Northwest Atlantic Fisheries Organization

Serial No. N1001

NAFO SCR Doc. 85/52

SCIENTIFIC COUNCIL MEETING - JUNE 1985

Hydroacoustic Survey of Capelin Stocks in Divisions 2J+3K and Trawl Survey of Capelin Prerecruits in Divisions 3KLNO in November 1984-January 1985

by

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ABSTRACT

Results of the acoustic survey of capelin feeding concentrations in Divs. 2J3K and the trawl survey of capelin prerecruits off the Grand Newfoundland Bank (3KLNO) are presented in the paper and hydrographic characteristic of the area investigated, distribution and biological characteristic of fish are briefly given.

For technical reasons this year the acoustic survey was carried out nearly by 1.5 month later than usual, when almost all the capelin migrated into the southern areas of Div. 3K and, as a result of that, a considerable number of it distributed in territorial waters and was not covered by the survey. The capelin abundance was estimated to be 19.9 bill spec., and the biomass - 268 thou.t.

The result of the trawl survey showed that the 1984 year class abundance occurred to be nearly by 21 times lower than that of 1983, estimated in the similar survey in 1983.

INTRODUCTION

The total stock of capelin feeding concentrations in Divs. 2J3K is estimated during the echo surveys in autumn period. The best period of surveys is late October - the first half of Novem-

ber, when an intensive feeding of fish is over and it concentrates into dense schools. The concentrations here consist mainly of the first maturing specimens and survived postspawning fish at age from 2+ to 5+ years. As a rule, young fish at age 1+ year are observed in the southern areas of Div.3K and in the northern - 3L. Capelin fingerlings (0+) are registered further to the south over the whole Grand Newfoundland Bank.

An assessment of prerecruits during a trawl survey was started in 1983, where the first positive results were obtained. The survey on capelin prerecruits and also the estimation of capelin stocks in Divs. 2J3K were carried on in 1984, while for technical reasons they were carried out nearly by 1.5 month later than usual. The paper presents the results of these investigations.

MATERIAL AND METHODS

The investigations were carried out by RV "Kokshaisk" in the 200-mile fishing zone of Canada. Capelin echo survey was carried out in Divs. 2J3K in two stages: from 4 to 10 December - in the southern area investigated and from 17 to 24 December - in the northern one. The conducting of survey in the northwestern areas, adjacent to territorial waters, occurred to be impossible because of solid ice fields.

EK-400 echo sounder, operating in the regime of 38 KHz, and echo integrator SIORS were used in the echo survey. Methods of the acoustic survey and treatment of results were similar to those used earlier for that area (Mamylov, Bakanev, 1984).

Values from the integration system were reported for every 5 miles of the survey track. Mean length and weight values of capelin were obtained by the results of control fishing sets, carried out by midwater trawl.

Capelin prerecruit survey (0+, 1+) in the southern areas of Div.3K and in the northern ones of Div.3L was carried out from 11 to 15 December, and in the other areas (3LNO) - from 30 December in 1984 to 14 January 1985.

Trawl-acoustic method, similar to that one for adult fish estimation, was used to estimate the abundance of young fish at age 1+ year. Capelin fingerlings were estimated on the basis of

catches from finemeshed trawl, used in similar investigations in autumn 1983. The positions of trawl stations with considerable variations also resembled the young fish survey in 1983.

Each haul included successive fishing in the 0-20, 20-40 and 40-60 m layers with 10 minute duration in each. Besides, the 24-hour station with the fishing of those layers separately, with the 20-minute haul duration was made.

Calculation of the index of fingerlings abundance was carried out by two methods: by the method used when calculating the index of 0-group capelin abundance in the Barents Sea, presented in details earlier (Bakanev, et al., 1984) and by the method of isolines of capelin distribution density taking into account the area and mean value of catches at each grading.

