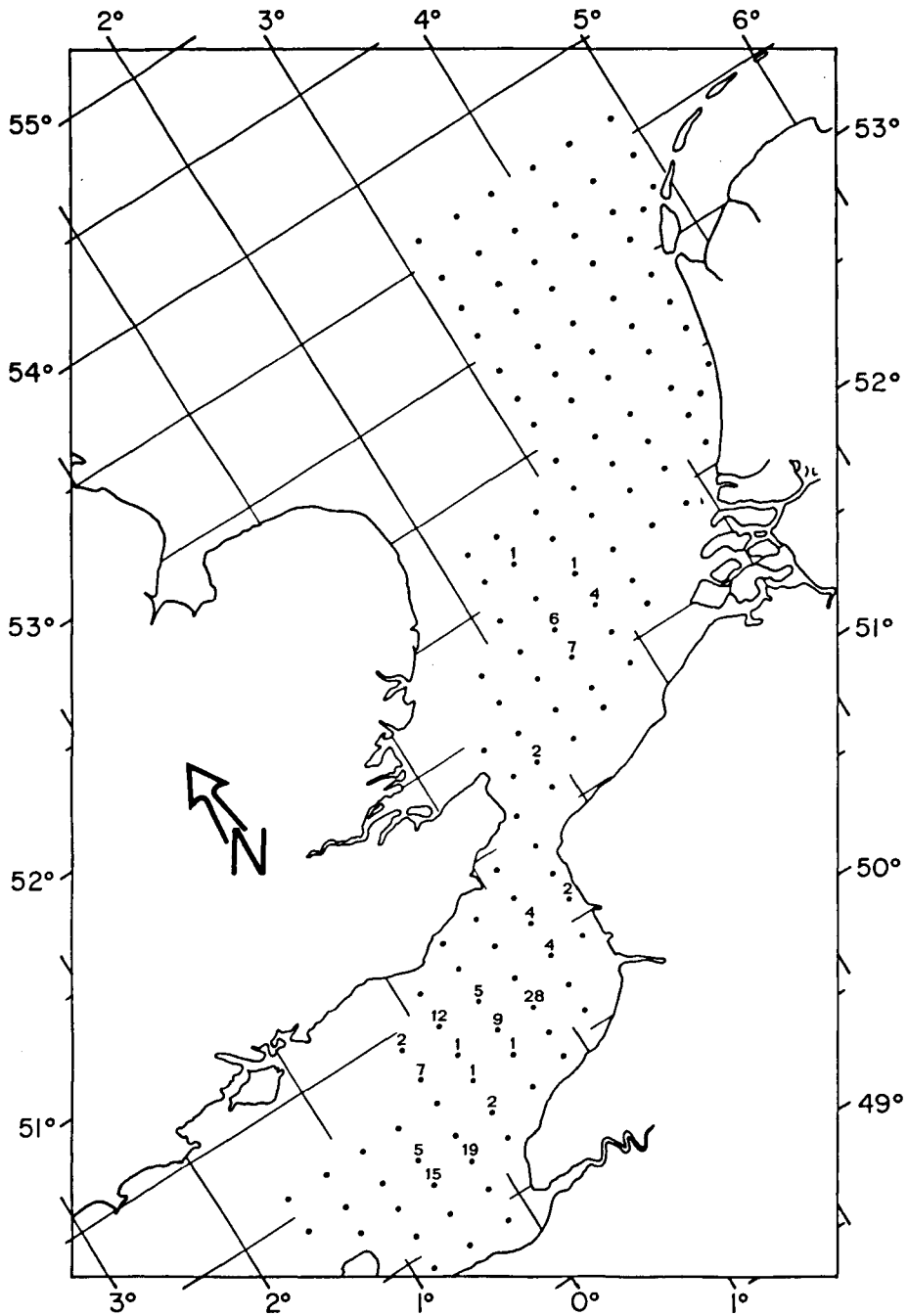

Fig. 12 NUMBERS OF LARVAE 10-15 m.m. BELOW 1 sq. metre
SOUTHERN NORTH SEA & ENGLISH CHANNEL - 7 - 24 dec. 1970
(Holland)

