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Distribution and abundance of fish in the North Sea in February 1977 as compared with earlier winter surveys.

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ABSTRACT

A trawling survey covering the North Sea at 82 randomly chosen stations was made in February 1977. Similar surveys had been done by SAHRHAGE in 1962 and 1963. The results do not indicate very large changes in the distribution of the common stocks. Compared with 1962, abundance has increased in Norway pout, sprat and plaice, and abundance has decreased in herring and long rough dab. The positive difference in Norway pout and sprat might be due to year to year fluctuations in those relatively short lived fish.

INTRODUCTION

During the last 15 years the North Sea fish stocks have undergone remarkable changes. Several demersal stocks showed strong recruitment with increased growth and earlier maturity. On the other hand the stocks of herring and mackerel decreased, at least partly due to heavy fishing. Good information on the population dynamics is available on most of the regularly exploited stocks, but only from areas of main fishing activities. Less data are at hand on the stocks of the recently exploited industrial fish and on the non-commercial fish.

From 1959 to 1963, SAHRHAGE (1964, 1967) carried out two winter and two summer trawling surveys covering the whole North Sea. Fishing then was done with a 18o ft bottom herring trawl. To achieve optimum comparability the present investigation was carried out with a net of the same type. The aim was to study the changes in distribution, abundance, growth and in age at first maturity in a variety of species. This paper gives the results in regard of changes in distribution and abundance, as recorded during the first fishing cruise of the newly built R.V. "Poseidon" from the 27th of Jan. to 28.th of Febr., and from the 4th to the 12th of March 1977.

MATERIAL AND METHODS

According to the expected fish density the North Sea was split into subareas (fig. 1) for a stratified sampling programm. A total of 82 stations was divided among these strata, according to strata size and density of the abundant species as expected from SAHRHAGE's winter surveys. Within each area the stations were randomly placed, those falling on unfishable grounds (shallow waters, stony grounds, oilrigs and pipelines) were rejected and replaced by another randomly chosen location.

The 180ft herring bottom trawl under use was made of perlon. It had a mesh size of 20 cm in the opening and of 4 cm in the cod end. A towing time of 30 minutes was kept on every station, the towing speed being between 3 and 4 knots. Most of the catches were obtained during day time.

Perlon netting catches more fish than a manila net as used by SAHRHAGE. Therefore the results had to be converted from perlon to manila on the basis of the conversion factors taken from SAHRHAGE (1964) in order to compare the previous results with those of the present survey. The averages of the fish density were obtained without taking the stratification into account, i.e. the average density over the North Sea. On every station a vertical hydrographical profile was taken by means of a bathysonde recording pressure, temperature and conductivity.

Except for small abundant fish in a few large catches all fish were sorted, counted and measured. Either total weight by species or individual weights were taken and in many cases otoliths were obtained. The results of inspections for parasites as carried out for several species are reported in a paper by H. MÖLLER (C.M. 1977, E:20).

RESULTS

A: Hydrography

The distribution of temperature and salinity was found to be more similar to conditions in winter 1962 than to those in 1963. Figs. 2 and 3 show surface conditions, but as the temperature difference was in no case greater than 0.1 °C, they may be regarded representative for the whole water column.

B: Fisheries

The distribution of fish biomass, given as unit catch by weight, is shown in Fig.4, indicating an increase from southeast to northwest.

During the survey a total amount of 55 species was caught, ten of them are economically important. Table 1 gives the total catch by weight. The gadoid fishes represent 82.2 % of the total catch of 7875 kg, obtained by 82 hauls. Within the gadoids haddock and whiting were caught by equal proportions, each representing about 30 % of the total catch, while cod represents about 10 %. The clupeids amount to 8.2 % and the flatfishes to 6.7 % by weight. The most abundant clupeid was the sprat. Common dab represented the majority of the flatfish. Herring represented only 1.5 % of the total catch, i.e. only about 120 kg of herring was caught during the survey.

The relative density and the distribution of the most frequent species are shown in the figures 5 to 15, showing circles representing the number of each species in the 30 min haul. The dashed line and the hatched area give the area of occurrence found by

SAHRHAGE in 1962, when hydrographical conditions were similiar to those in 1977.

Table 2 gives the average catches in winter 1962 and 1963 as found by SAHRHAGE and the average catches of this year including the conversion of the latter to manila standard. Averages are mean catches of those stations where the species was caught.

Herring: Herring was found in small numbers all over the North Sea with somewhat higher figures near the German Bight and off the British coast (fig. 5). The average catch (in manila standards) shows the decline of the herring stock since 1963, when there was still a great stock in the North Sea resulting in a total commercial catch of more than 0.6 x 10^6 tons.

Sprat: Sprat was mainly concentrated east of the Dogger bank in waters deeper than 40 m (fig. 6). The area of distribution was less restricted than in 1962. In the northern part of the central North Sea much more sprat were found then previously. Unfortunately no conversion factor between perlon and manila netting is available.

Poor cod: Poor cod was sporadically found all over the North See. There is no indication of changes in distribution (fig. 7) compared with the results of SAHRHAGE (1964).

Cod: Cod occured all over the North Sea, the best concentrations being located in waters deeper than 40 m north of the Dogger bank (fig. 8). A concentration off Scotland could not be observed. On the other hand cod was found in the southwestern North Sea. The average catch per haul only shows a slight increase (tab.2), although one would expect a higher average catch rate, according to the great increase in total commercial catches of cod since 1962.

Haddock: No changes in overall distribution was found. The density increased from the south to the north, showing biggest concentrations near the Shetlands (fig. 9). The average catch was nearly the same as in 1962 (tab. 2). The high numbers in 1963 are due to the very strong 1962 year class.

Whiting: Whiting showed no difference in the distribution (fig. 10). It was found all over the North Sea, but numbers per catch were low on the Dogger bank and in shallow areas near the coasts. The average catch (tab. 2) per haul was lower than in 1962 and 1963. Like haddock whiting showed a very strong 1962 year class, influencing the high average catches in 1963.

Norway pout: Norway pout was the most common small gadoid found north of 55° N, with great concentrations in the deeper waters of the northern North Sea (fig. 11). The concentrations were far bigger than in the beginning of the 60ies, which is also emphasized by the high average catch of 5284 specimens per haul (tab. 2).

Grey Gurnard: Grey Gurnard occurs in medium depths and is missing in shallow areas. The distribution did not change (fig. 12). The average catches indicate a decrease in numbers during the last fifteen years (tab. 2).

Long rough dab: Long rough dab was mainly found north of the Dogger bank (fig. 13). Contrarily to the former investigations, it was outnumbered by common dab in this area. Accordingly, the average catches seem to have decreased (tab. 2).

Common dab: Common dab was found all over the North Sea (fig. 14), with higher numbers in the southern North Sea, i.e. in the shallower areas. As SAHRHAGE (1964) did not give the catch in numbers, our average catch in tab. 2 is also given in weight. The data indicate a decrease in the abundance of the common dab.

Plaice: Plaice was found mainly in the southern North Sea and occasionally north of the Dogger bank (fig. 15). Different from 1962, plaice was found in the central North Sea. The average catch of 1977 is higher than that of 1962 and 1963 (tab. 2).

Lemon sole: The Lemon sole lives in deeper waters throughout the central North Sea (fig. 16) only off the British coast, it is found further to the south than in 1962. Its overall distribution was found to be more extended than in 1962. The low average catches on all surveys (tab. 2) do not permit conclusions on the changes in density.

Starry ray: Most common amongst the rays was the Starry ray, living north of Dogger bank, but only west of 4°E. In 1977 it did not reach the Danish coast as shown by SAHRHAGE in 1962 (fig. 17). The average catch did not change.

Other fishes

The following species were only caught occasionally.

Northern N. Sea	Southern N. Sea
Maurolicus muelleri	Trisopterus luscus
Argentina sphyraena	Gobiidae
Pollachius virens	Roccus labrax
Pollachius pollachius	Trachinus vipera
Micromesistius poutassou	Agonus cataphractus
Gadiculus thori	Zoarces viviparus
Merluccius merluccius	Callionymus sp.
Molva molva	Solea solea
Anarhichas sp.	Buglossidium luteum
Sebastes viviparus	Arnoglossus laterna
Lepidorhombus whiff-iagonis	Raja clavata

Unregularly distributed

Cyclopterus lumpus
Trachurus trachurus
Glyptocephalus cynoglossus
Psetta maxima
Scophthalmus rhombus
Phrynorhombus norvegicus

DISCUSSION

In general the area of distribution of most species has very little changed if one compares the years 1962 and 1977. There is a slight tendency for cod, whiting, Norway pout and grey gurnard to appear further to the south west than before. Plaice extended its area to the north west.

The figures presented do not indicate large changes in abundance. This is partly in contrast to the changes in landings since the early 1960's and to the results of various stock reviews presented at the ICES-Symposium on changes in North Sea fish stocks and their causes, 1975. The largest positive difference between 1962 and 1977 results were found in sprat, Norway pout and plaice. However a comparison between the two consecutive years 1962 and 1963 show the great year to year fluctuations in abundance of the first two species. Catches were poorer in 1977 compared with 1962 in whiting and grey gurnard and particularly in herring and long rough dab. There are certain limitations to the comparison between the three surveys and to generalisations for the entire North Sea. SAHRHAGE (1964) choose the fishing stations (67 ind 1962 and 72 in 1963) mainly amongst trawlable positions known to the fishing master of RV "Anton Dohrn". By this he might have been biased towards rich stations.

Neither the earlier nor the present survey covers the stony grounds which caused us to reject 22 % of the randomly chosen stations. According to fishermen some of those grounds are rather rich in gadoids and flatfish and the same holds now for the vicinity of oilrigs. Similar surveys are planned for August 1977 and 1978 and for February 1979.

