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Results of an Acoustic Survey for Capelin  
(*Mallotus villosus*) in NAFO Division 3L in 1992

by

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This paper presents the results of an acoustic survey of the NAFO Division 3L capelin stock during the period May 6-26, 1992. Biomass was estimated at 206,347 tons.

Methods

Acoustic data were collected using the same data acquisition system manufactured by FEMTO Electronics as was used for the 1991 surveys. The data acquisition system is functionally the same as the HYDAS system used in all previous surveys prior to 1991. Calibration parameters for the system were as follows:

Combined source level/receive sensitivity	54.0 dB
Fixed receiver gain	10.88 dB
TVG gain	20 log R
Attenuation coefficient	.012 dB/m
Pulse length	0.6 msec
Bandwidth	3.3 kHz
Average beam pattern	-28.79 dB
Target strength	-34 dB/kg

The area covered by the acoustic survey is shown in Figure 1. The strata covered are the same as in 1990 with the exception of strata C and D which were extended 160 kilometers to the east. This was done because of the occurrence of capelin in trawl sets on groundfish trawl surveys in this area. Ice was not as much of a problem as for the 1991 survey and only prevented the placing of any transects north of latitude 48°53' in stratum A.

Parallel transects were selected randomly as recommended by CAPSAC Pelagic Subcommittee (O'Boyle and Atkinson 1989). Estimates of mean biomass and backscatter and their standard error were calculated the same as for the surveys beginning in 1989. As noted in previous surveys, the standard error indicates variability only from the survey sampling design and does not include any variability due to error in the target strength value used or measurement of the calibration parameters of the acoustic data acquisition system.

Fishing sets were conducted on an opportunistic basis throughout the survey with an attempt to have at least one set per transect and one set per twelve hour survey period (Figure 1). A random length/sex/maturity of 200 fish was selected from each set and a stratified age sample of 2 fish per sex per 0.5 cm length was selected to construct an age length key. A length composition and age/length key was constructed for each acoustic strata to determine age composition and total survey age composition was compiled by summing the individual strata. Mean lengths at age and percent mature at age were calculated for each strata and total survey mean lengths at age and percent mature were calculated by weighting the individual strata parameters by

the strata biomass estimates.

Results

Table 1 gives estimates of acoustic backscatter and biomass by strata and for the total survey. Total biomass was estimated at 206,347 tons. Table 2 provides estimates of backscatter and biomass by transect and shows the distribution of biological sampling. Tables 3 and 4 give age composition by numbers and weight for the historical period of acoustic surveys on this stock. Table 5 provides a summary for the survey of biological parameters by strata.

XBT's were taken after each midwater trawl fishing set and also at 18 kilometer intervals on transect 2 (Latitude 47°49') in stratum C to provide a complete profile of water temperatures in the survey area. Water temperatures were mostly below 0°C throughout the water column. Capelin occurred most often when temperatures were above 0°C.

References

O'Boyle, R. N., and D. B. Atkinson. 1989. Hydroacoustic survey methodologies for pelagic fish as recommended by CAFSAC. CAFSAC Res. Doc. 89/72. 12 p.

Table 1. Statistics for each strata and total survey.

Strata	Transects sampled	Number of possible transects	Transect area (km <sup>2</sup> )	Transect area scattering coefficient		Strata total backscatter	Biomass per transect (tons)		Total biomass (tons)
				Mean	S.E.		Mean	S.E.	
A	4	35	408.8	1154	180.6	40373	2897.5	453.7	101413
B	4	30	447.6	978	536.1	29337	2456.4	1346.7	73692
C	4	30	728.5	354	73.1	10617	889.0	183.7	26669
D	4	30	735.7	51	8.3	1538	128.8	20.9	3863
E	3	30	319.7	5	1.7	149	12.5	4.1	375
F	3	30	263.4	4	1.0	133	11.2	2.6	335
Total	22	185		444	18.7	82148	1115.4	47.0	206347
C.V.						.198			.198

Table 2. Backscatter, biomass, and biological sampling for each acoustic transect.