RESULTS

According to the data on hydrographic section of 8-A, carried out on 13-14 November, cooling of the surface waters (0-50 m) and a core of the Labrador Current (50-200 m) was the most considerable for the recent 20 years. Water temperature anomalies constituted -1.8° and -0.9° respectively (Table 1). This predetermined the earlier starting of capelin migrations southwards and distribution of its schools southeasterly.

During the survey capelin were registered in the form of small scatterred schools in Div.2J. The densest concentrations were registered in the southern sections of Div. 3K (Fig. 1). Length of capelin from control catches varied from 8.5 to 18.5 cm; specimens of 12 cm long from the 1982 year class were predominant (Fig. 2).

A total predominance of capelin over the area investigated (6.7 thou. square miles) constituted 19.9 bill spec., and the biomass - about 268 thou. t. (Table 2). Undoubtedly, only a part of the total capelin stocks was assessed by the survey, and a considerable number of it were distributed in the territorial waters of Canada and was inaccessible for surveying.

Isolated concentrations of fish at age 2 years (1+) with insignificant by-catch of fish at age 3 years (2+) were registered in the northern area of Div. 3L (Fig.3). According to the results of the first survey (1-4December) the total abundance of fish at age 2 years over the area of 4088 square miles constituted 46.1 bill spec. or 211.6 thou. t. Mean weight of one specimen constituted 4.6 g.

During the repeated survey (11-14 December) concentrations of fish at age 2 years distributed over the vaster area (6058 square miles), but they occurred to be less dense. Their total abundance constituted 25.2 bill spec., and biomass - 139.5 thou. t. Mean weight of one specimen constituted 5.5 g.

Comparative results of capelin fingerling trawl surveys for recent two years are presented in Fig.4. Attention is drawn to the fact that both the area of distribution of capelin fingerlings and their density, estimated in the expedition mentioned, are much lower than those from the similar survey in 1983.

Index of abundance for the given survey , estimated according to the formula

$$T = AS + KAd = 36.3 + 10 \cdot 3.3 = 66.5,$$

occurred to be lower by 4 times, compared to that one obtained in 1983 (254.2).

However, absolutely different result was obtained when comparing capelin abundance at the stage of fingerlings using a common method of catch separation into gradations of density, taking into account the area and mean density.

According to the given methods of calculation the index of capelin fingerling abundance for this year is nearly 21 times lower than that of 1983 (Table 3). This method of calculation, apparently, adequately reflects actual results of trawl surveys in comparison with the Norwegian method of index abundance estimation.

Fig. 5 presents length composition of larvae by areas. The largest specimens were observed in Div. 3K, and the smallest ones - in Div. 3O.

12 hauls with fishing of the 0-20, 20-40 and 40-60 m layers with the 20-minute duration of each were made to study diel dist-

ribution of capelin fingerlings by depths, in the densest concentrations in Div. 3N (mean positions - 44°33'N 50°55'W). Results of the investigations are presented in Table 4. As in the survey of 1983 the highest amount of larvae were observed in the lower water layers and the lowest one - in the uppermost. Larger fingerlings were also observed in lower layers.

REFERENCES

Bakanev, V.S., A.A.Filin, and S.V.Chechenin. MS 1984. Trawl survey of capelin prerecruits in NAFO Divisions 3LNO in November 1983. NAFO SCR Doc. 84/VI/40.

Mamylov, V.S., and V.S.Bakanev. MS 1984. An acoustic assessment of capelin stocks in NAFO Div. 3LNO and 2J+3K in 1983. NAFO SCR Doc. 84/VI/39.