REFERENCES

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SAHRHAGE, D., 1967: Teil II. Januar 1962 und 1963. Ber. Dt. Wiss. Komm. Meeresforsch., XIX (2), 66-179

Table 1: Total catch by weight (kg) and proportion of the total catch held by the most common groups and species.

		kg	kg	%	%
Clupeoids	herring	119,3		1,52	
	sprat	521,9		6,63	
	others	1,3			
	total		642,5		8,16
Gadoids	haddock	2.708,4		34,39	
	whiting	2.443,2		31,03	
	cod	759,6		9,65	
	Norway pout	473,4		6,01	
	others	86,6		1,10	
	total		6.471,2		82,17
Platfish	long r. dab	294,0		3,73	
	common dab	134,0		1,45	
	lemon sole	49,7		0,63	
	others	26,0		0,33	
	total		501,8		6,37
Elasmobranchs	spiny dogfish	51,8		0,66	
	starry ray	52,5		0,67	
	total		104,3		1,33
	grandtotal		7.875,0	97,80	98,03

Table 2: Catch and average catch of the most common North Sea fish species in the winters of 1962, 1963 and 1977. Data for 1962/1963 and the conversion factor are extracted from SAHRHAGE (1964). For 1962/1963 only the stations situated within the 1977 area of investigation have been taken into account.

	January 1962			January 1963			Febrary 1977				
	67 stations			72 stations			82 stations				
	No. of specimens	No.(and %) of positive stations	Average catch	No. of specimens	No.(and %) of positive stations	Average catch	No. of specimens	No.(and %) of positive stations	Average catch	Average manila standard	Conversion factor
Herring	1890	41(61)	46	49013	59(82)	831	3852	66(81)	58	12	0.2
Sprat	155	20(30)	8	45529	36(50)	1265	32818	67(82)	488	-	-
Cod	546	58(87)	9	481	57(79)	8	1281	73(89)	17	10	0.6
Haddock	11765	48(72)	245	72954	36(50)	2026	13055	65(79)	201	221	1.1
Whiting	21842	67(100)	326	41949	68(94)	617	17894	78(95)	229	252.	1.1
Norway pout	12479	39(58)	320	45941	38(53)	1209	47838	48(59)	997	5284	5.3
Grey gurnard	1707	48(72)	36	571	48(67)	12	905	39(48)	23	11	0.5
Long r. dab	4074	56(84)	73	3961	58(81)	68	269	51(62)	5	9	1.8
Plaice	205	30(45)	7	141	23(32)	6	518	44(54)	12	17	1.4
Lemon sole	53	20(30)	3	28	15(21)	2	131	34(42)	4	6	1.4
Starry ray	156	38(57)	4	100	30(42)	3	108	32(39)	3	4	1.4
Common dab+	730	58(87)	13	463	61(85)	8	299	71(87)	4.2	5.9	1.4

+ Data for common dab are given in kg

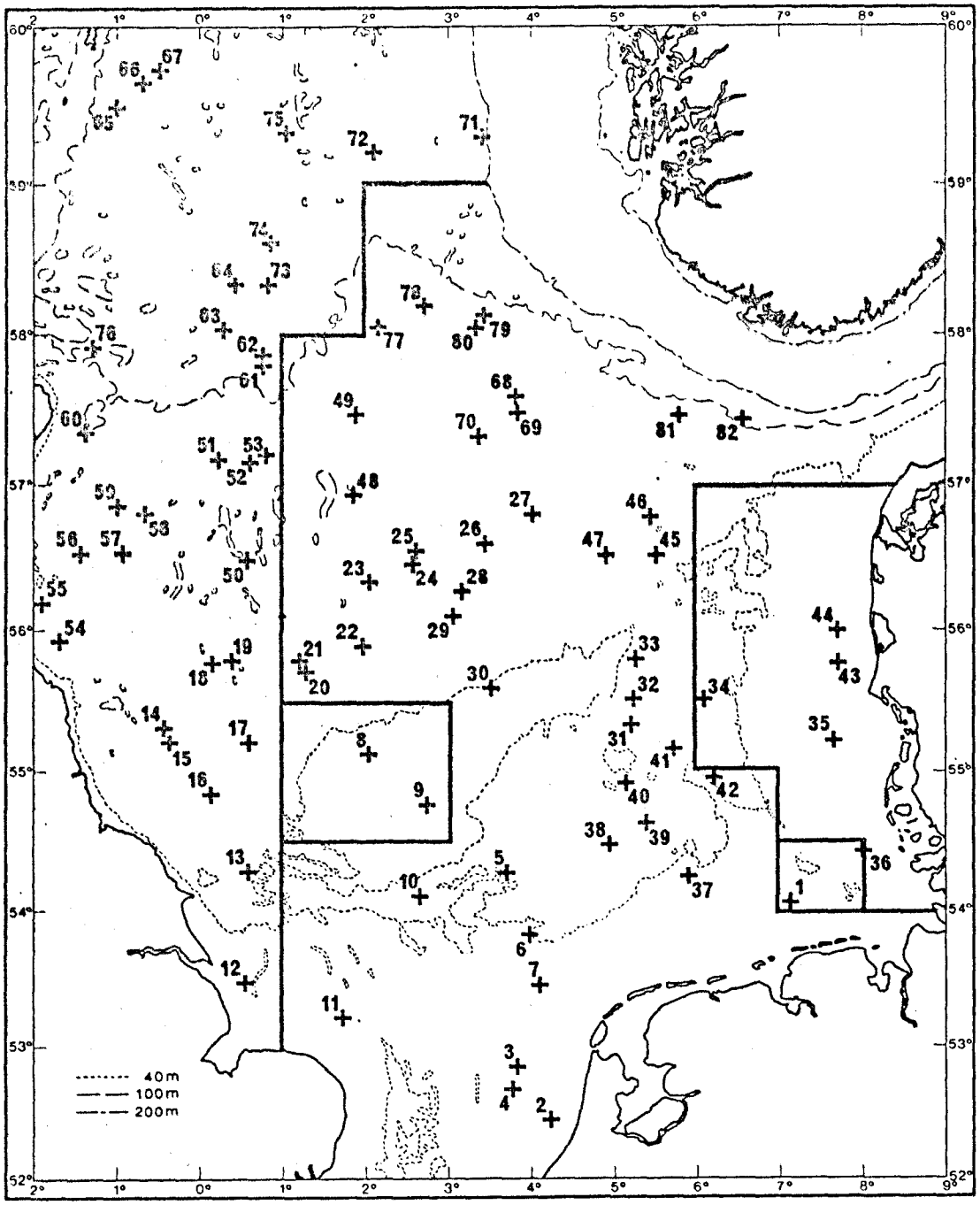

Fig. 1

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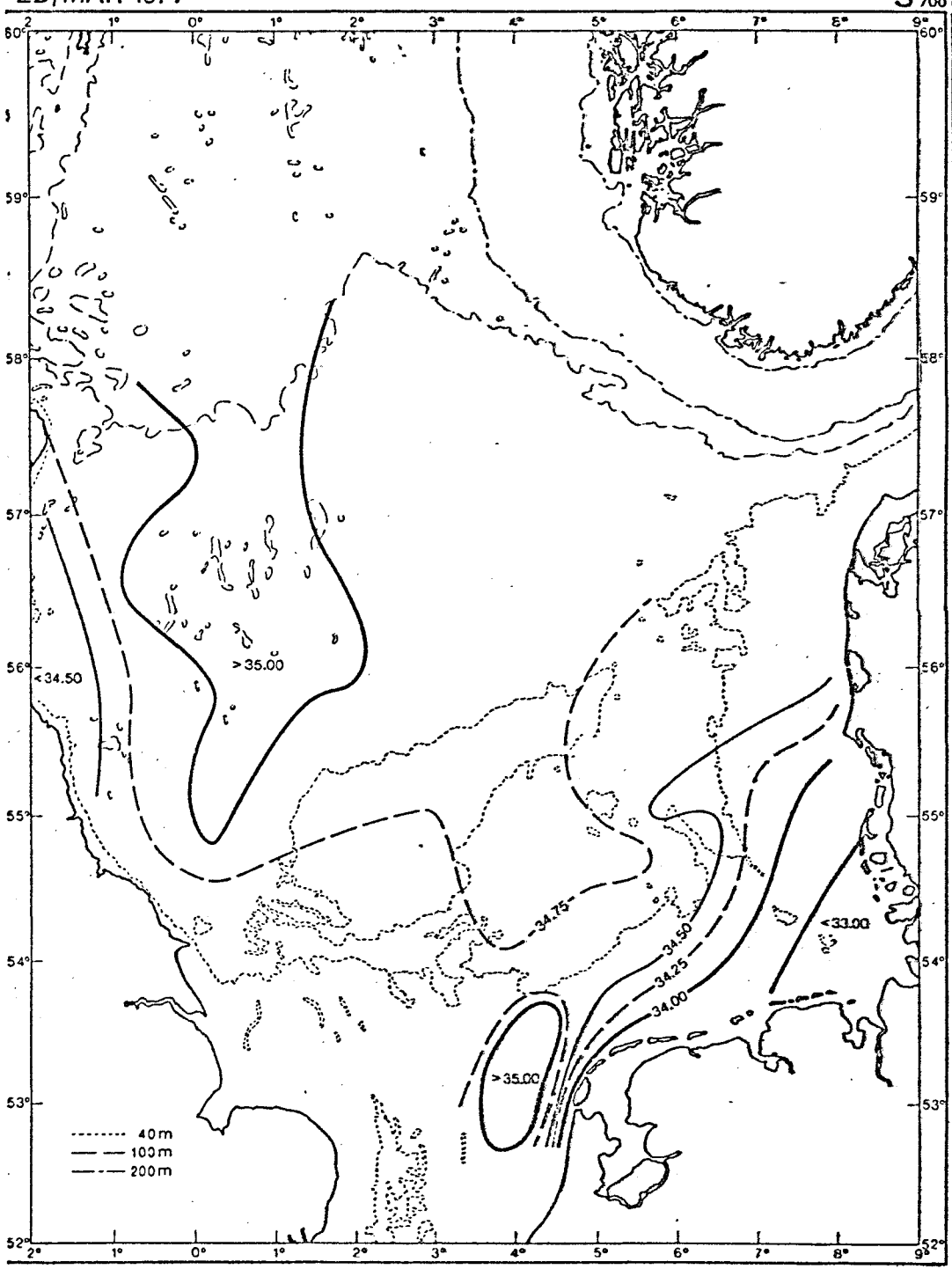