Strata	Transect number	Transect length (km)	Transect area (km <sup>2</sup> )	Area scattering (sr <sup>-1</sup> )	Total backscattering (m <sup>2</sup> /sr)	Density (g's/m <sup>2</sup> )	Transect biomass (tons)	# of Lsm's sets		Ages
A	1	220.7	408.8	1.67	683	4.20	1716	2	304	109
	2			3.35	1371	8.43	3445	2	400	79
	3			3.65	1493	9.17	3750	1	200	50
	4			2.61	1067	6.55	2680	2	400	82
B	1	241.7	447.6	.56	252	1.42	634	1	200	44
	2			.44	197	1.11	496	0	0	0
	3			5.58	2499	14.02	6277	1	200	52
	4			2.15	963	5.40	2419	2	400	49
C	1	393.4	728.5	.67	492	1.70	1235	2	200	38
	2			.39	282	.97	707	2	400	80
	3			.25	184	.63	462	2	200	58
	4			.63	459	1.58	1152	2	400	86
D	1	397.2	735.7	.08	58	.19	142	2	200	58
	2			.05	40	.14	99	1	200	48
	3			.10	73	.25	182	1	200	6
	4			.05	37	.13	92	1	200	11
E	1	172.6	319.7	.03	8	.06	20	0	0	0
	2			.01	4	.03	11	1	200	17
	3			.01	3	.02	6	1	200	12
F	1	142.2	263.4	.02	6	.06	16	0	0	0
	2			.01	4	.03	9	0	0	0
	3			.01	3	.03	8	0	0	0

Table 3. Numbers at age (in billions) from NAFO Division 3L acoustic surveys.

Survey date	Cruise	Age	1	2	3	4	5+	Total
May 6-26, 1992	215		5.7	19.0	6.5	0.7	<0.1	31.9
May 7-26, 1991	200		18.7	7.7	3.2	0.5	<0.1	30.1
May 9-27, 1990	181		18.9	353.2	169.0	55.6	1.9	598.6
May 11-29, 1989	166		3.4	314.8	96.2	11.0	1.4	426.8
May 14-June 1, 1988	151		13.6	380.4	65.7	9.7	16.8	486.2
May 14-June 2, 1987	137		0.3	88.1	18.3	38.9	4.0	149.6
May 14-June 1, 1986	124		0.0	59.4	158.1	21.3	1.0	239.8
May 10-28, 1985	109		0.2	369.5	80.5	3.8	2.3	456.3
April 29-May 14, 1984	93		0.1	21.0	6.2	3.1	0.5	30.8
April 29-May 9, 1983	77		<0.1	3.4	1.9	0.8	0.1	6.2
April 3-20, 1982	64		<0.1	9.7	16.2	2.4	0.9	29.2

Table 4. Biomass at age (in thousands of tons) from NAFO Division 3L acoustic surveys.

Survey date	Cruise	Age	1	2	3	4	5+	Total
May 6-26, 1992	215		2	74	111	18	1	206
May 7-26, 1991	200		7	40	56	12	1	116
May 9-27, 1990	181		6	2507	2862	1517	66	6958
May 11-29, 1989	166		2	1776	1643	358	50	3829
May 14-June 1, 1988	151		10	1953	1604	380	604	4551
May 14-June 2, 1987	137		<1	640	436	1358	142	2576
May 14-June 1, 1986	124		0	411	2653	600	33	3697
May 10-28, 1985	109		<1	1992	1253	107	74	3426
April 29-May 14, 1984	93		<1	129	121	88	15	353
April 29-May 9, 1983	77		<1	25	35	22	2	84
April 3-20, 1982	64		<1	49	327	61	29	466

Table 5. Age composition (%), mean length at age (L), and percent mature (%M) for each strata from sampling data for the Division 3L survey.