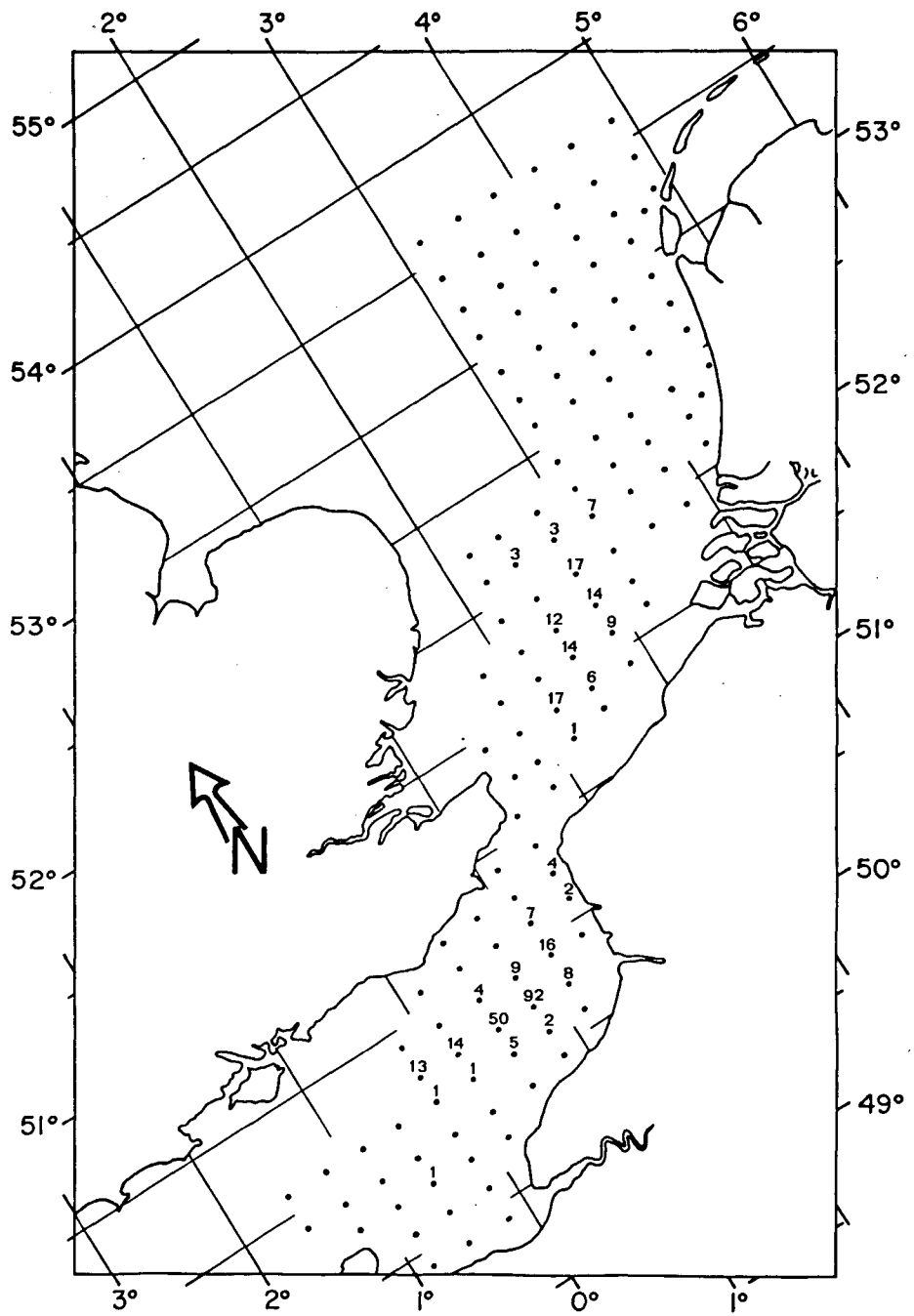

Fig. 13 NUMBERS OF LARVAE 10-15 m.m. BELOW 1 sq. metre
SOUTHERN NORTH SEA & ENGLISH CHANNEL - 5 -14 jan. 1971
(England)