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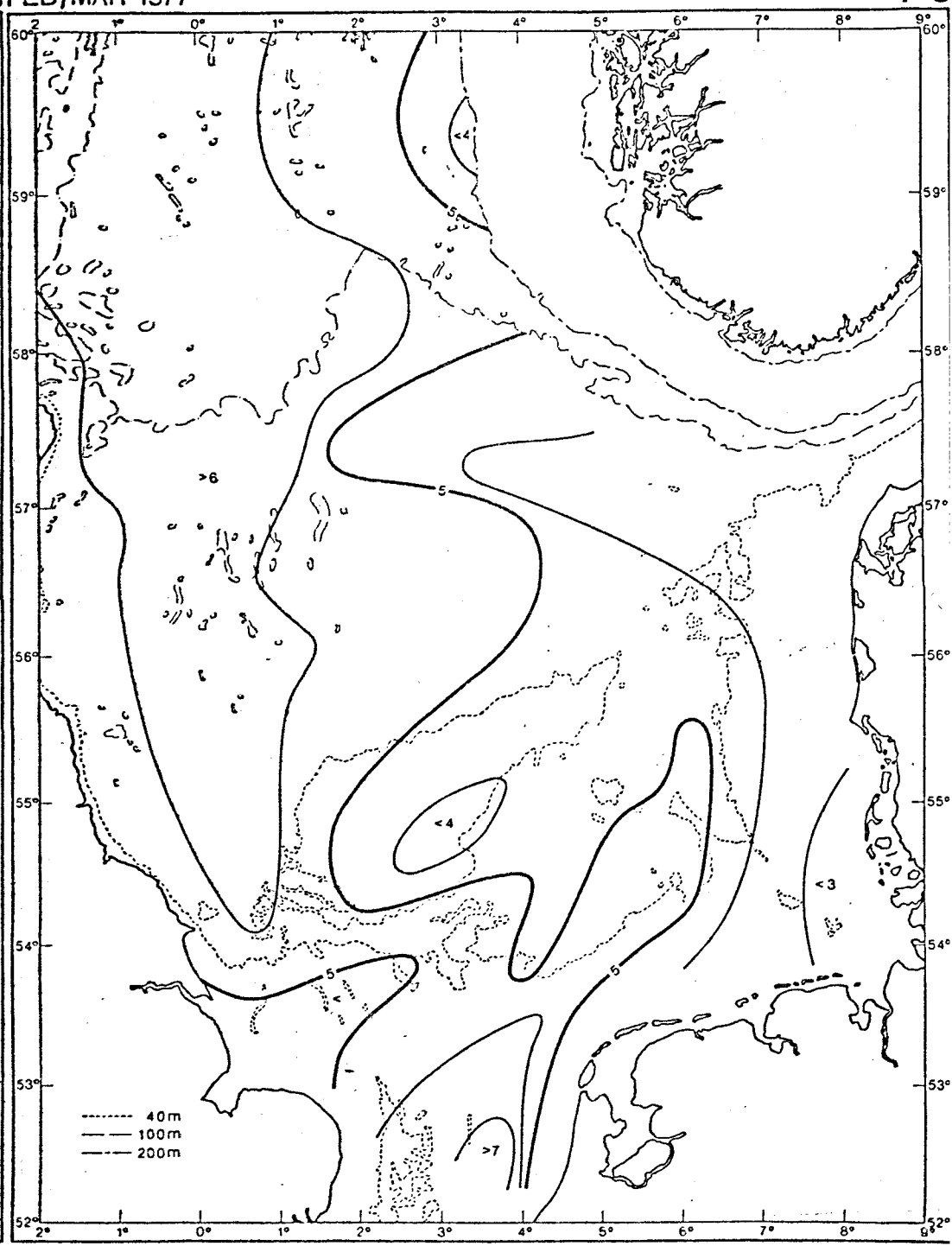

