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By-Catches of Capelin in Canadian Bottom-Trawl Surveys From Northern Labrador to the Southern Grand Bank (Div. 2GHJ3KLNO) in Autumn 1991

by

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Abstract

The distribution of capelin in the region from northern Labrador to the southern Grand Bank in October-December 1991 was inferred from by-catches in bottom-trawl surveys. Capelin were caught at 174 (23%) of the 758 fishing stations. Moderate to large catches were obtained between southern Div. 2J and northern Div. 3L, with the greatest concentration of large catches occurring on Funk Island Bank in Div. 3K.

Introduction

Because of uncertainity in 1991 about the status of the capelin stock in Div. 3L, STACFIS recommended that additional data be presented to a special meeting in March 1992 (NAFO, 1991). The data requested included "capelin by-catch in groundfish bottom-trawl surveys".

Capelin are frequently caught during bottom-trawl surveys directed toward demersal fish off Labrador and eastern Newfoundland. To my knowledge, there has been no study of the relationship between catches of capelin in a bottom-trawl and the density of capelin in the immediate vicinity as measured by hydroacoustics. Nevertheless, a catch of capelin in a bottom-trawl demonstrates the presence of capelin, and it is possible that a large catch indicates a high density of capelin near the bottom, especially since large catches are frequently taken close together, often in sequential sets.

The distribution and magnitude of capelin catches from Canadian bottom-trawl surveys in Div. 2J3K during the autumns of 1978-90 have been compared with geographic coverage by the Canadian acoustic surveys to help determine whether coverage by the acoustic surveys has been adequate (Carscadden et al., 1989; Carscadden et al., 1990; Miller and Lilly, 1991). This paper continues this series of comparisons with data from the bottom-trawl survey in autumn 1991.

In addition, the broader-scale distribution of capelin in autumn 1991 is examined with catch data from a bottom-trawl survey off northern and central Labrador (Div. 2GH) and bottom-trawl surveys on Grand Bank (Div. 3LNO). These surveys provide information on capelin distribution north and south of the area covered by the Canadian acoustic survey.

Materials and Methods

Capelin were caught during random depth-stratified bottom-trawl surveys conducted from northern Labrador to the southern Grand Bank during a 2-month period in October-December 1991 (Table 1). All ships towed an Engel-145 trawl, with 29 mm mesh liner in the codend, at 3.5 knots for 30 min at each fishing station. Catches from the few stations of duration other than 30 min were appropriately adjusted.

The distribution of capelin is presented in expanding symbol plots, as opposed to contour plots, in order to provide visual information on the spatial distribution of fishing stations, the relationship between capelin catches and bathymetry, and the variability among stations.

Results

Div. 2GH

The bottom-trawl survey in Div. 2GH was conducted during November 20-29 (Table 1). One capelin was recorded from one fishing station in the far southeast of Div. 2H (Fig. 1).

Div. 2J3K

The bottom-trawl survey in Div. 2J3K was conducted from November 6 to December 17 (Table 1), with a median date of fishing of November 26. This is similar to recent years (Carscadden et al., 1989; Carscadden et al., 1990; Miller and Lilly, 1991). In contrast to previous years, when the number of fishing stations assigned to each stratum was roughly proportional to stratum area, the number of fishing stations assigned to each stratum was selected to minimize variance as observed during surveys in earlier years.

Capelin were recorded at 39% of the fishing stations conducted at depths less than 750 m. This is the third highest frequency of occurrence in the period 1981-1991 (Table 2), but as noted above, the 1991 survey is not directly comparable to surveys in earlier years. Catches were moderately large compared to earlier years (95th percentile = 4 kg; maximum = 68 kg) (Table 2).

Very few capelin were caught on Hamilton Bank and toward the coast off southern Labrador and northeastern Newfoundland. Largest catches were obtained in the region of western Belle Isle Bank and St. Anthony Basin, and on northern and western Funk Island Bank (Fig. 2). In the southernmost part of Div. 3K, capelin occurred in every set except those nearest the shelf edge. The distribution in 1991 was similar to that observed in 1987 and 1990 (Carscadden et al., 1989; Miller and Lilly, 1991), with perhaps an even greater tendency toward the southeast.

Most of the large catches on Funk Island Bank in 1991 occurred in those strata omitted from the Canadian acoustic survey (Fig. 2). The area of high frequency of occurrence in southeasternmost Div. 3K was included in the acoustic survey.