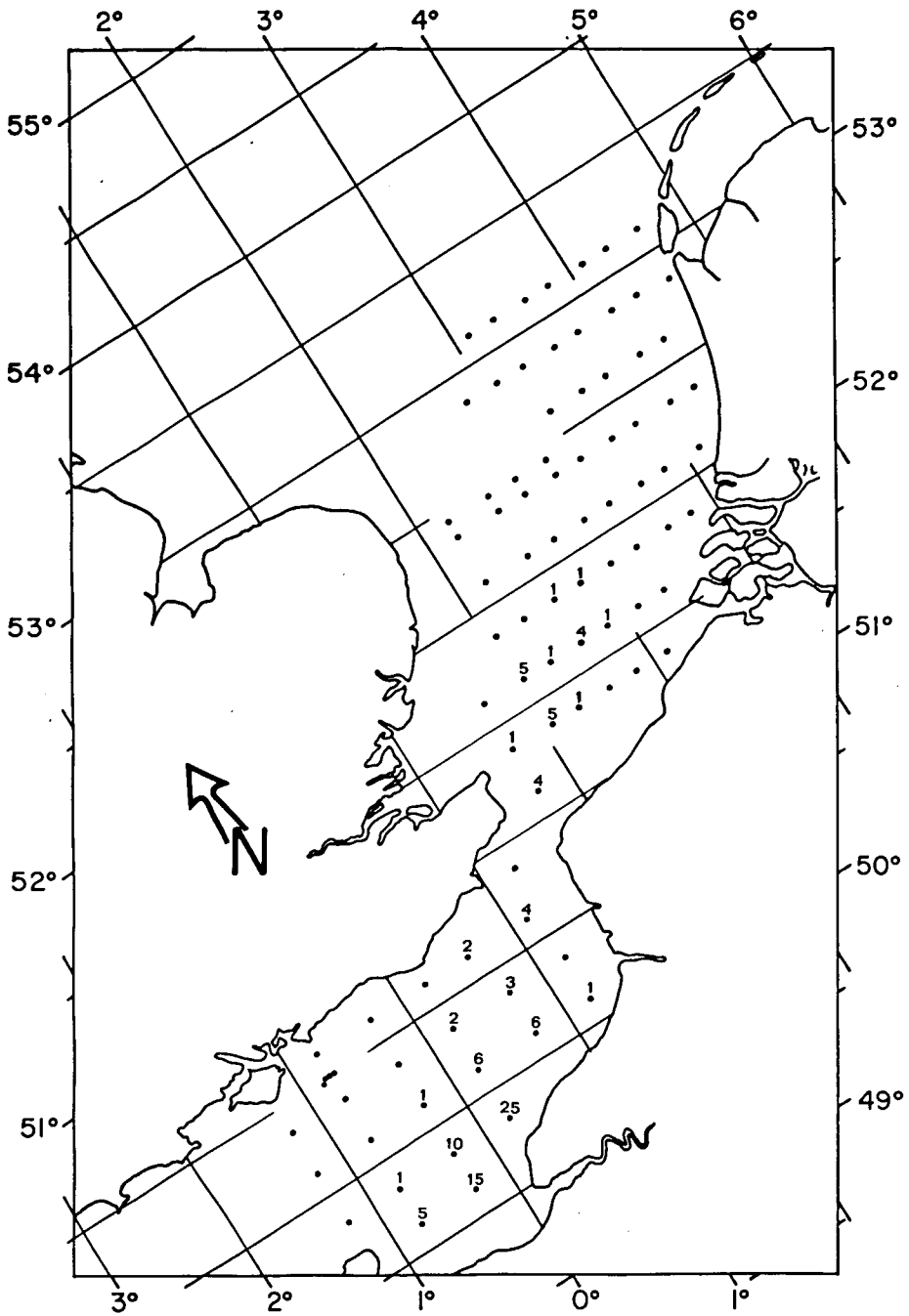

Fig. 14 NUMBERS OF LARVAE >15 m.m. BELOW 1 sq. metre
SOUTHERN NORTH SEA & ENGLISH CHANNEL - 5 - 14 jan. 1971
(England)

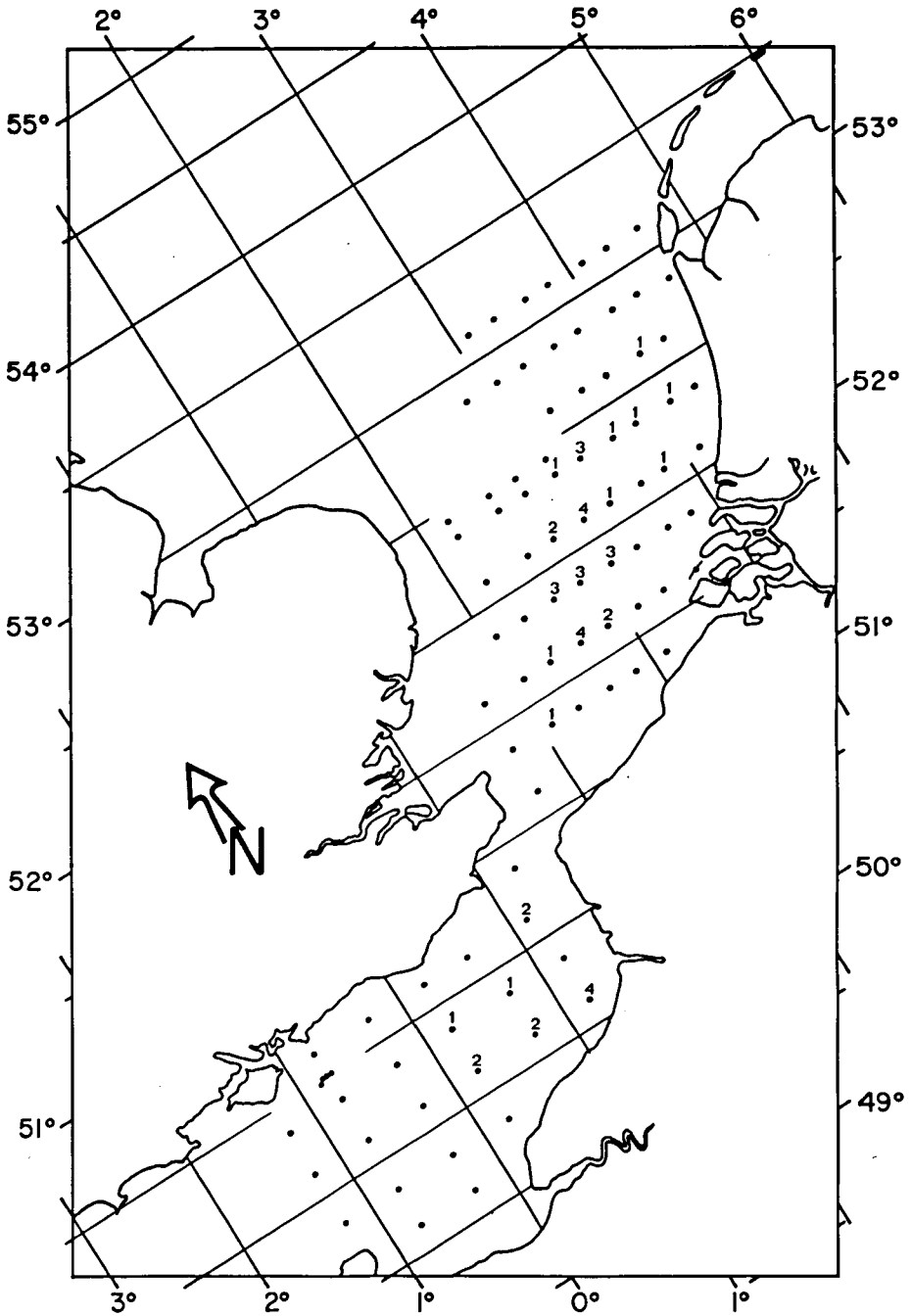

Fig. 15 NUMBERS OF LARVAE 10-15 m.m. BELOW 1 sq. metre
SOUTHERN NORTH SEA & ENGLISH CHANNEL - 5 - 23 jan. 1971
(Holland)