Table 1. Mean water temperature (t) and its anomalies (Δt) in the coastal branch of the Labrador Current in the section of 8-A for 1975-1984 and average for 1964-1984

YEAR	LAYERS, m					
	0 - 50		50 - 200		0 - 200	
	t	Δt	t	Δt	t	Δt
1975	1.38	0.21	0.48	0.40	0.78	0.38
1976	0.80	- 0.37	0.18	- 0.26	0.13	- 0.27
1977	1.34	0.17	1.85	1.77	1.67	1.27
1978	0.84	- 0.33	0.38	0.30	0.50	0.10
1979	1.48	0.31	0.00	- 0.08	- 0.49	0.09
1980	1.51	0.34	0.08	0.00	0.54	0.14
1981	2.94	1.77	- 0.11	- 0.19	0.82	0.42
1982	0.46	- 0.71	- 0.09	- 0.17	0.08	- 0.32
1983	0.54	- 0.63	- 0.88	- 0.96	- 0.42	- 0.82
1984	- 0.65	- 1.82	- 0.87	- 0.95	- 0.95	- 1.20
Average for 1964-1984	1.17		0.08		0.40	

Table 2. Results of the acoustic estimation of capelin abundance and biomass

AREA	Survey date	Area (square mile)	Abundance (mill spec.)	Biomass (thou.t.)
2 J+ 3K	04.- 24.I2.84	6680	I9900	268
3 L	0I - 04.I2.84	4058	46I00	2II
3 L′	II - I4.I2.84	6058	25200	I39

Table 3. Results of calculation of the index of capelin fingerling abundance for 1983 and 1984

I983			I984		
Mean density, spec.	Area (sq. mile)	Number (thou. spec.)	Mean density, spec.	Area (sq. mile)	Number (thou. spec.)
32758	I5I9	49759	2087	I453	3032
I5000	I74	26I0	I99	84I5	I675
7530	499I	37582	I43	280	40
6I50	I4I0	867I	74	5482	406
3600	I52	547	70	4335	303
2640	27I2	7I60	44	I530	67
833	2278	I898	22	5737	I26
7I0	I3237	9398	6	3060	I8
I80	I95	35			
5I	65I0	332			
	33I78	II7992		30292	5667

Table 4. 24-hour trawl station results of fishing of capelin fingerlings

Date of fishing	Depth, m	Number of catches	Number of measur.	Mean Length, mm	σ	Variation coeffic. C
23.00-23.20	00-20	594	594	47.4 ± 0.08	2.I9	4.6
00.40-0I.00	20-40	98	98	49.5 ± 0.43	4.29	8.6
0I.30-0I.50	40-60	735	735	47.2 ± 0.07	2.0I	4.2
05.25-05.45	00-20	46I	46I	47.I ± 0.I0	2.35	4.9
06.35-06.55	20-40	I900	63I	49.I ± 0.09	2.3I	4.6
07.25-07.45	40-60	4000	9I5	49.3 ± 0.05	I.79	3.6
II.35-II.55	00-20	5I2	5I2	47.9 ± 0.08	I.87	3.9
I2.20-I2.40	20-40	429	429	46.4 ± 0.I0	2.09	4.5
I3.I0-I3.30	40-60	I253	I253	48.I ± 0.04	I.55	3.2
I6.00-I6.20	00-20	I67	I67	47.2 ± 0.28	3.72	7.8
I6.40-I7.00	20-40	330	330	48.4 ± 0.I5	2.79	5.7
I7.30-I7.50	40-60	624	624	47.6 ± 0.08	2.I8	4.5