Div. 3L

The bottom-trawl survey of Div. 3L was conducted from November 8 to December 2 (Table 1). Capelin were recorded at 21% of the stations (Table 1). They were found primarily north of 48° N, with a few small catches along the northeast slope of Grand Bank, near the shelf edge in southeastern Div. 3L, and in the southern Avalon Channel (Fig. 2,3). There were no catches on the plateau of Grand Bank.

Div. 3NO

The bottom-trawl survey of Div. 3NO was conducted from October 19 to November 10 (Table 1). Capelin were recorded in just 7% of the stations (Table 1). A few small catches of capelin were recorded in northwestern Div. 3O and near the shelf edge in northeastern Div. 3N (Fig. 3).

Discussion

Most of the capelin caught during the bottom-trawl surveys in autumn 1991 were taken between Belle Isle Bank in southern Div. 2J and the northern edge of Grand Bank in northern Div. 3L. The greatest concentration of large catches was on Funk Island Bank. The distribution in Div. 2J3K was more to the south and east than in previous years.

There is no evidence from these surveys that large quantities of capelin were distributed either north or south of the Canadian acoustic survey. The greatest concentration of large catches occurred on Funk Island Bank in strata omitted from the acoustic survey.

Comparisons between capelin distribution as observed during the acoustic survey and capelin distribution as inferred from the bottom-trawl survey must be treated with caution because the bottom-trawl survey of Div. 2J3K required

about 6 weeks to complete and did not start until the acoustic survey had been completed. Thus, for any point in space, the duration between coverage by the two surveys could range from one week to two months. It is possible that the capelin move during this period, with the movement most likely being toward the south and east (Kovalyov and Kudrin, 1973; Carscadden, et al., 1988).

Additional information on the distribution of capelin in autumn 1991 will become available from the examination of stomach contents of predators caught during the bottom-trawl surveys reported in this paper. Broad-scale patterns of capelin distribution are apparent from analysis of stomach contents of both cod (Lilly, 1991) and Greenland halibut (Bowering and Lilly, 1991).

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Table 1. By-catches of capelin and other selected data for bottom-trawl surveys in Divisions 2GHJ3KLNO in autumn 1991. GA = GADUS ATLANTICA, WT = WILFRED TEMPLEMAN, AN = ALFRED NEEDLER[a].

Division	Ship/Trip	Sampling dates (d/mo. - d/mo.)	No. of stations	Stations with capelin	
				No.	%
2GH	AN 161	20/11 - 29/11	75	1	1
2J3K	GA 208-210	06/11 - 17/12	313	117	37
3L	WT 114-115	08/11 - 02/12	219	45	21
3NO	WT 113-114	19/10 - 10/11	151	11	7
TOTAL		19/10 - 17/12	758	174	23

[a] The GADUS ATLANTICA is a 74 m stern trawler and the WILFRED TEMPLEMAN and ALFRED NEEDLER are 50 m stern trawlers.

Table 2. Statistics for by-catches of capelin during bottom-trawl surveys in NAFO Div. 2J3K during the autumns of 1978 to 1991.

Year	GADUS ATLANTICA trip number	Number[a] of sets	Sets with capelin		Percentiles of capelin catches (kg)[b]			
			No.	%	50	75	95	Max.
1978	15	125	2	2	0.03			<<1
1979	29	124	42	34	0.09	0.3	9	185
1980	44	134	25	19	0.50	1.8	149	172
1981	58,59	214	53	25	0.30	1.0	24	345
1982	71,72	291	97	33	0.20	0.5	3	18
1983	86-88	248	58	23	0.10	0.3	2	24
1984	101-103	251	67	27	0.15	0.4	2	3
1985	116-118	297	127	43	0.12	0.4	3	10
1986	131-133	210	50	24	0.18	0.8	12	24
1987	145-147	276	94	34	0.20	1.0	18	117
1988	159-161	233	84	36	0.15	0.8	3	39
1989	174-176	273[c]	134	49	0.12	0.3	2	32
1990[d]	190-192	232[c]	82	35	0.09	0.3	1	11
1991	208-210	302	117	39	0.14	0.5	4	68

[a] Sets in depths >750 m are not included. Sets in strata 618 and 619 on the coastal shelf off northern Newfoundland are included. These strata were not fished prior to 1984.