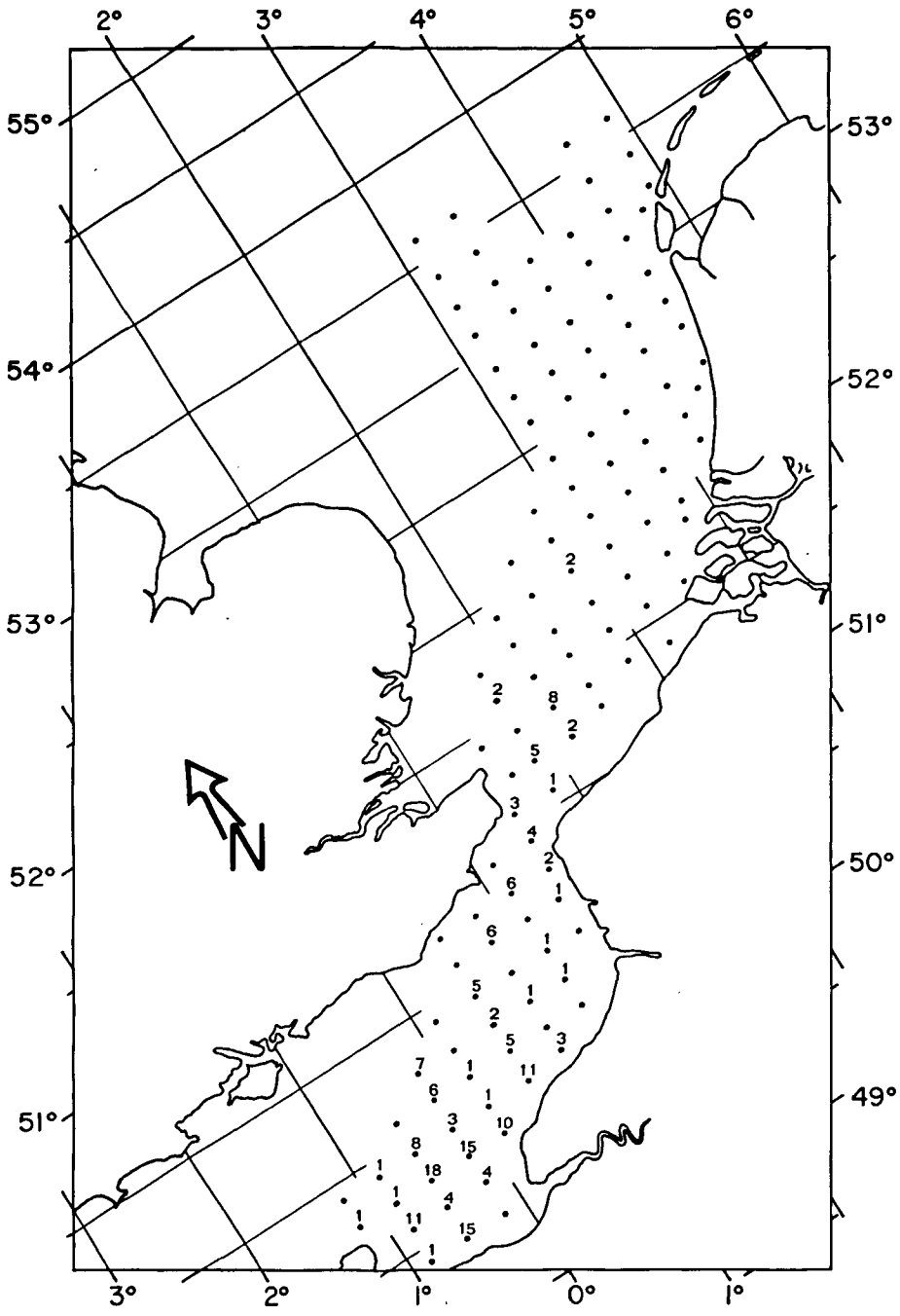

Fig. 16 NUMBERS OF LARVAE >15 m.m. BELOW 1 sq. metre
SOUTHERN NORTH SEA & ENGLISH CHANNEL - 5 - 23 jan. 1971
(Holland)