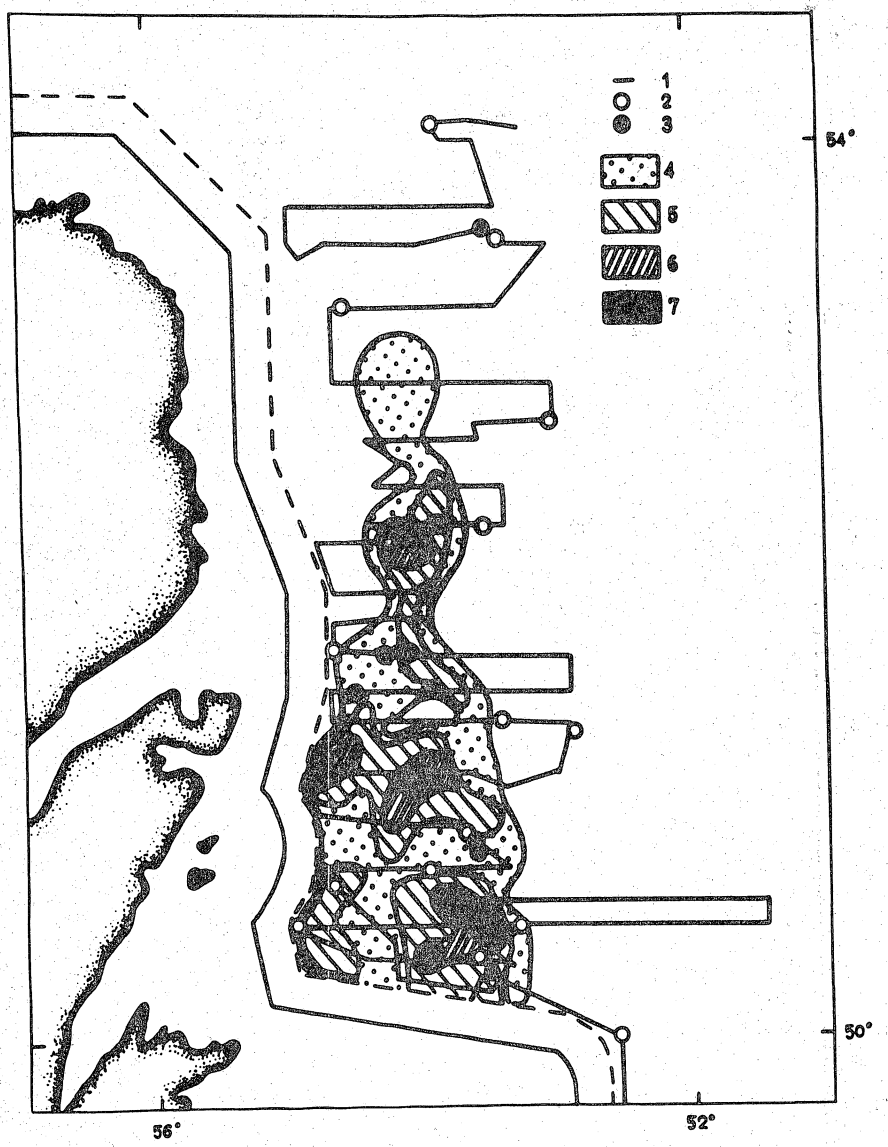

Fig. 1. Acoustic survey route and distribution of capelin concentrations in December 1984.

1 - survey route, 2 - hydrographic stations,

3 - control fishing sets.

Density of concentrations (echo integrator's units):
4-1-20, 5-21-100, 6-101-300, 7- over 301