[b] Percentiles are calculated for those sets in which capelin were recorded in the catch.

[c] Only sets from first-stage sampling are included.

[d] Not directly comparable to previous years, because the number of fishing stations assigned to each stratum was not roughly proportional to stratum area, as was the case in 1978-90.

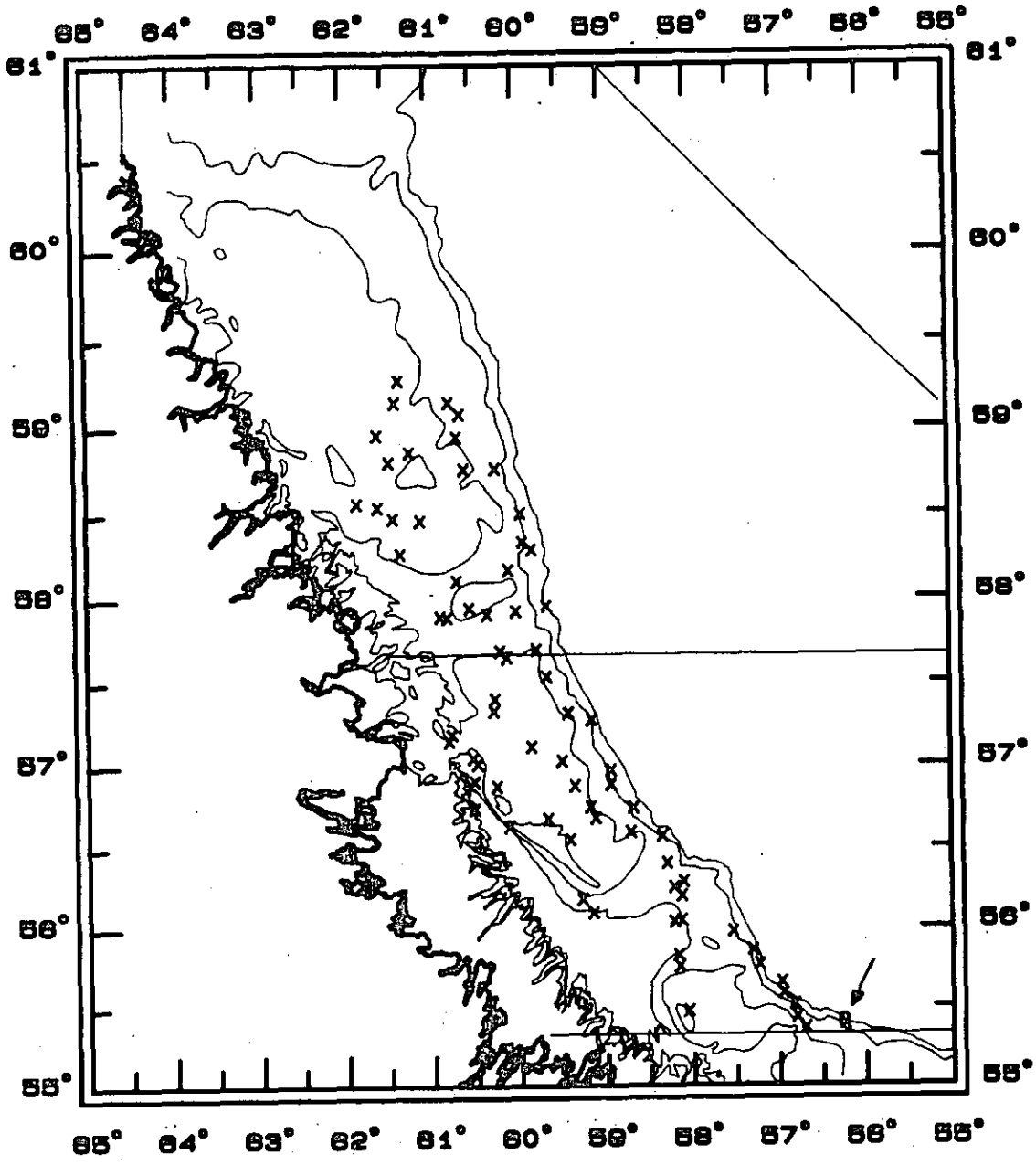

Fig. 1. Capelin catches (kg/30 min tow) during a random depth-stratified bottom-trawl survey in Div. 2GH in autumn 1991. One capelin was caught at the station indicated by an arrow. x = nil.