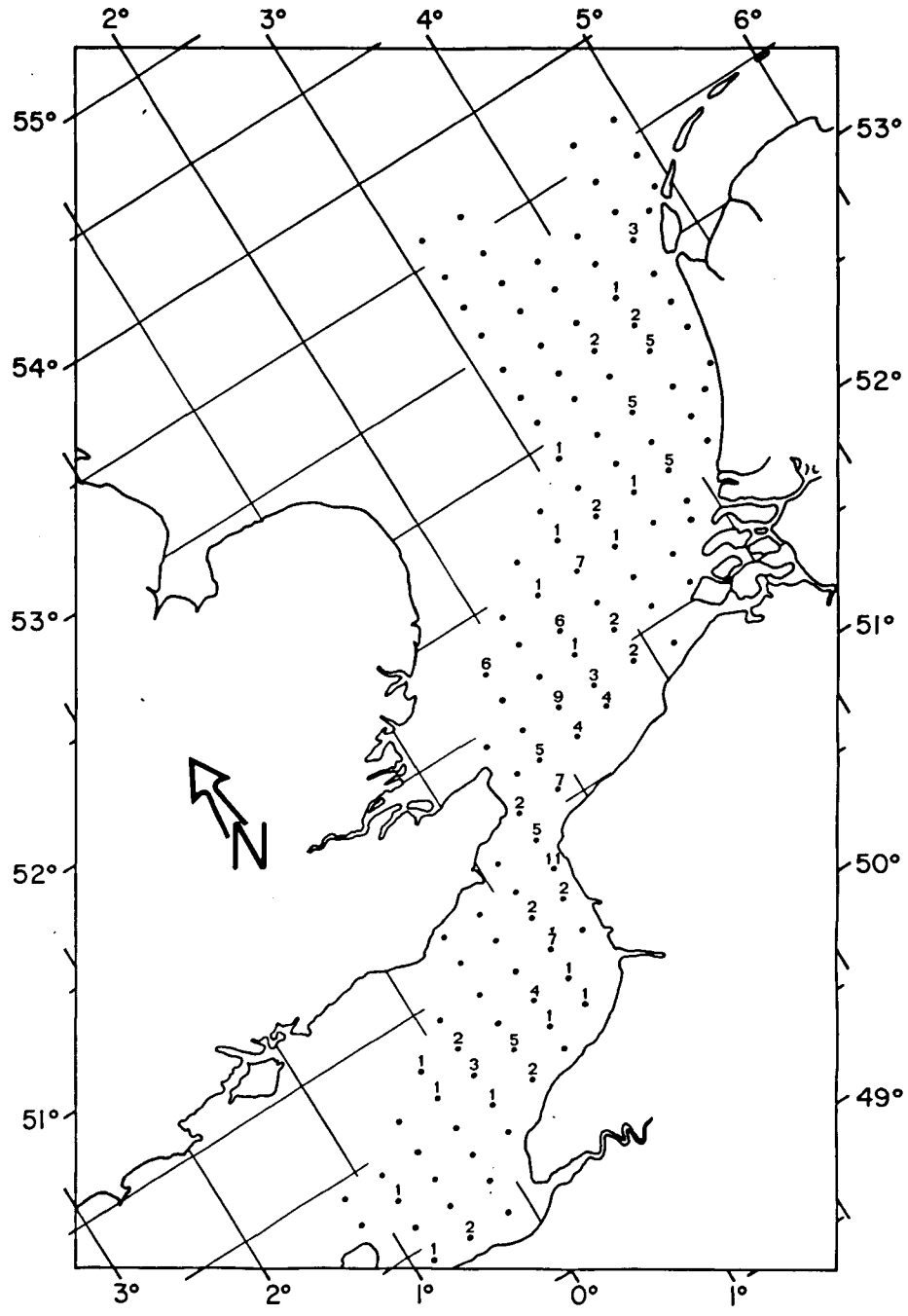

Fig. 17 NUMBERS OF LARVAE 10-15 m.m. BELOW 1 sq. metre
SOUTHERN NORTH SEA & ENGLISH CHANNEL -20-30 jan. 1971
(England)

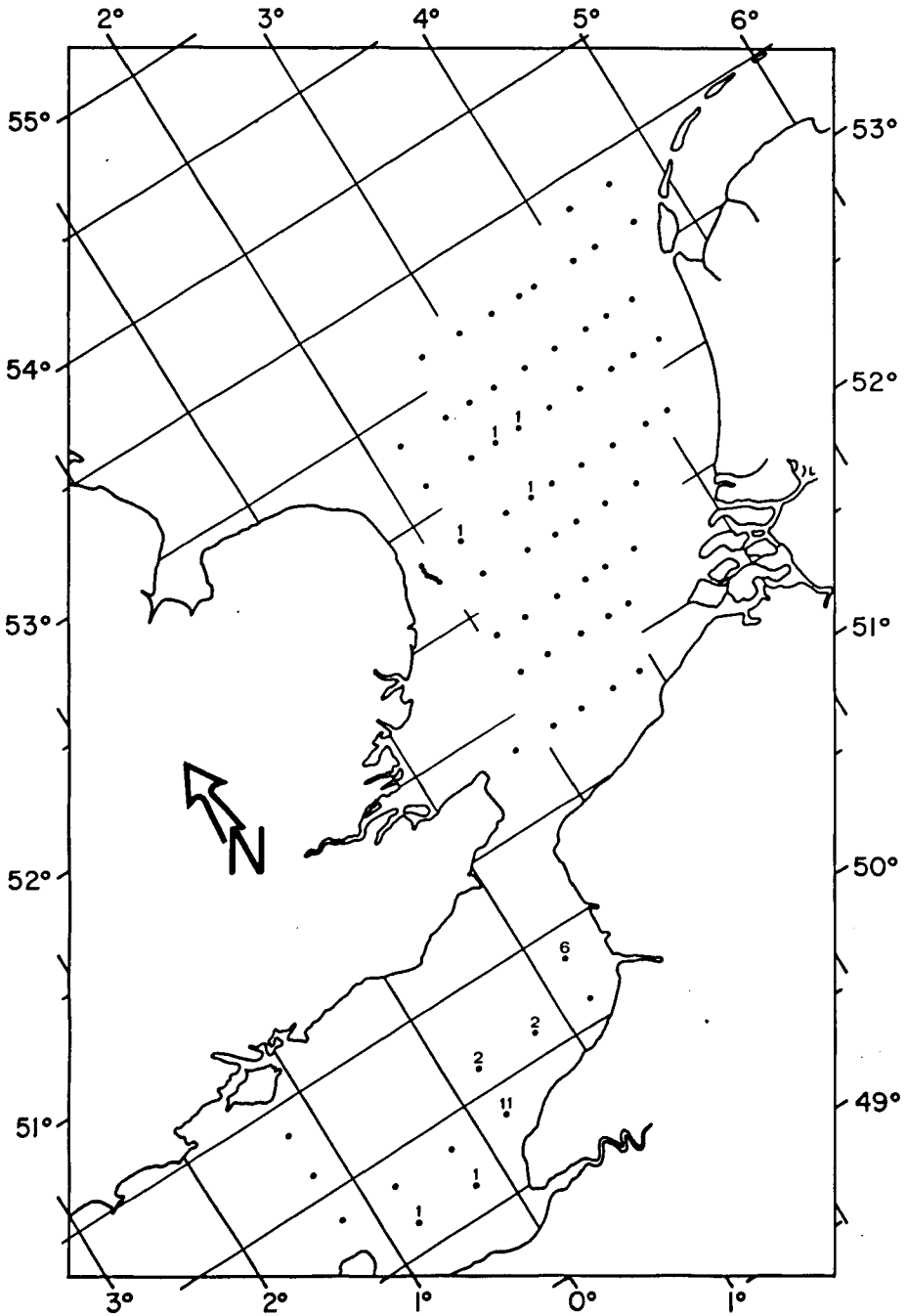

Fig. 18 NUMBERS OF LARVAE >15 m.m. BELOW 1 sq. metre
SOUTHERN NORTH SEA & ENGLISH CHANNEL -20-30 jan. 1971
(England)