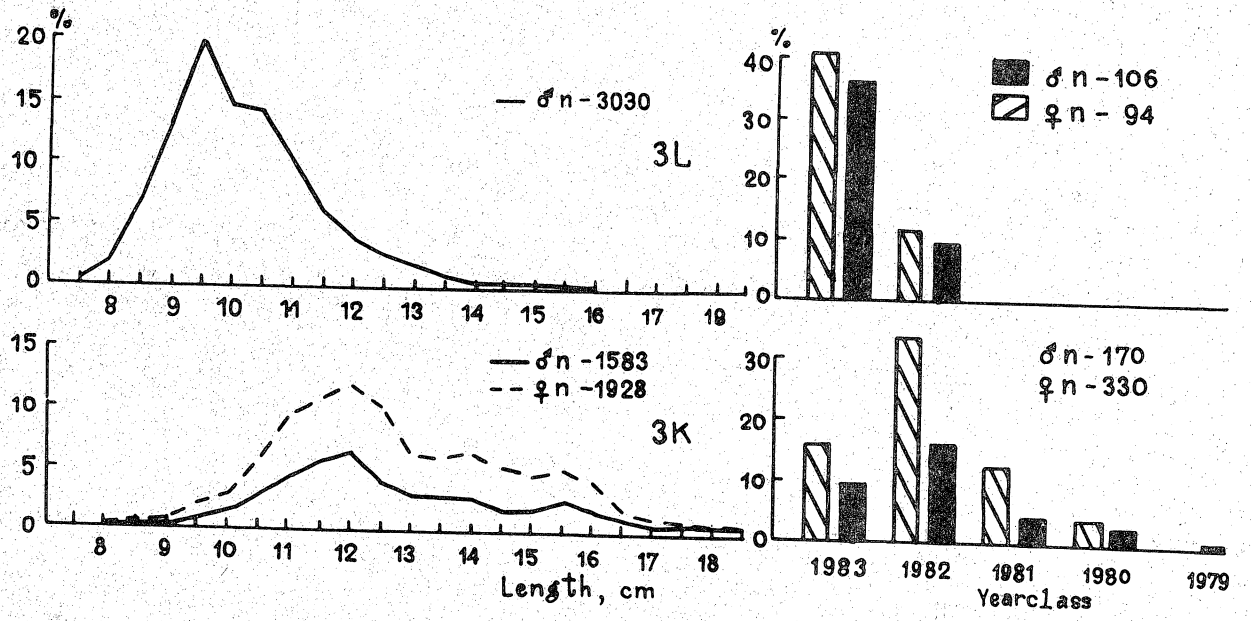

Fig. 2. Length and age composition of capelin in Divs. 3K and 3L in December 1984