FEB/MAR 1977 **TOTAL CATCH**

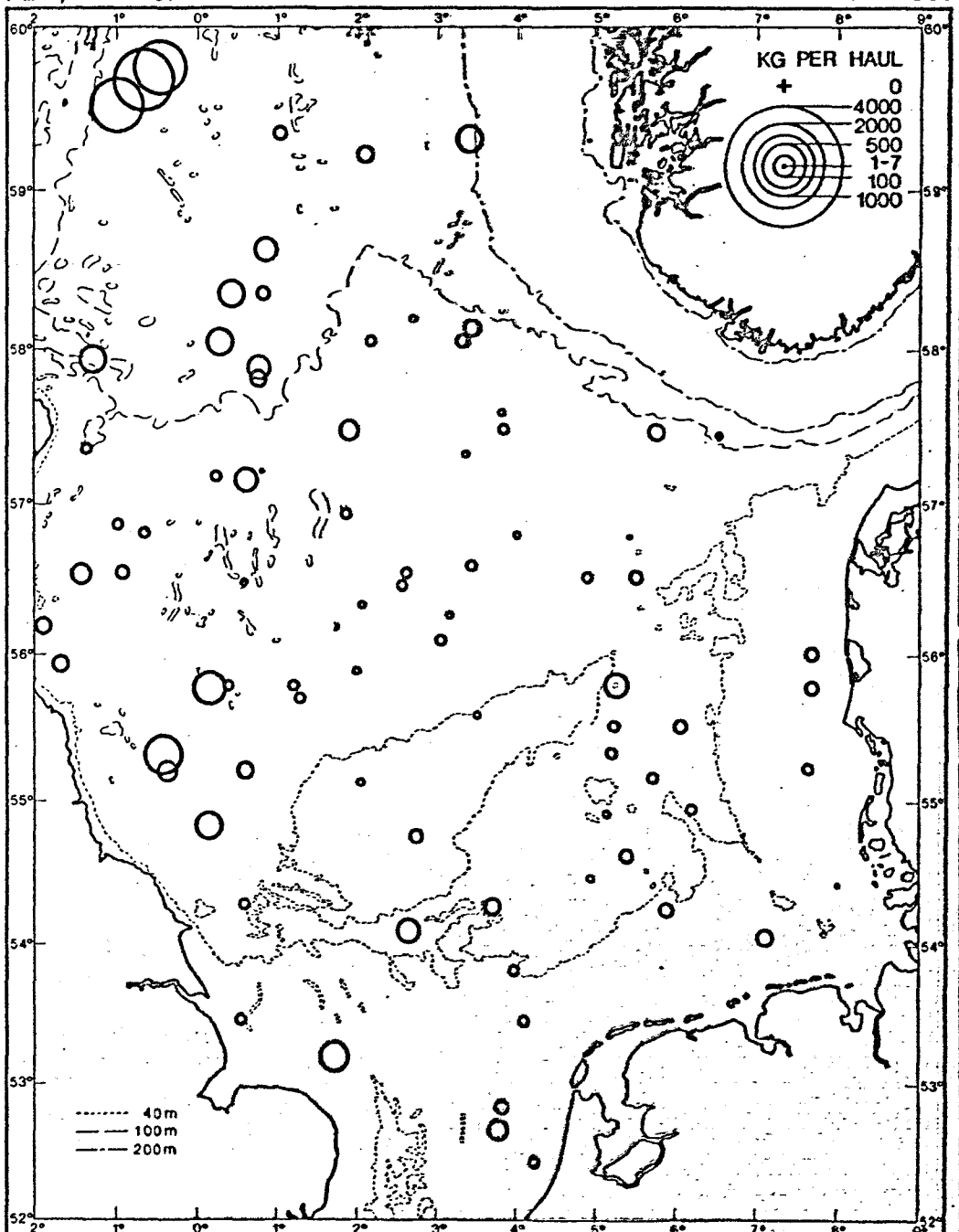

Fig. 4

FEB/MAR 1977 **HERRING**

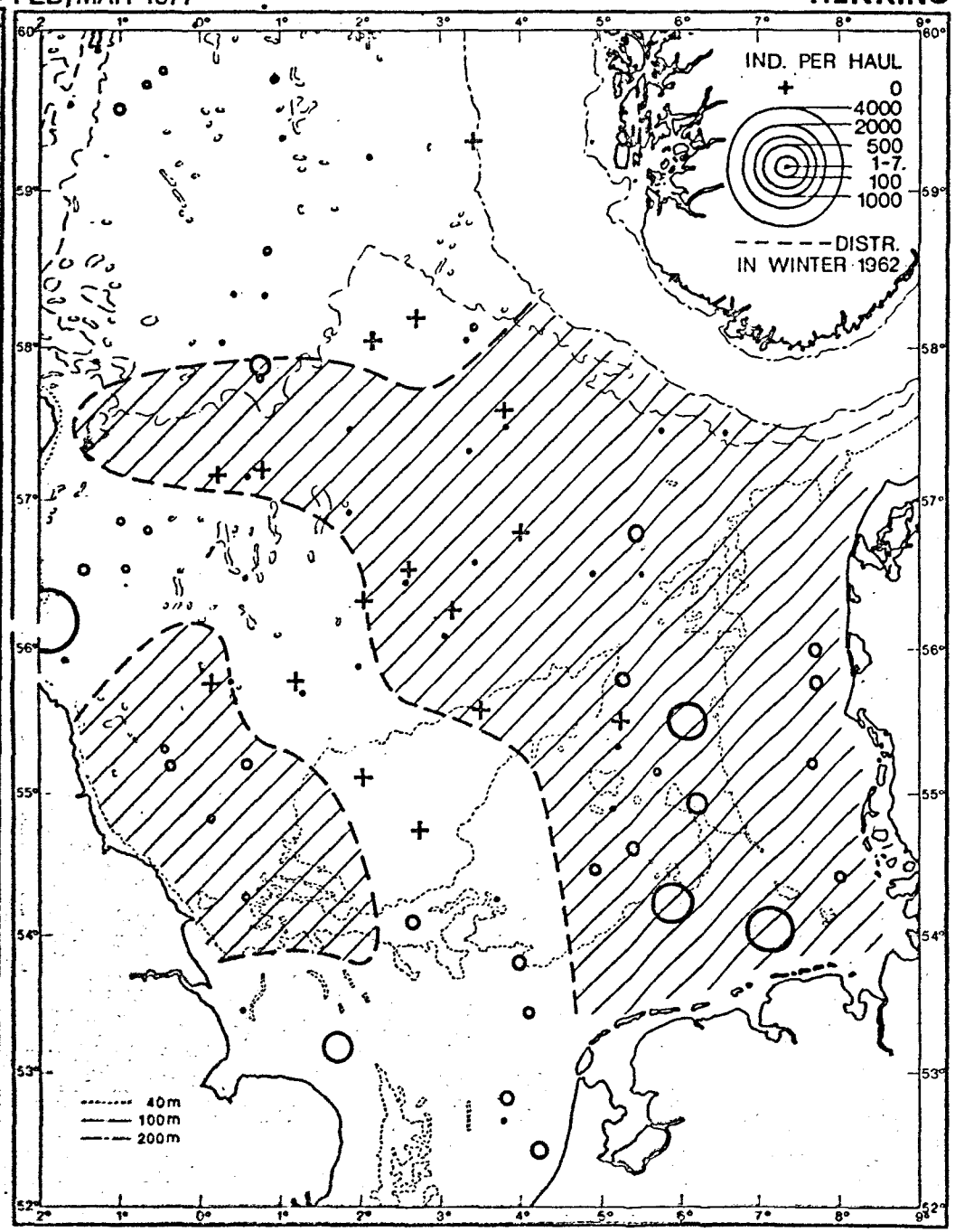

Fig. 5

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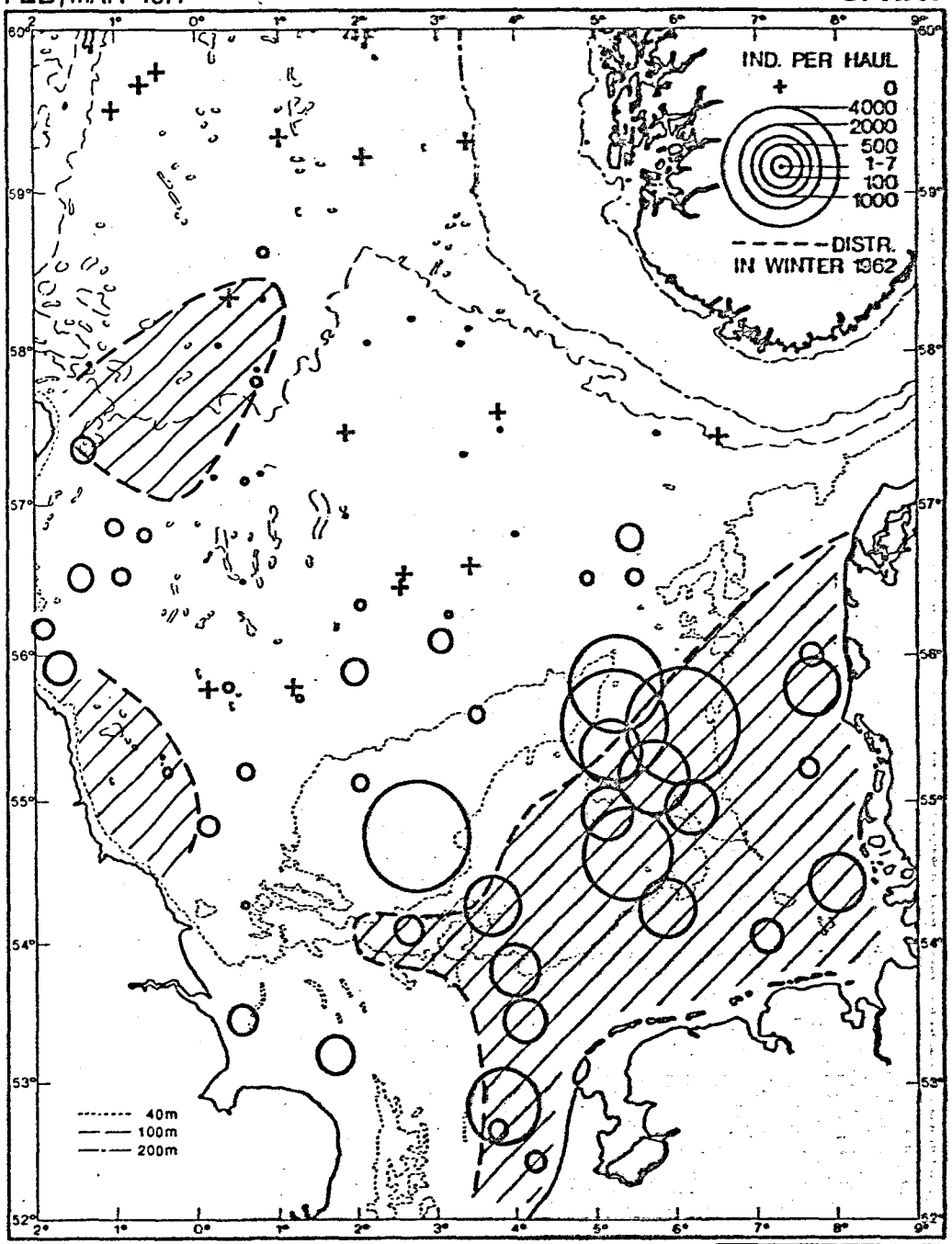

Fig. 6

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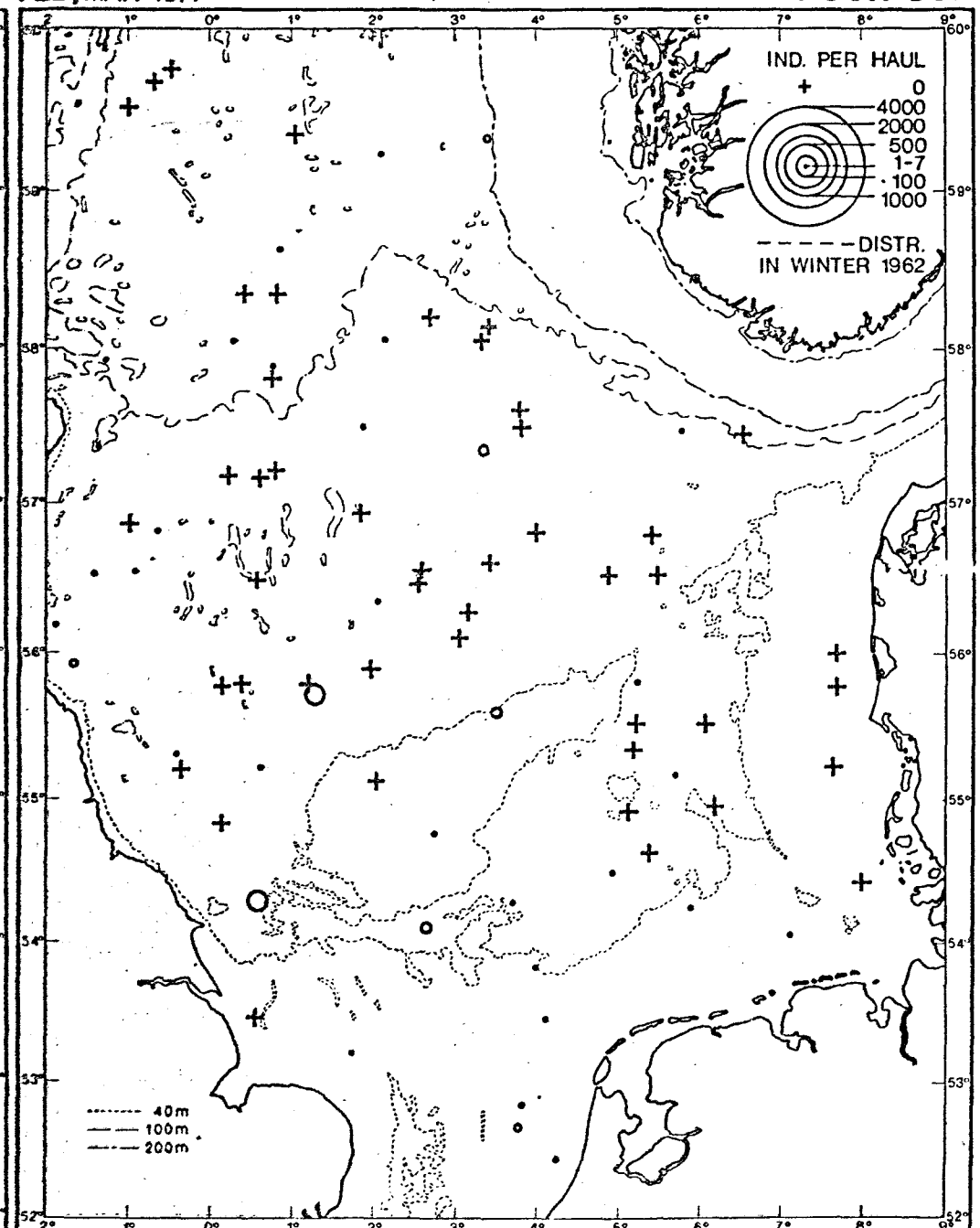