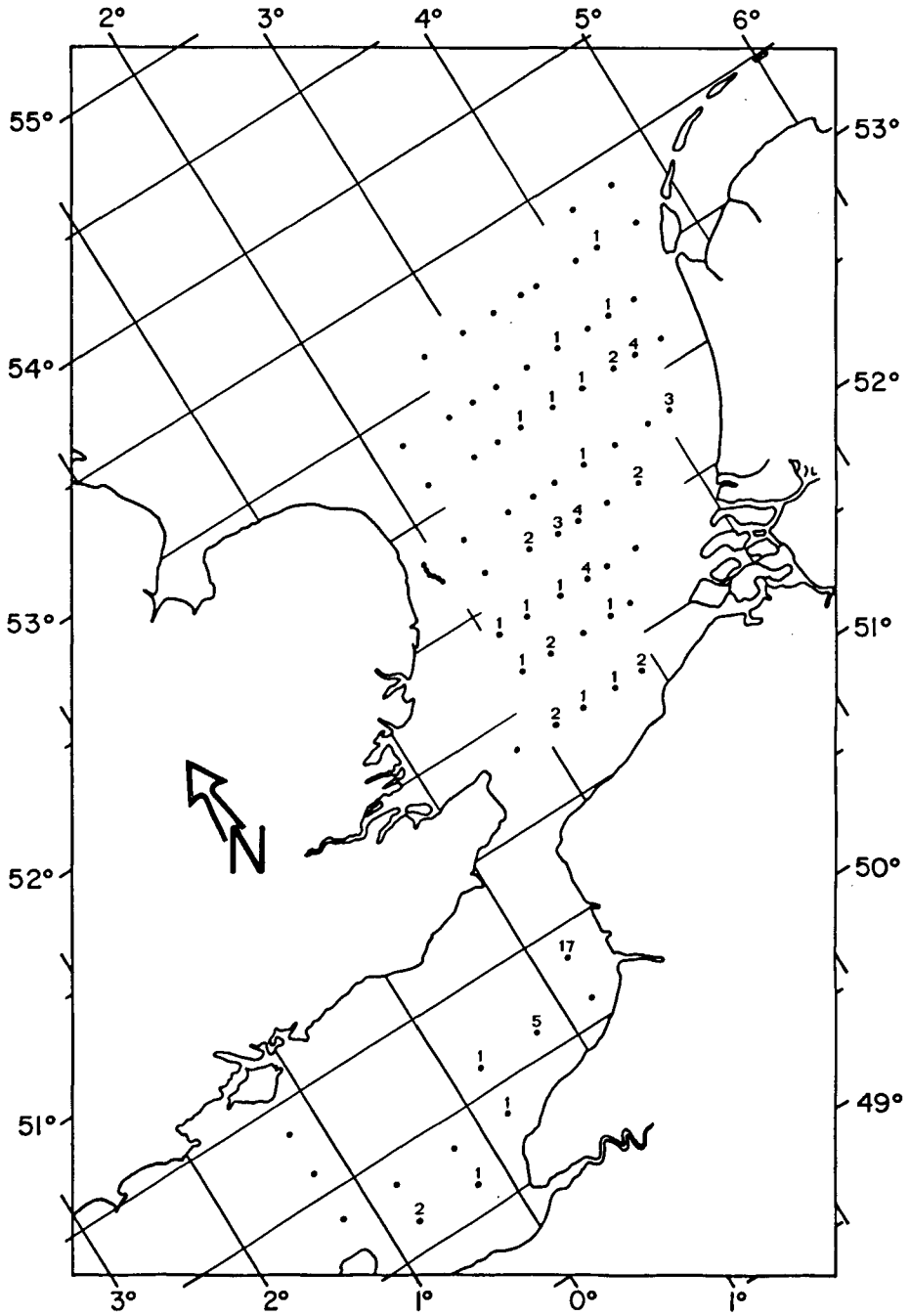

Fig. 19 NUMBERS OF LARVAE <10 m.m. BELOW 1 sq. metre
EASTERN NORTH SEA & KATTEGAT - 13 - 28 oct. 1970