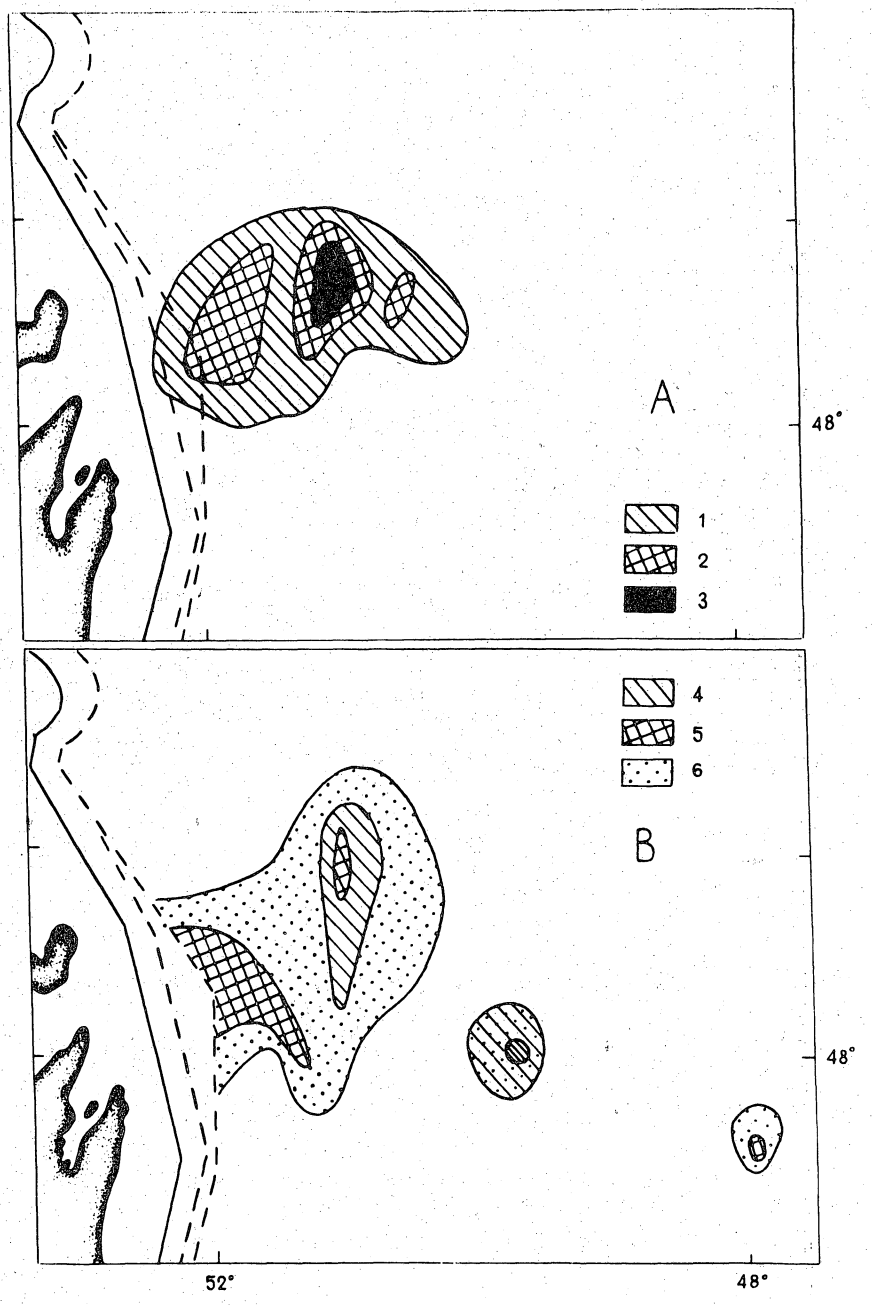

Fig. 3. Distribution of capelin at age 2 years (1+) from 1 to 4 December (A) and from 11 to 14 December (B) 1984. Density (echo integrator's units): 1-1-100; 2-101-300; 3-over 301; 4- 1-50; 5- 51-100; 6- over 101.

