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Capelin Acoustic Surveys in NAFO Divisions 3L and 3N0, 1983

by

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Abstract

Acoustic surveys for capelin in NAFO Divisions 3L and 3LN were carried out from the research vessel 'Gadus Atlantica' during the periods 26 April to 9 May 1983 and 16 June to 4 July 1983, respectively. Biomass estimates for Division 3L are provided from the April-May and the June-July surveys and for Division 3N from the June-July survey. Age and length distributions from capelin sampled throughout the surveys are presented.

Introduction

These surveys are part of a continuing Canadian survey program for capelin stocks in the Newfoundland area. The U.S.S.R. also conducts a similar acoustic survey for capelin in Division 3LN. The capelin stocks in the 3LN area have been subjected to very low fishing mortality rates (Division 3L) or complete fishery closure (Division 3N0) in recent years. Consequently, the use of sequential analytical models has not been appropriate and the status of these capelin stocks is determined mainly from the results of Canadian and U.S.S.R. acoustic surveys.

Materials and Methods

Data were collected in the same manner as during the 1982 surveys (Miller and Carscadden 1983) with the exception that the echo sounder used was a SIMRAD EK 400 operating at 49 Khz with a pulse length of 0.3 milliseconds. Target strength determination and acoustic data analysis were carried out in an identical manner to that for the 1982 surveys (Miller and Carscadden 1982).

Results

Figures 1 and 2 show the areas covered by the surveys for Division 3L (April-May) and Division 3LN (June-July), respectively. During the April-May survey in Division 3L, no capelin were found in Block A and no acoustic estimate is provided for that block. During the June-July survey, an electrical short in the transducer cable invalidated data collected for survey Block A and no acoustic estimate could be provided.

Figures 3 and 4 show age and length composition of capelin sampled during the surveys from each block. Total age and length compositions are weighted by the biomass estimates for each survey block. Capelin of the 1980 and 1981 yearclass were predominant in the April-May survey in Division 3L. For the June-July survey, 1982 yearclass were predominant in Division 3L while mature capelin of the 1979 and 1980 yearclass were predominant in Division 3N.

Tables 1 and 2 show a summary of the results of the acoustic surveys. Coefficients of variation due to sampling were calculated in a cluster sampling model (Nakashima 1981). The delta (δ) parameter describes the contribution of intra- or inter-transect variance to the sample variance (Nakashima 1981). If δ approaches 1.0, inter-transect variance accounts for most of the variance, if δ approaches the lower limit of delta, then intra-transect variance accounts for most of the variance.

Table 3 gives the age composition both by numbers and weight for the acoustic abundance estimates. Abundance for both Division 3L and 3N are lower than in 1982 (Miller and Carscadden 1983). In Division 3N, this is due to the fact that in 1983 the strong 1979 yearclass only made ¼ of the contribution to the biomass estimate as in 1982. Similarly in Division 3L, the 1979 yearclass contributed 28.6 thousand tons (April-May estimate) and 12.9 thousand tons (June-July) compared to 117.2 thousand tons in the 1982 estimate.

References

- Miller, D. S. and J. E. Carscadden. 1983. Capelin Acoustic Surveys, NAFO Divisions 2J3K and 3LN0, 1982. NAFO SCR Doc. 83/VI/50, 9 p.
- Nakashima, B. S. 1981. Sampling variations and survey design for capelin (*Mallotus villosus*) densities from an acoustic survey in Division 3LN0, 1980. NAFO SCR Doc. 81/II/14, 8 p.

Table 1. Summary of acoustic survey results for *Gadus Atlantica* Cruise 77 and 80.

Block	NAFO Div.	Area km ²	\bar{W} (g's)	T.S. (dB)	Biomass/m ² (grams)	Coeff. of variation		Lower limit of	Total biomass (metric tons)
Gadus 77									
B	3L	12279	12.6	-52.0	1.46	0.18	.96	-.03	17927
C	3L	12685	25.7	-49.4	0.97	0.18	.95	-.03	12304
D	3L	9960	12.8	-52.6	9.21	0.14	.96	-.03	91731
TOTAL		34924			3.49	0.11			121962
Gadus 80									
B	3L	17242	3.2	-59.2	3.51	0.18	.96	-.03	60519
C	3L	18828	1.9	-61.5	1.71	0.27	.97	-.02	32196
E	3L	12425	3.4	-59.0	5.74	0.18	.97	-.03	71319
TOTAL		48495			3.38	0.12			164034
D	3N	12833	27.3	-49.2	14.83	0.25	.94	-.03	190313

Table 2. Number of transects (t), transect length, range of mean densities \bar{X}_i and the range of intervals (ni) per transect for each survey block.