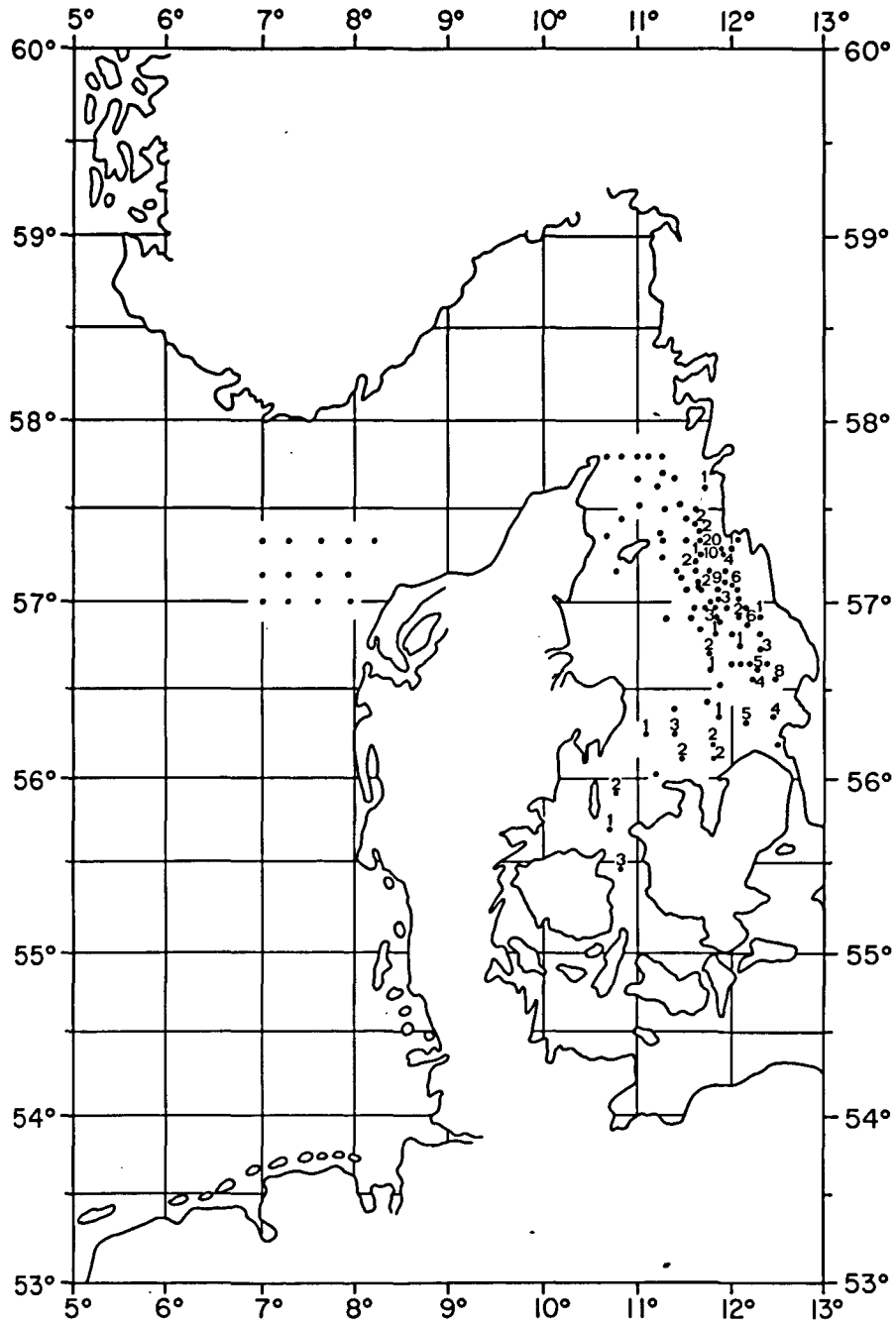

Fig. 20 NUMBERS OF LARVAE 10-15 m.m. BELOW 1 sq. metre
EASTERN NORTH SEA & KATTEGAT - 13 - 28 oct. 1970