Fig. 7

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COD

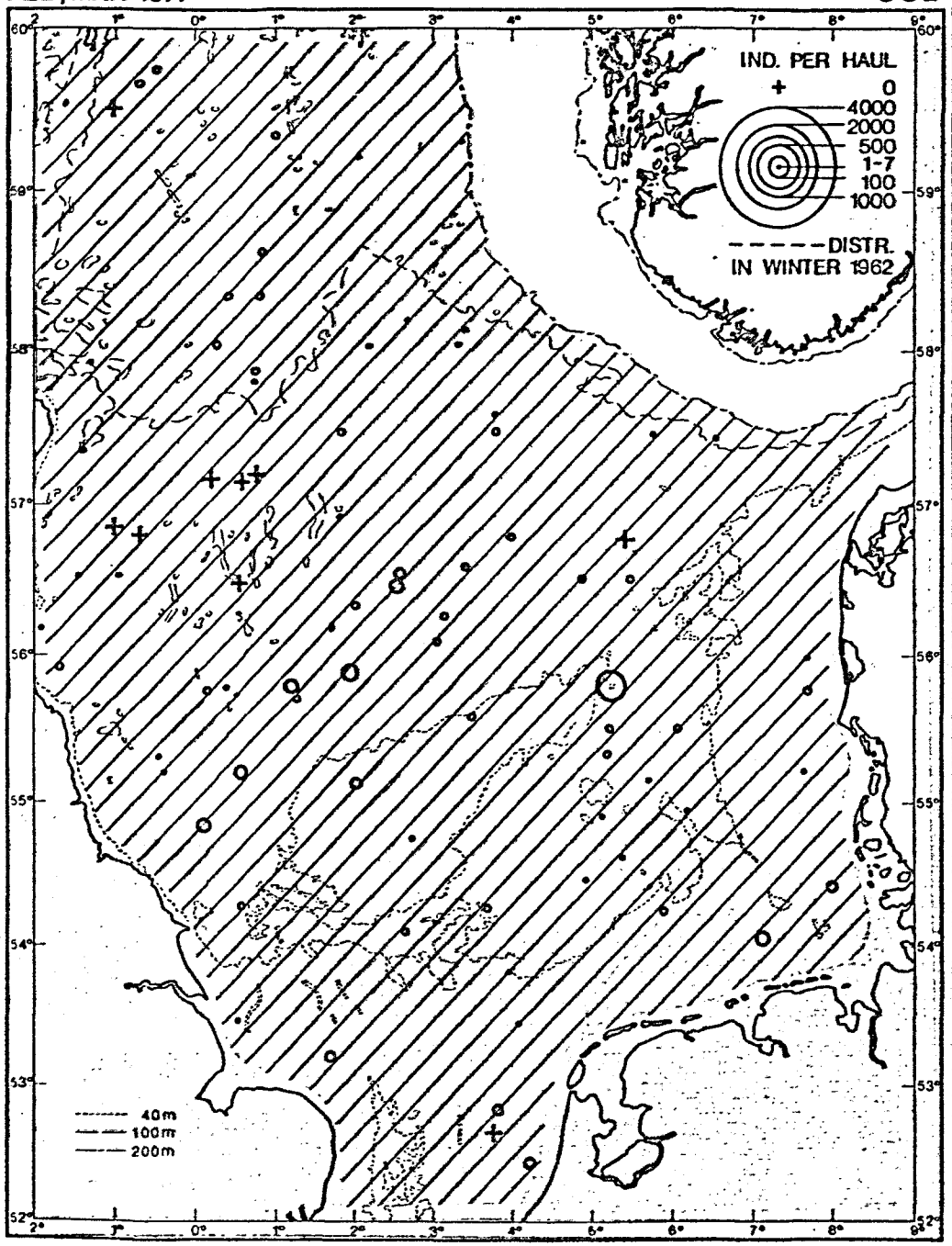

Fig. 8

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HADDOCK

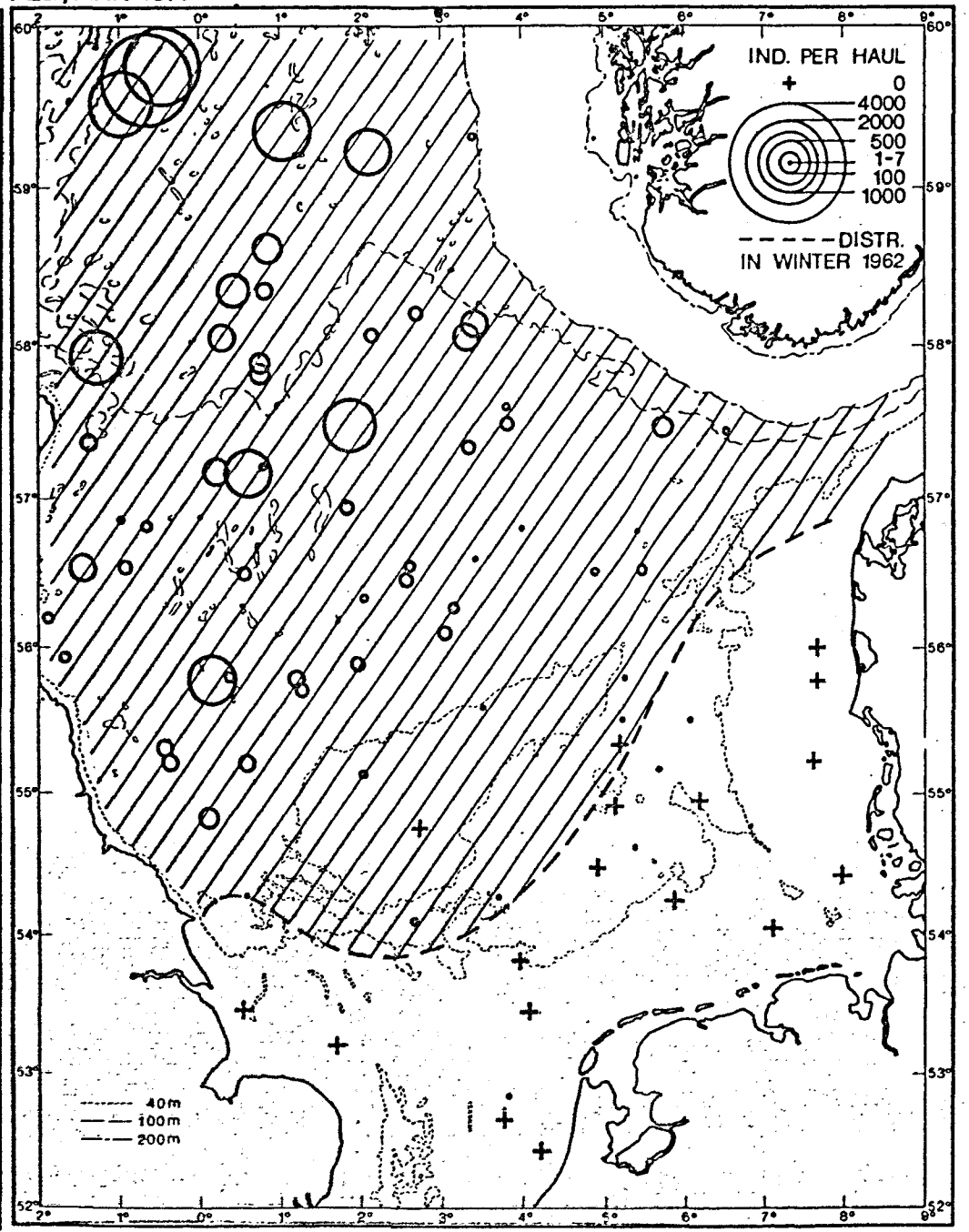

Fig. 9