	Block	t	Length (km)	Range of \bar{X}_i	Range of ni's
Gadus 77	B	14	72.2	0.14-4.37	26-32
	C	14	72.2	0.09-2.74	28-32
	D	8	102.6	4.16-17.65	38-43
Gadus 80	B	10	95.0	0.53-5.92	24-40
	C	9	112.6	0.21-3.81	44-48
	E	7	94.6	2.39-10.62	31-32
	D	14	99.8	0.40-54.94	30-33

Table 3. Numbers and biomass at age from acoustic survey results.

	Age					
	1	2	3	4	5	6
Gadus 77 (3L)						
Numbers (millions)	66	5232	2675	1006	70	12
Biomass (1000's t)	0.1	39.7	51.1	28.6	2.1	3.5
Gadus 80 (3L0)						
Numbers (millions)	52644	1918	1466	496	18	0
Biomass (1000's t)	102.1	17.5	31.0	12.9	0.5	0
(3N)						
Numbers (millions)	0	130	3150	3278	411	5
Biomass (1000's t)	0	1.8	73.6	99.9	14.8	0.2

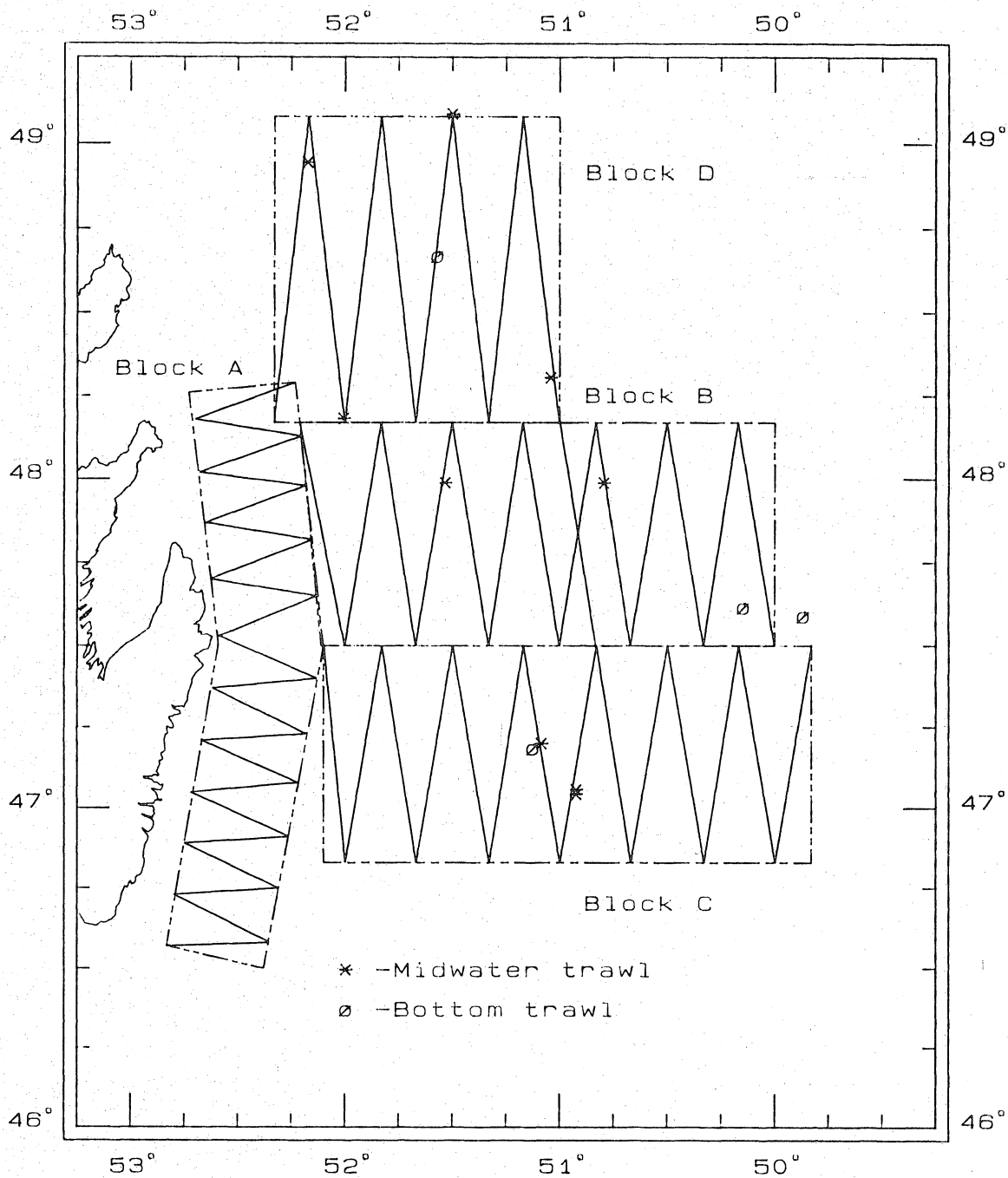


Figure 1. Survey track for Gadus Atlantica cruise #77
NAFO Division 3L April 26 - May 9, 1983