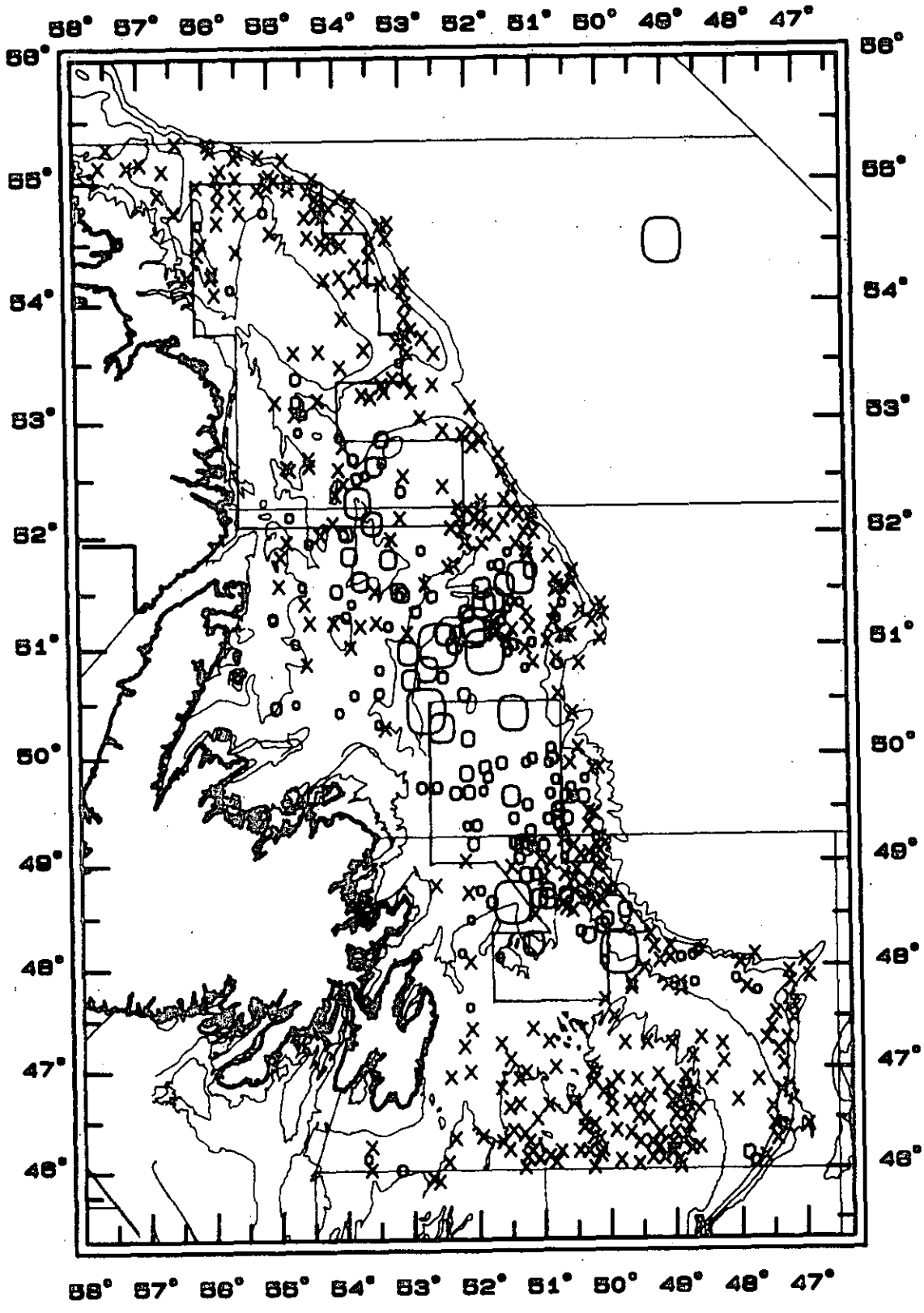

Fig. 2. Capelin catches (kg/30 min tow) during random depth-stratified bottom-trawl surveys in Div. 2J3KL in autumn 1991. Catches were set to a maximum of 10 kg before plotting. A symbol for 10 kg is shown at top right. Symbol area is proportional to catch. x = nil. Also shown is the boundary of the Canadian acoustic survey.