FEB/MAR 1977 **WHITING**

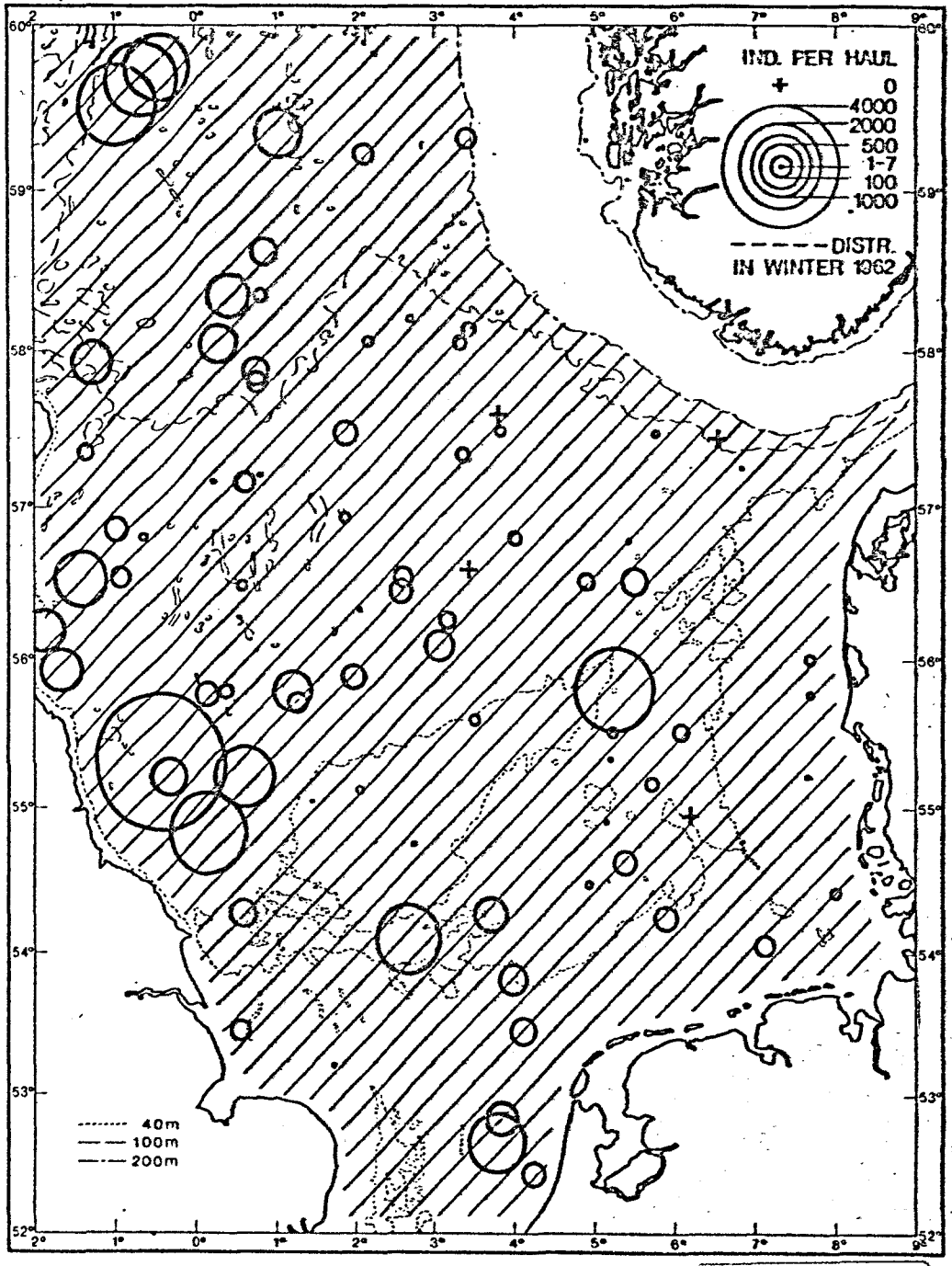

Fig. 10

FEB/MAR 1977 **NORWAY POUT**

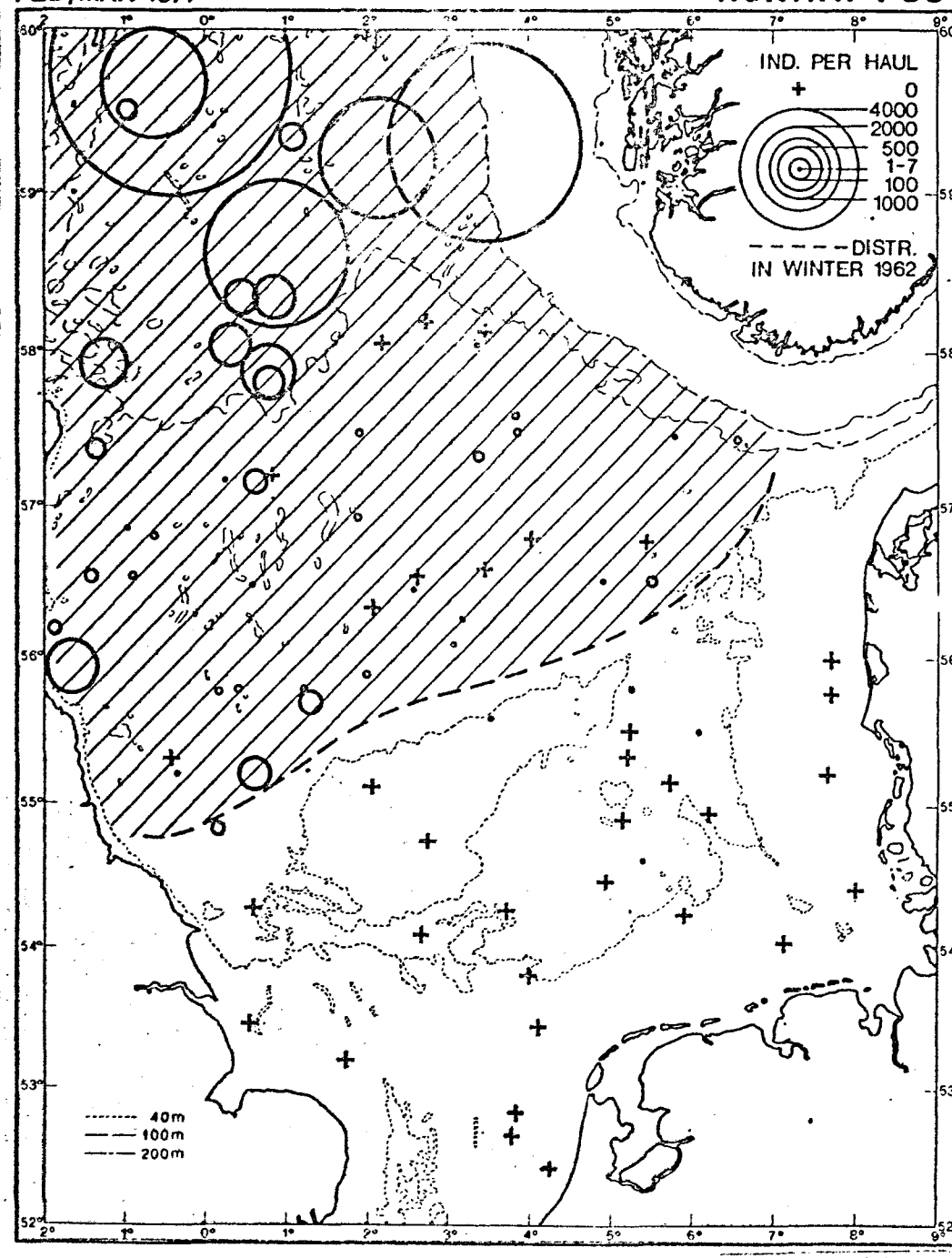

Fig. 11

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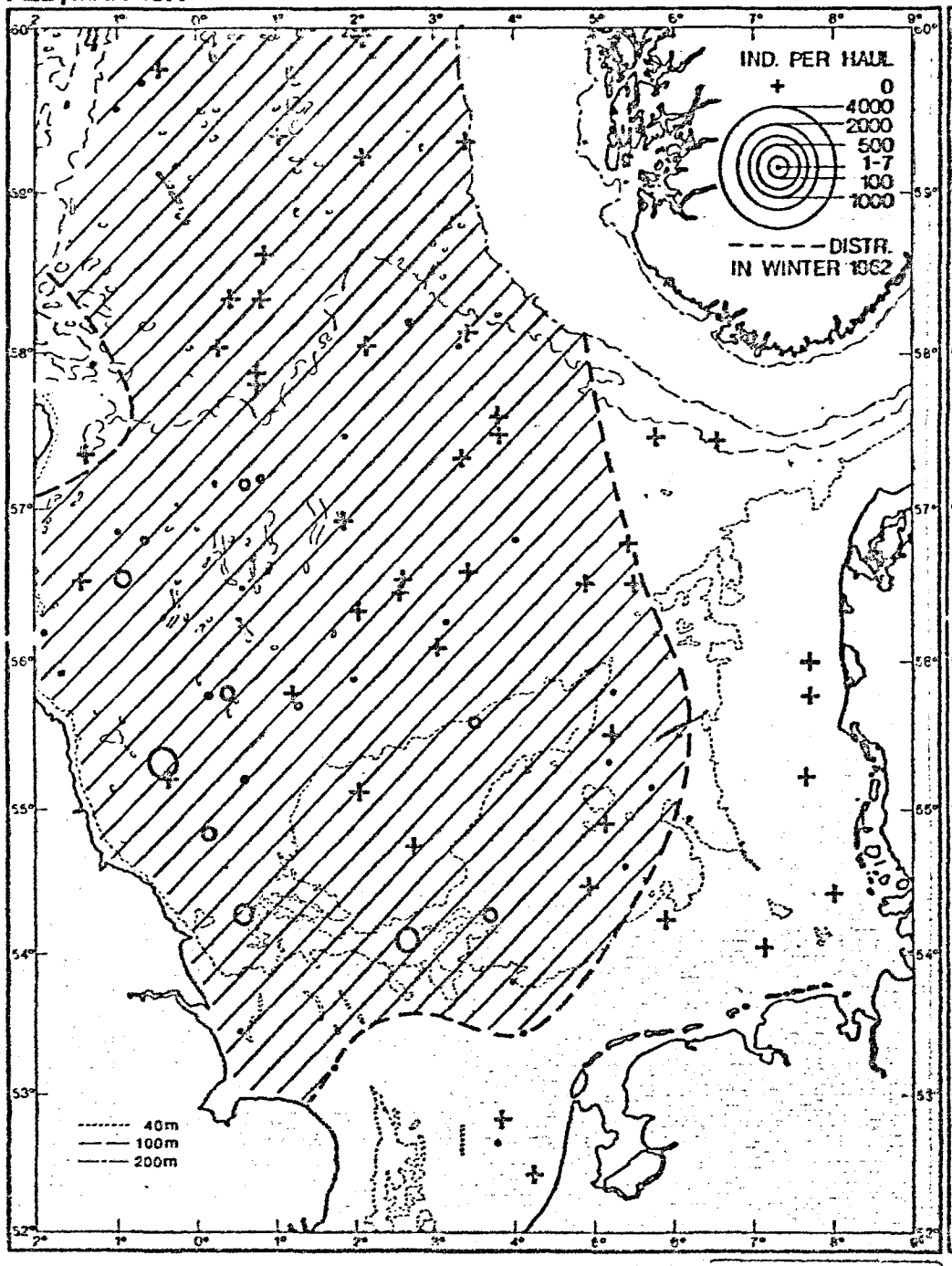