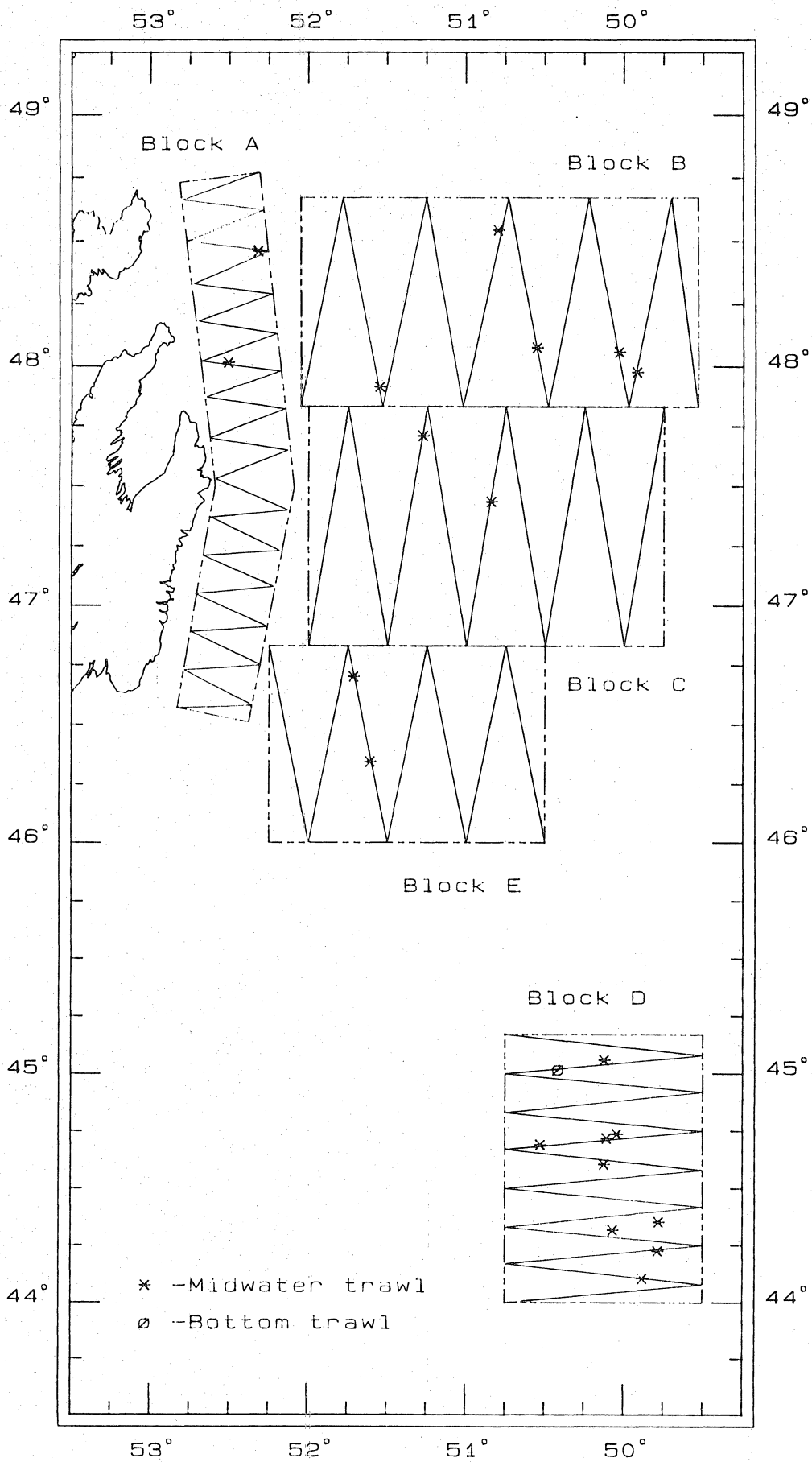


Figure 2. Survey track for Gadus Atlantica cruise 80
NAFO Division 3LN June 16 - July 4, 1983.