Strata	Age	1	2	3	4	5+	Total	Number of samples
A	%	0.1	66.4	29.9	3.5	0.1	123	7
	L	73	109	151	165	178		
	%M	0.0	7.0	87.3	100	100		
B	%	22.4	51.1	23.4	2.9	0.2	106	4
	L	69	97	153	167	180		
	%M	0.0	2.8	95.0	98.6	100		
C	%	2.9	90.6	6.2	0.2	0.0	108	6
	L	71	107	142	159	-		
	%M	0.0	5.5	76.9	100	-		
D	%	50.0	42.2	7.7	0.1	0.0	87	4
	L	57	112	144	153	-		
	%M	0.0	2.7	66.3	100	-		
E+F	%	98.7	1.3	0.0	0.0	0.0	63	2
	L	62	90	-	-	-		
	%M	0.0	0.0	-	-	-		
Total	%	17.8	59.4	20.3	2.3	0.1	109	23
	L	65	104	151	166	179		
	%M	0.0	5.2	89.6	99.4	100		

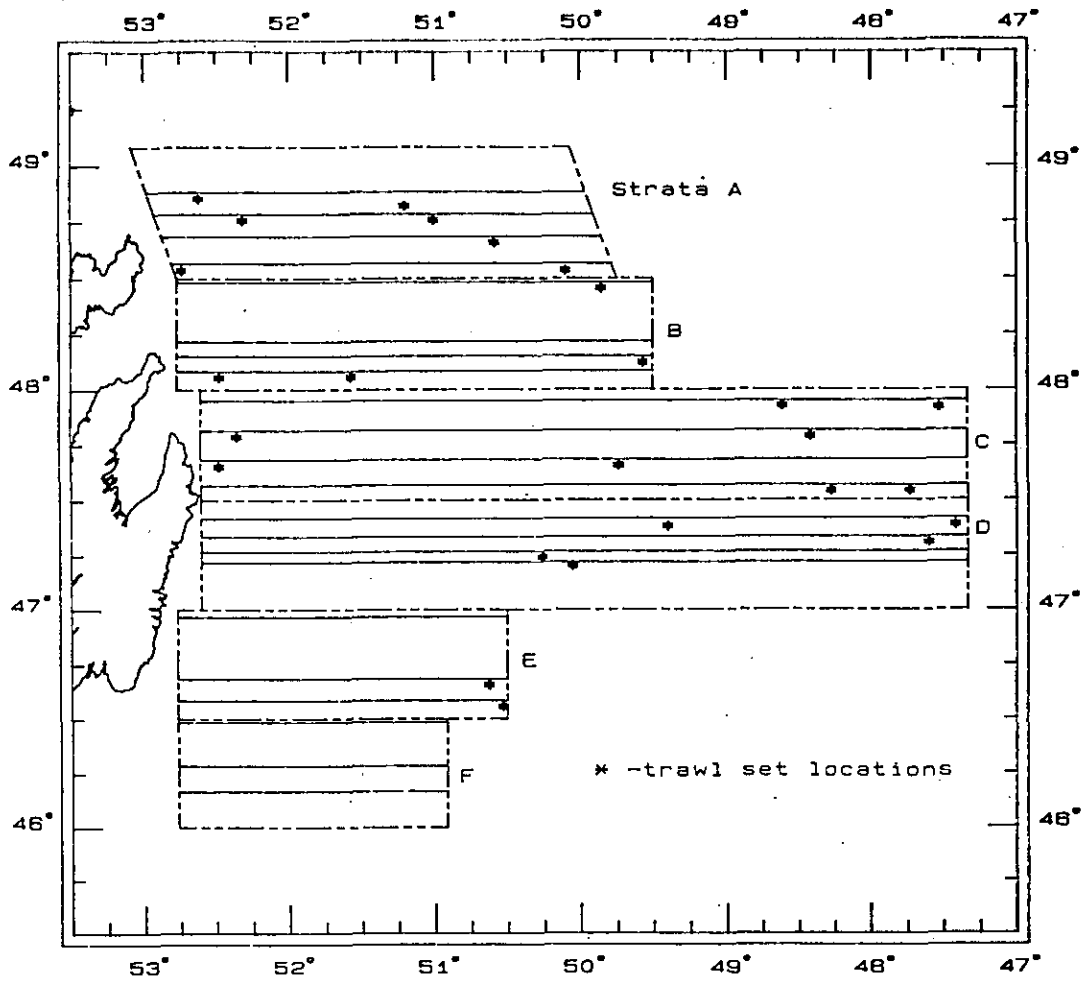


Fig. 1. Strata, transects, and fishing set locations for 1992 Div. 3L survey.