Fig. 12

FEB/MAR 1977 **L.ROUGH DAB**

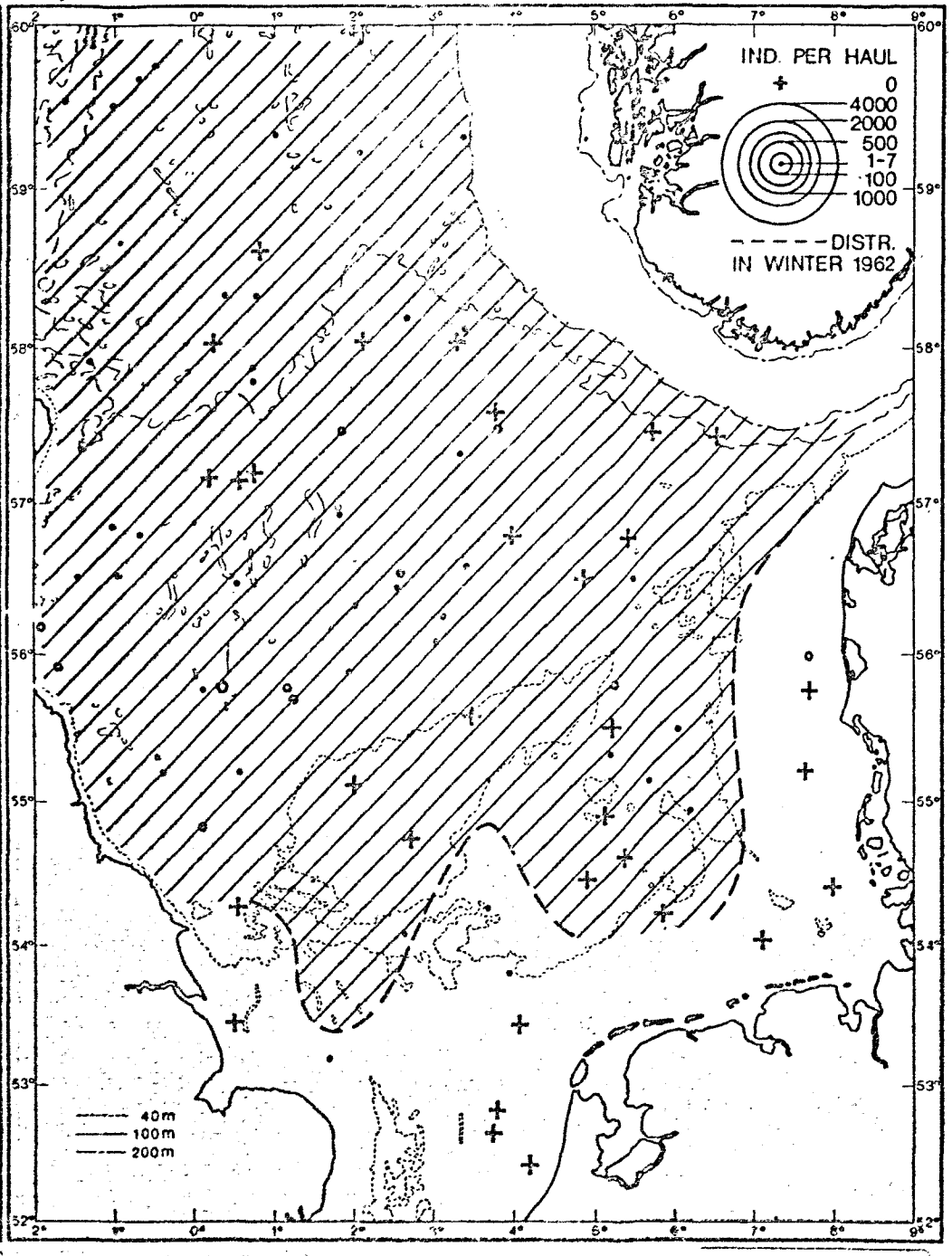

Fig. 13

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COMMON DAB

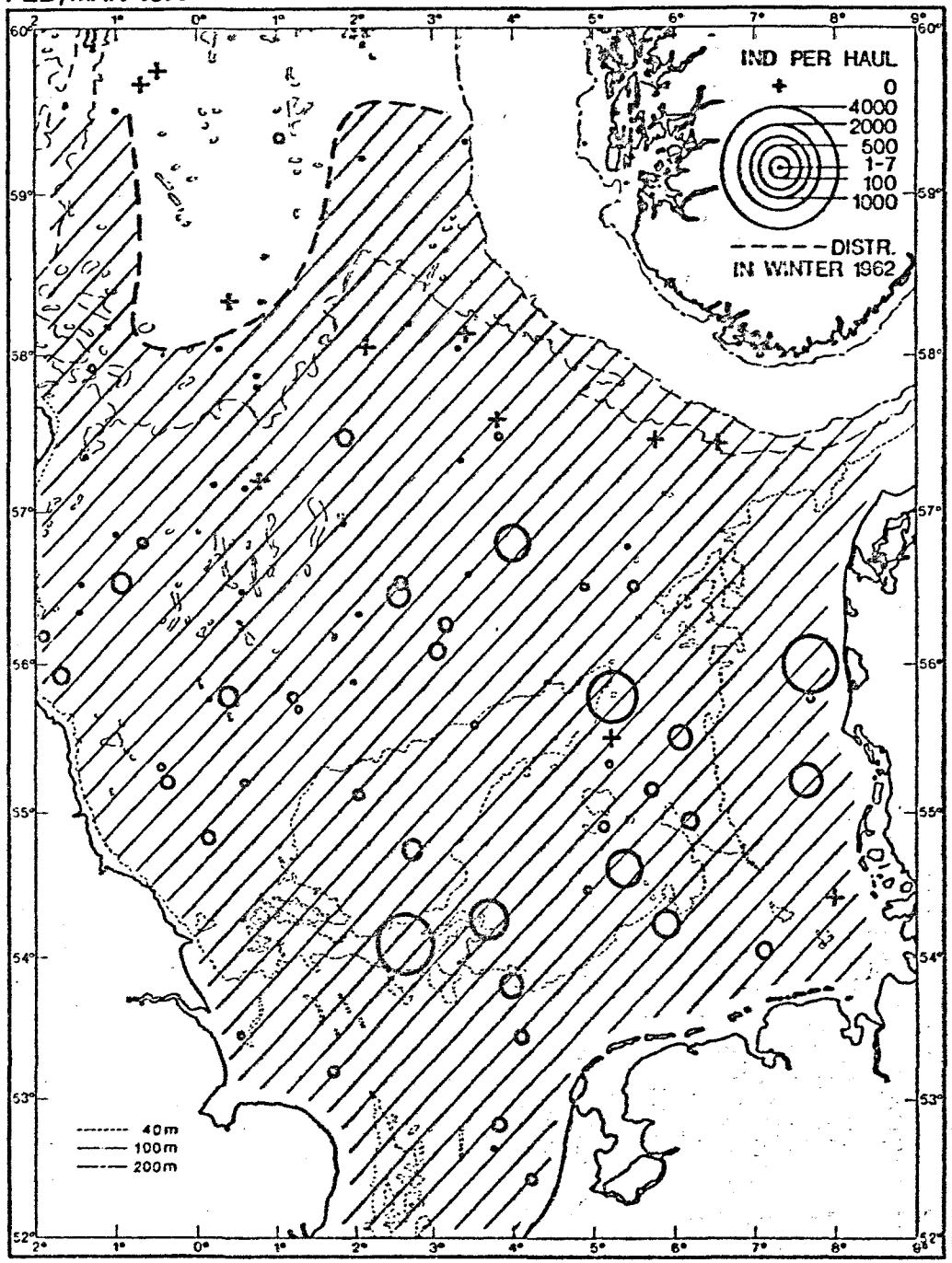

Fig. 14

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PLAICE