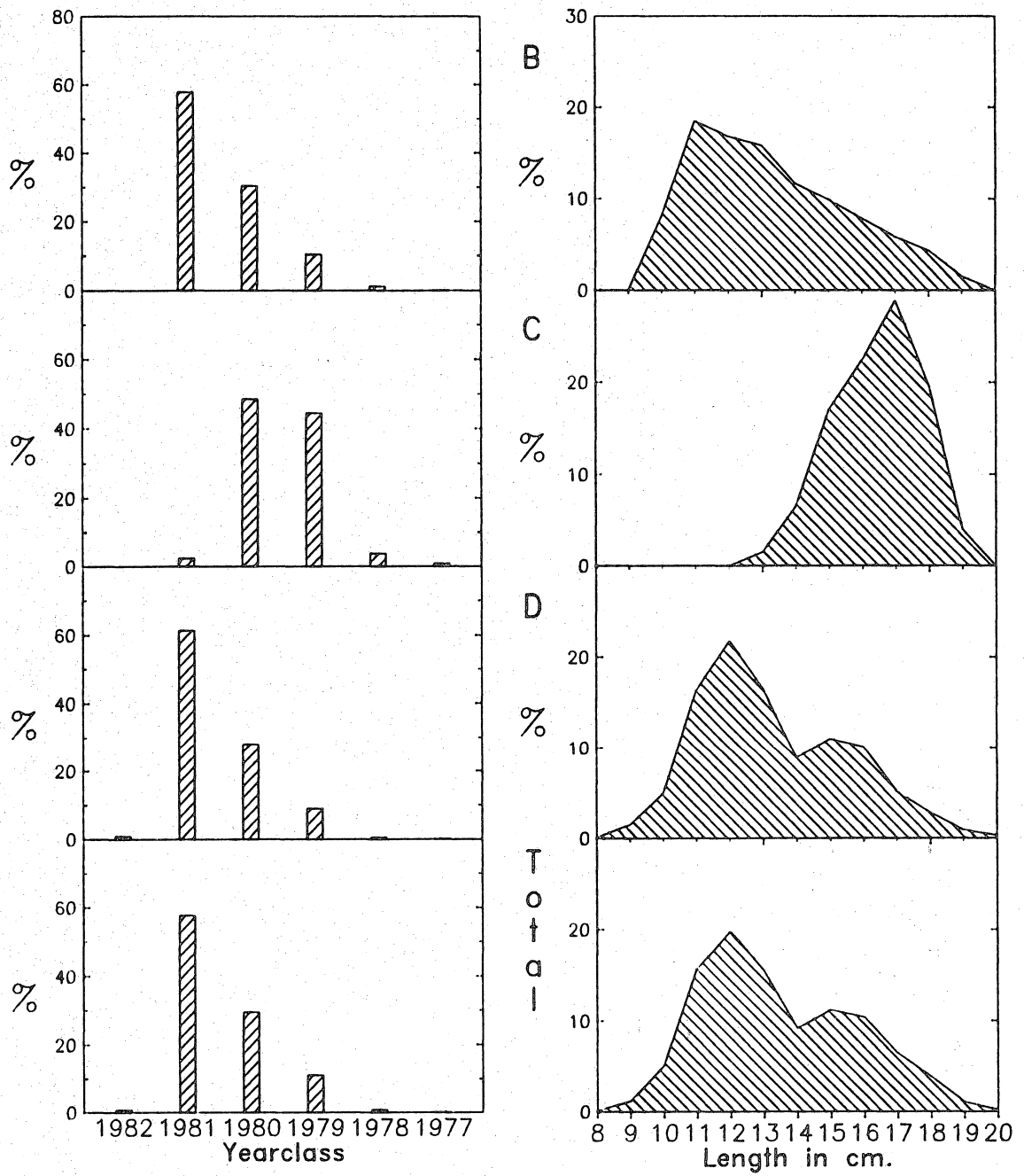
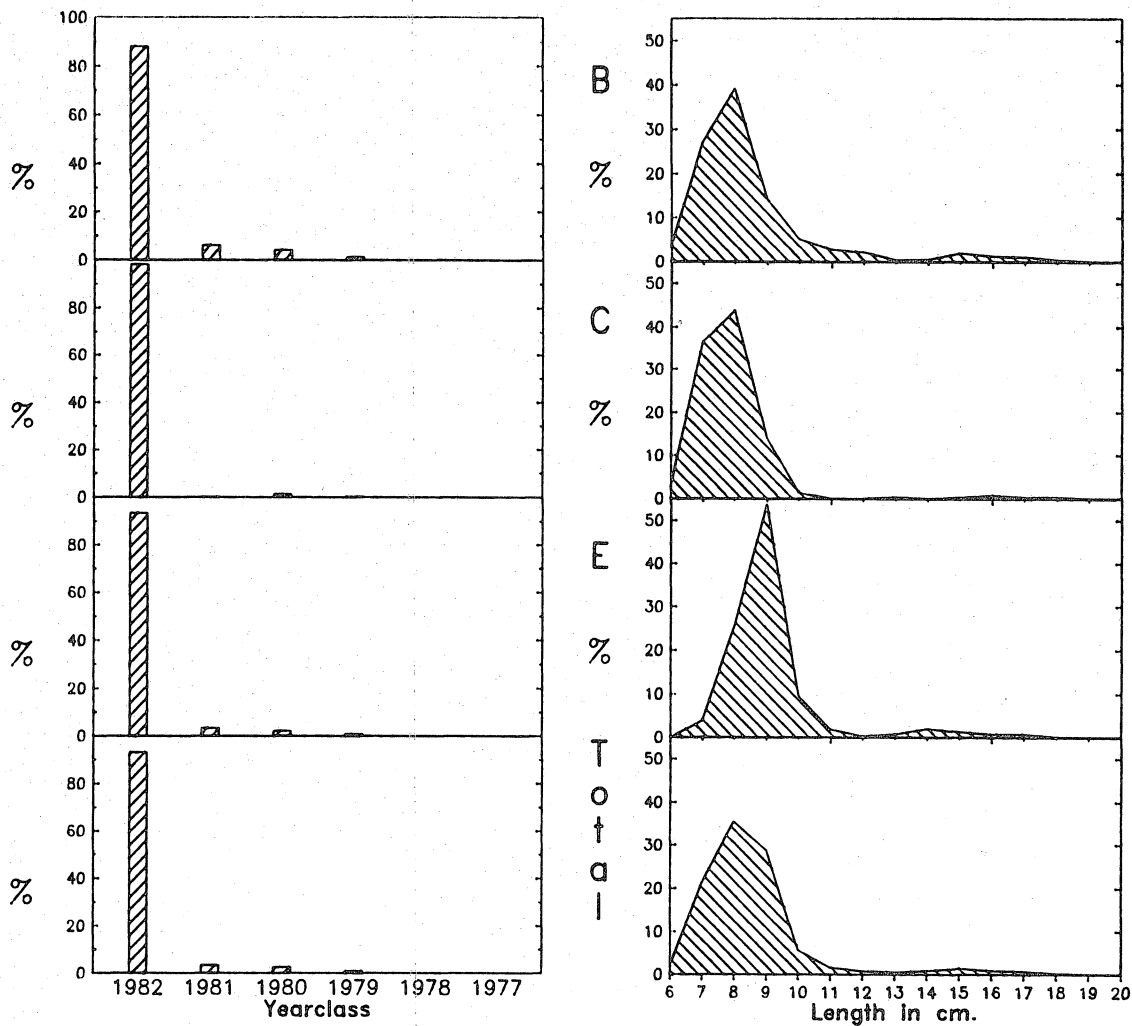