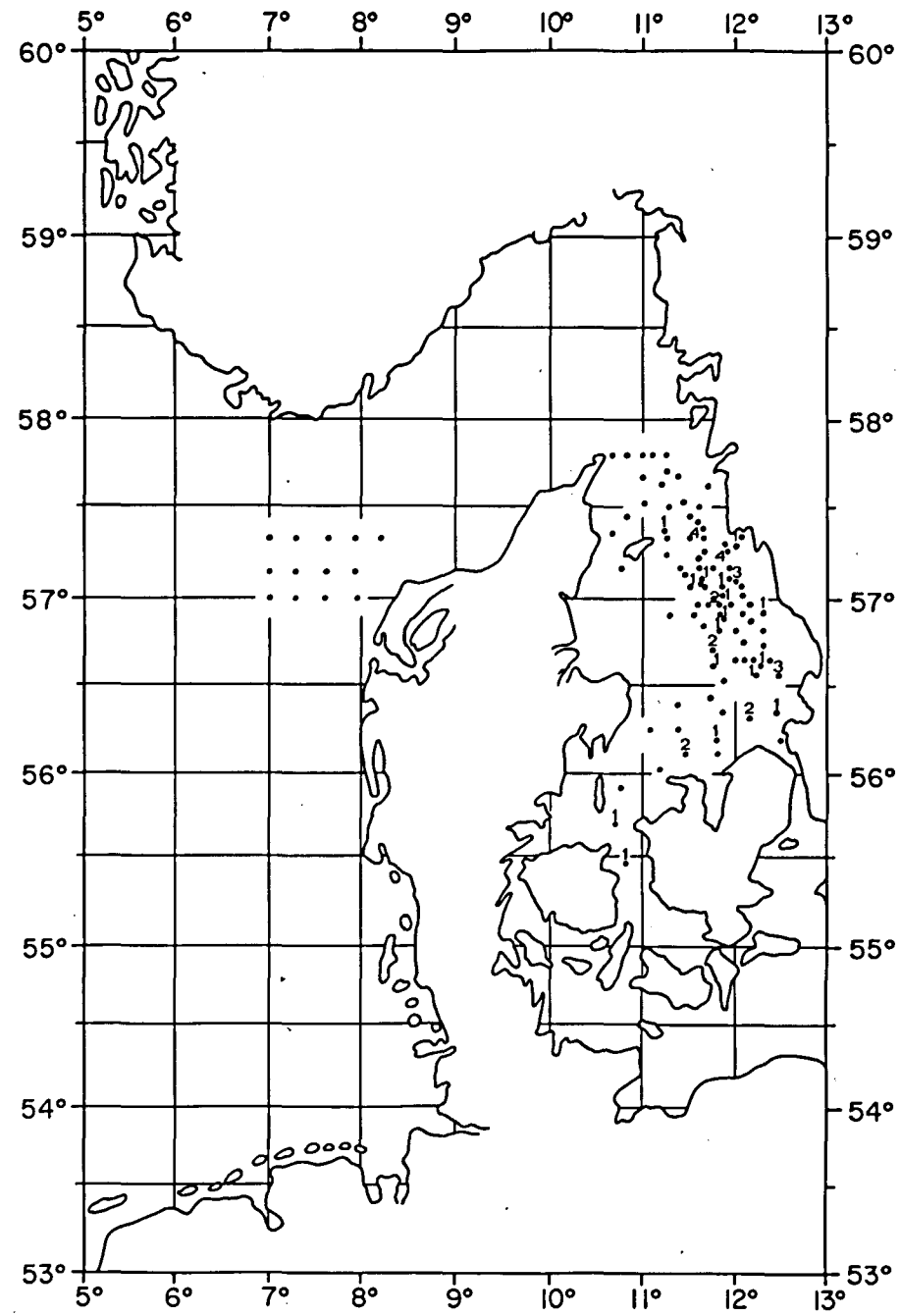

Fig. 21 NUMBERS OF LARVAE <10 m.m. BELOW 1 sq. metre
EASTERN NORTH SEA & KATTEGAT - 4 - 8 nov. 1970

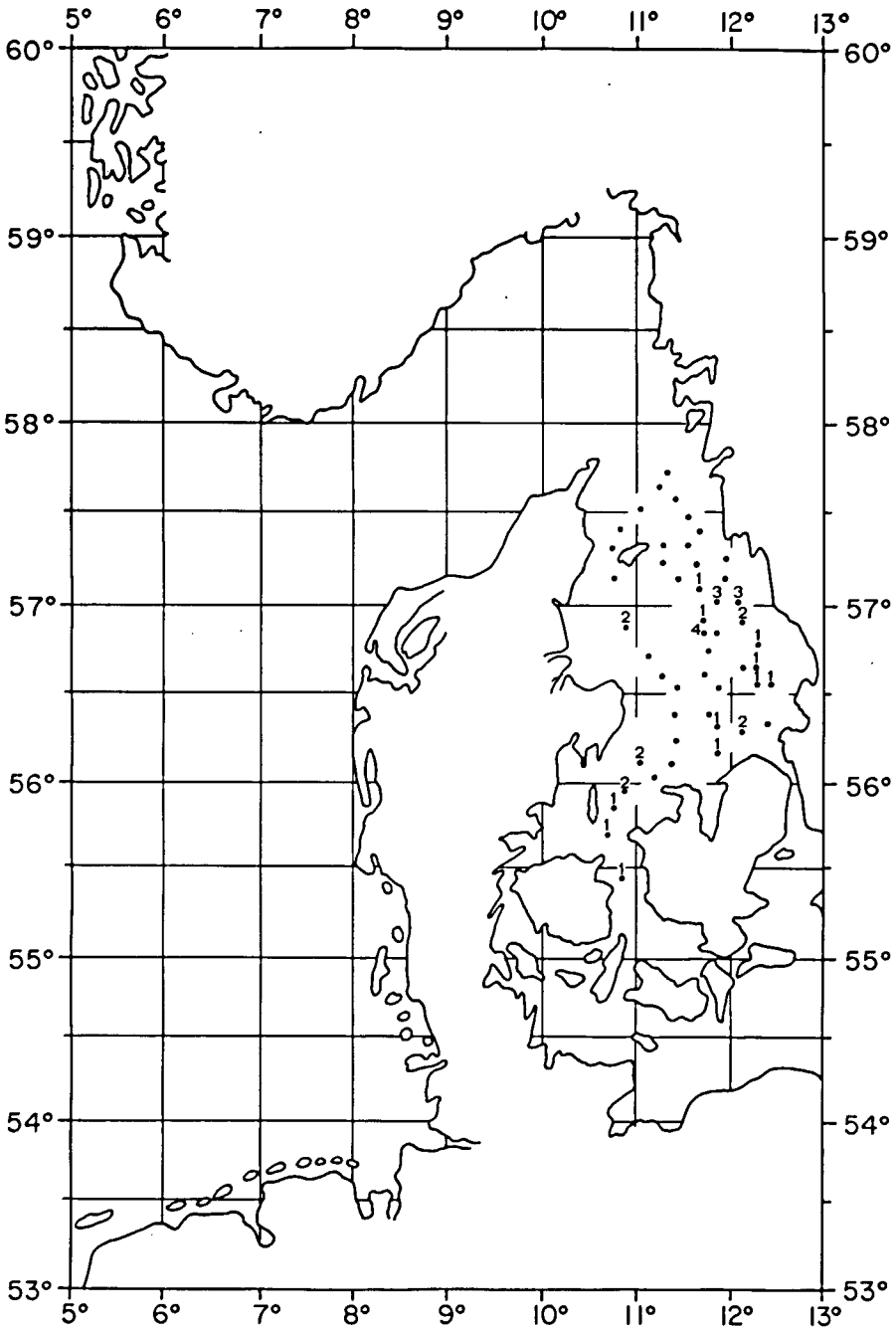

Fig. 22 NUMBERS OF LARVAE 10-15 m.m. BELOW 1 sq. metre
EASTERN NORTH SEA & KATTEGAT - 4 - 8 nov. 1970