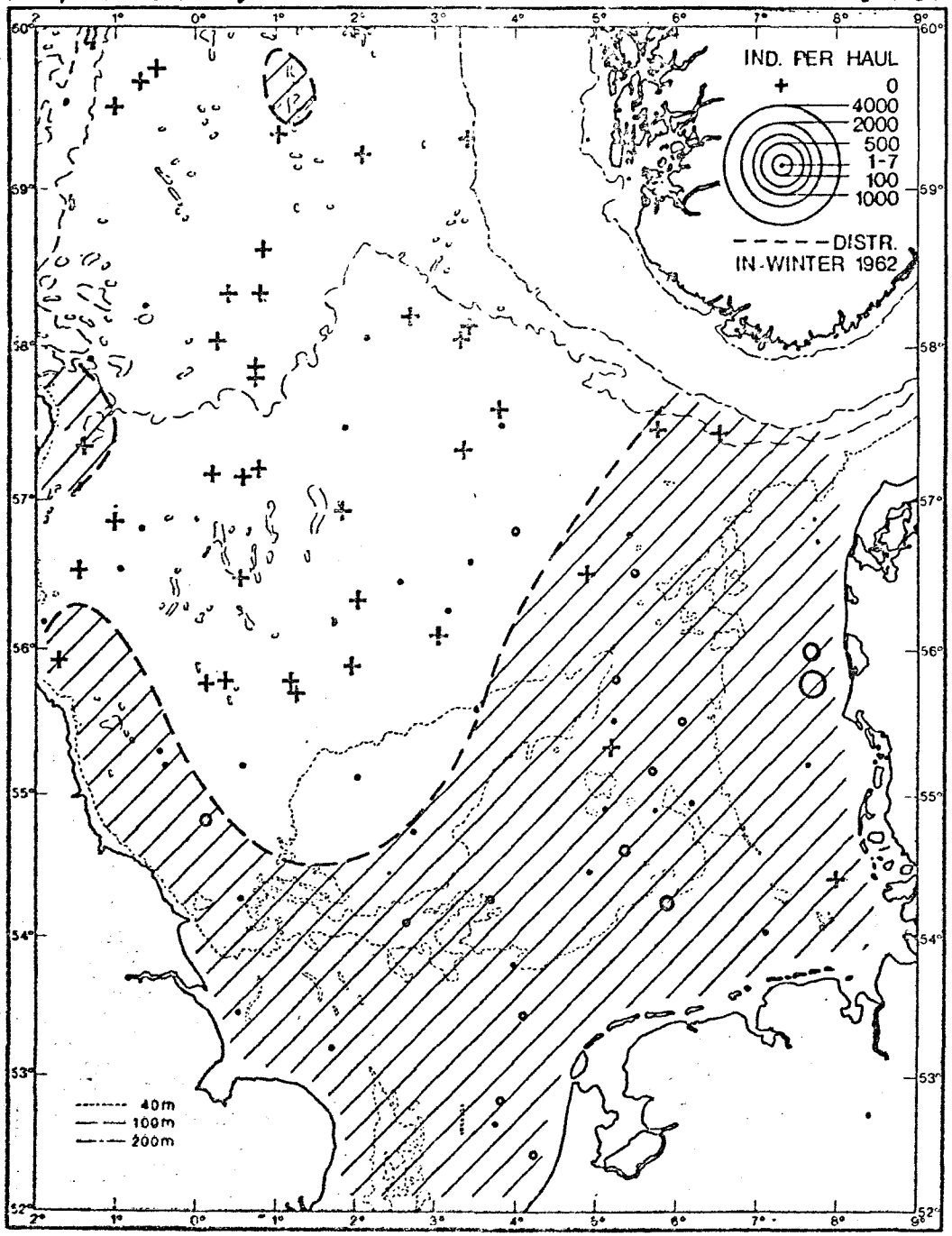

Fig. 15

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LEMON SOLE

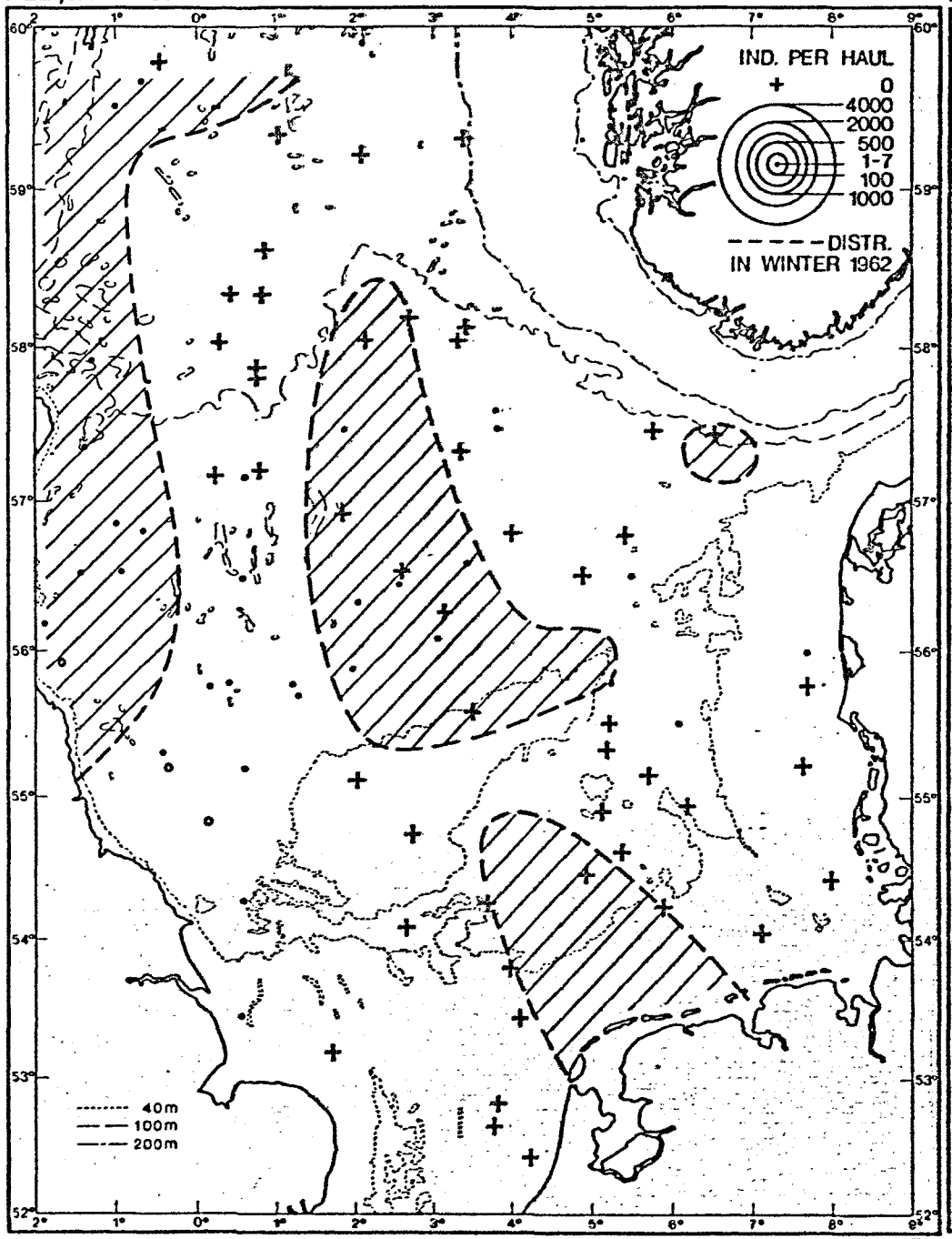

Fig. 16

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STARRY RAY

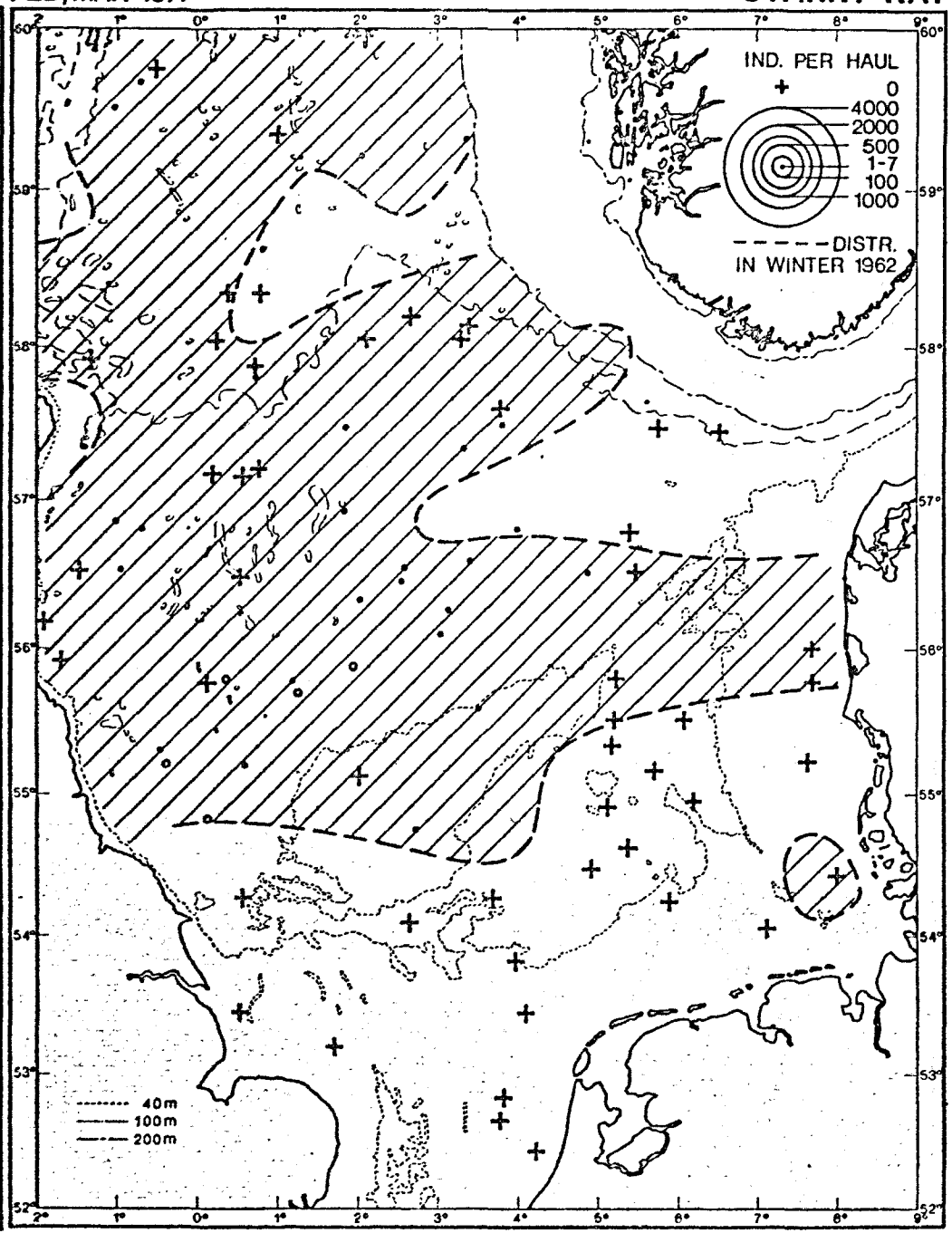

Fig. 17