Figure 3. Age and length composition of samples from *Gadus Atlantica* cruise #77

NAFO Division 3L



NAFO Division 3N

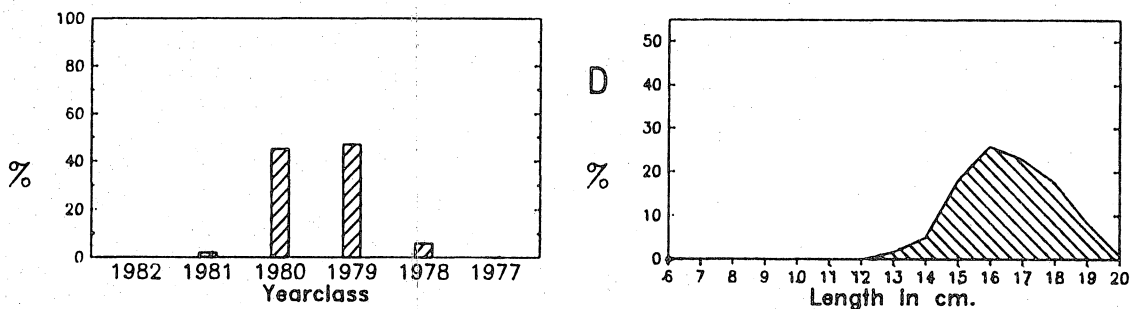


Figure 4. Age and length composition of capelin samples from *Gadus Atlantica* cruise #80