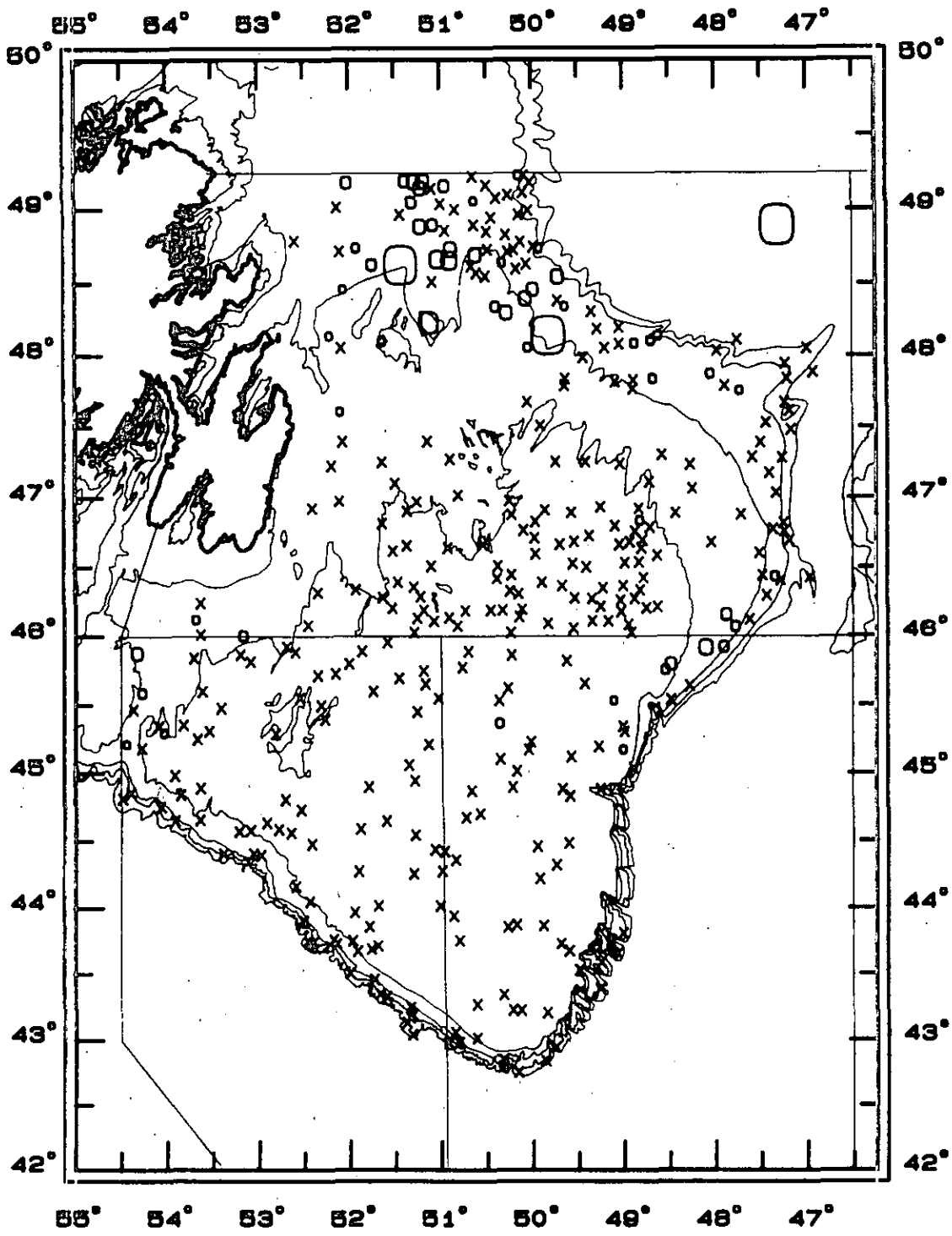

Fig. 3. Capelin catches (kg/30 min tow) during random depth-stratified bottom-trawl surveys in Div. 3LNO in autumn 1991. Catches were set to a maximum of 10 kg before plotting. A symbol for 10 kg is shown at top right. Symbol area is proportional to catch. x = nil.