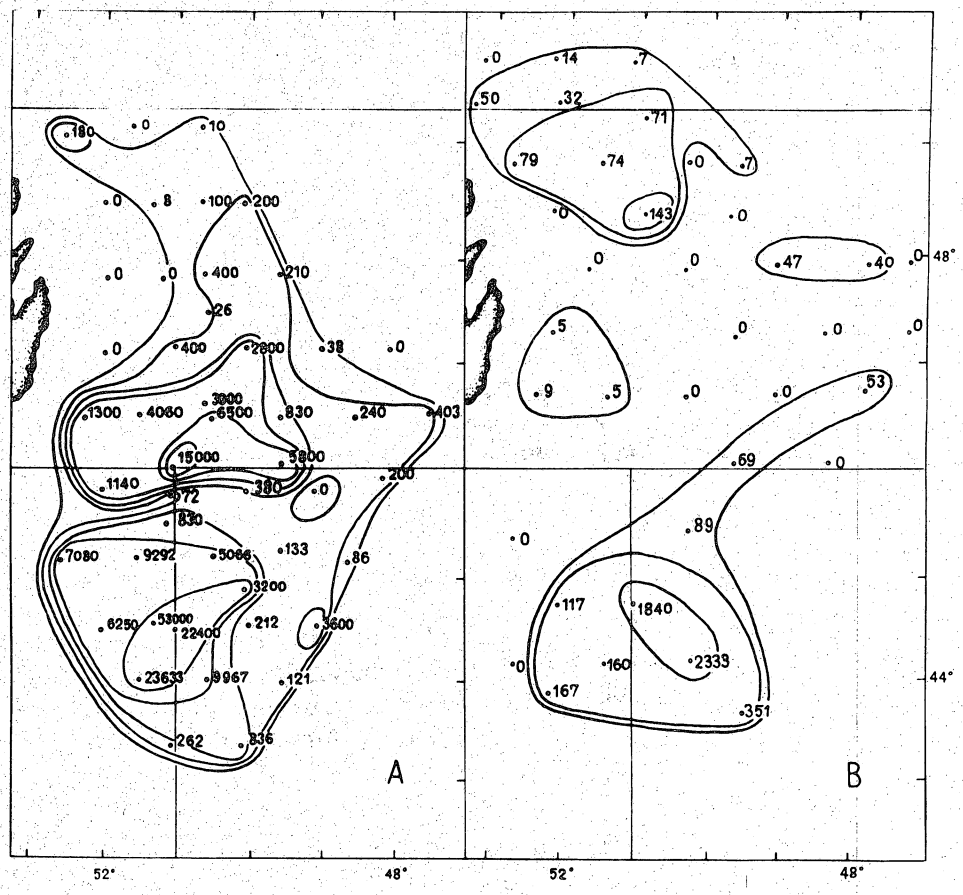

Fig. 4. Results of capelin fingerling catch (per 1 mile of haul, spec.) in November 1983 (A) and in December 1984 - January 1985.

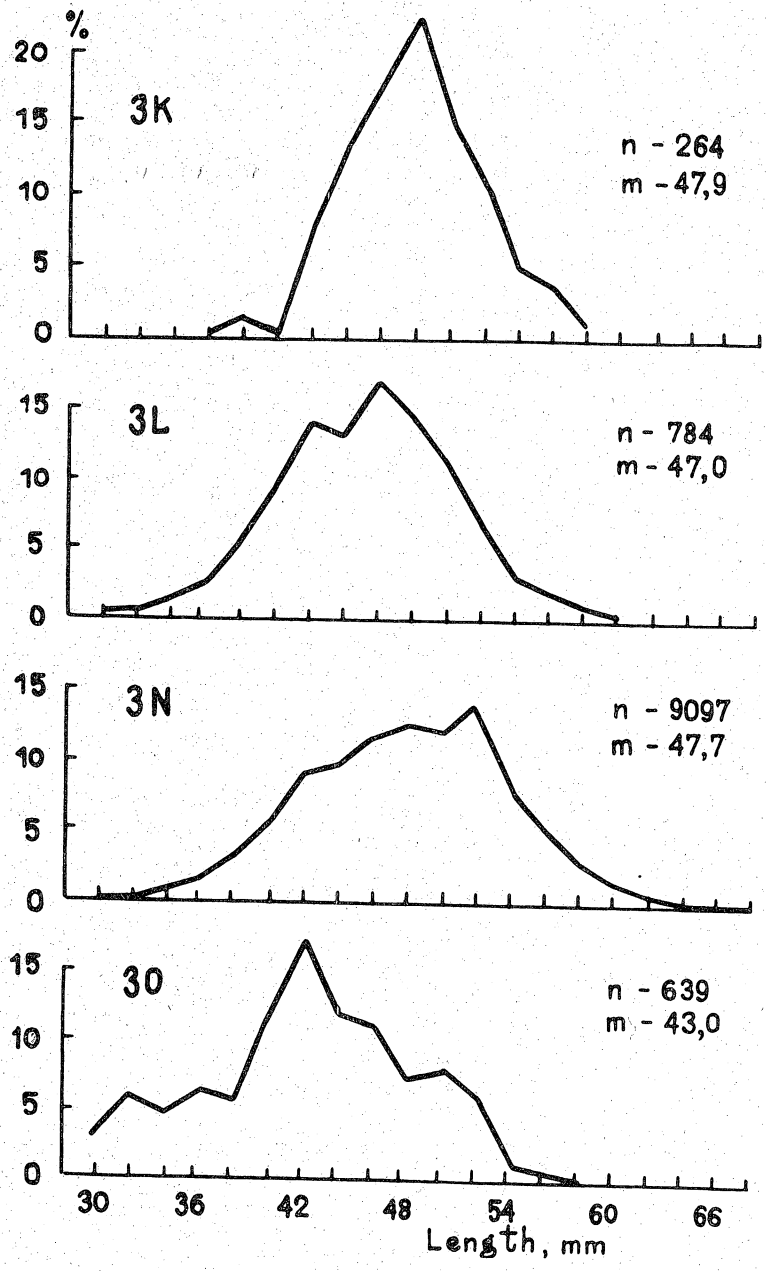

Fig. 5. Length composition of capelin fingerlings by areas.