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Observations and studies on SA2 + Div. 3K capelin in 1992

by

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### Abstract

This paper documents the results of an acoustic survey for capelin in NAFO Divisions 2J3K in October, 1992. The survey is part of a series of annual acoustic surveys of this stock that began in 1981 that are used as the basis for setting the fishery TAC. There was a further decline in estimated stock biomass in 1992 to 31,870 tons.

#### Résumé

Depuis 1981, on effectue chaque année des études acoustiques du stock de capelan des divisions 2J3K de l'OPANO, qui servent à établir le TPA pour la pêche. Le présent document contient les résultats de celle qui a été réalisée en octobre 1992. Il en ressort que la biomasse estimée a de nouveau diminué, pour s'établir à 31 870 tonnes en 1992.

### Introduction

An acoustic survey of capelin in NAFO Divisions 2J3K was conducted during the period October 2-25, 1992. Capelin detected acoustically in Divisions 2J3K had an estimated biomass of 31,870 tons. This paper provides data pertaining to the distribution and age composition of the acoustic biomass estimate.

## Methodology

The survey was conducted from the research vessel *Gadus* Atlantica during the period October 2-25, 1992. The configuration of the acoustic data acquisition system was the same as that used in recent surveys of this stock. The calibration parameters of the system were as follows:

Combined source level/receive sensitivity	54.55 dB
Fixed receiver gain	10.55 dB
TVG gain	20 log R
Attenuation coefficient	.012 dB/m
Pulse length	600 $\mu$ secs
Bandwidth	3.3 kHz
Average beam pattern	-28.79 dB
Target strength	-34 dB/kg

In the 1989, 1990 and 1991 surveys of this stock, the survey design used was random parallel transects with a minimum allowable spacing of 1 nautical mile as recommended by the CAFSAC Pelagic Subcommittee (O'Boyle and Atkinson, 1989). In 1992, the decision was made to switch back to a uniform parallel transect design as was used prior to 1989. This change was made because of the expected low stock abundance and a desire to space out the sampling effort to have the greatest probability of covering any capelin concentrations. This change in survey design precludes obtaining an estimate of survey sampling variance but still provides an unbiased estimate of the mean. Figure 1 shows strata outlines and transect locations and fishing set locations. Figure 2 shows contoured capelin density from estimates of acoustic density that were calculated for each 3.1 kilometer segment of survey track. Estimates of transect mean biomass and backscatter were calculated the same as for the 1989, 1990 and 1991 surveys.

Fishing sets were made on an opportunistic basis throughout the survey. It was attempted to have at least one set for each twelve hour watch and at least one set for each transect. For those midwater trawl sets that contained capelin, a random sample of 200 capelin was obtained for length, sex, and maturity observations and'a stratified age sample was selected from each length/sex/maturity sample. Length composition and an age/length key was constructed for each stratum from the samples obtained in that stratum.

## Results and Conclusions

Table 1 gives estimates of capelin acoustic backscatter and biomass for each stratum and for the total survey. The six northernmost strata (D-I) in Division 2J were surveyed during the first part of the survey (Oct 2-17). Total acoustic backscatter was very low in these strata, but fishing sets were made. Capelin catches were less than 0.1% of the total, the catches being comprised mainly of a variety of other fish species and invertebrates, the major components being jellyfish, euphausiids, amphipods and arctic cod. A few scattered concentrations of capelin were found in Division 3K in stratum C and one large school of capelin was found in stratum B. Capelin found in these strata comprised the total biomass estimate of 31,870 tons for Table 2. provides estimates of capelin backscatter the stock. and biomass for each acoustic transect and shows the distibution of the biological sampling amongst the acoustic transects. Tables 3 and 4 give the total age composition by numbers and biomass for the historical period of Canadian acoustic biomass estimates, Figure 3 shows the historical series of acoustic biomass estimates. Table 5. provides for each stratum, the percent at age by number, the mean length at age, total numbers and mean length and the number of samples used. The 1989 and 1990 yearclasses were predominant in the biomass estimate.

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.

Strata	Transects sampled	Number of possible transects	Transect area (km²)	Transect area scattering coefficient	Strata total backscatter (m²/sr) (sr¹)	Biomass per transect (tons)	Total biomass (tons)
				Mean		Mean	
I	5.	25.	237.0	0.	0.	0.0	0.
H	5.	25.	319.7	0.	0.	0.0	0.
G	5.	25.	343.0	0.	0.	0.0	0.
F	3.	25.	309.7	0.	0.	0.0	0.
E	3.	30.	189.7	0.	0.	0.0	0.
D	3.	45.	432.5	0.	0.	0.0	0.
С	4.	30.	534.4	28.	846.	70.8	2124.
В	4.	90.	574.8	132.	11842.	330.5	29746.
Total	32.	295.		43.	12688.	108.0	31870.

Table 1. Statistics for each stratum and total survey

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

Strata	Transect Number	Transect length	Transect area	Area scattering	Total backscattering	Density	Transect biomass	# of sets	Lsms	Ages
		(k	.m) (I	km²)	(sr <sup>-1</sup> )	(m²/sr)	(g/m²)	(to	ns)	
I	1	128.0	237.0	.00	0.	.00	0.	1	0	0
	2	128.0	237.0	.00	0.	.00	0.	1	0	0
	3	128.0	237.0	.00	0.	.00	0.	1	0	0
	4	128.0	237.0	.00	0.	.00	0.	1	0	0
	5	128.0	237.0	.00	0.	.00	0.	1	0	0
Н	1	172.6	319.7	.00	0.	.00	0.	1	0	0
	2	172.6	319.7	.00	0.	.00	0.	1	0	0
	3	172.6	319.7	.00	0.	.00	0.	1	0	0
	4	172.6	319.7	.00	0.	.00	0.	1	0	0
	5	172.6	319.7	.00	0.	.00	0.	0	0	0
G	1	185.2	343.0	.00	0.	.00	0.	1	0	0
	2	185.2	343.0	.00	0.	.00	0.	1	0	0
	3	185.2	343.0	.00	0.	.00	0.	0	0	0
	4	185.2	343.0	.00	0.	.00	0.	0	0	0
	5	185.2	343.0	.00	0.	.00	0.	1	0	0
F	1	167.2	309.7	.00	0.	.00	0.	1	0	0
	2	167.2	309.7	.00	0.	.00	0.	0	0	0
	3	167.2	309.7	.00	0.	.00	0.	1	0	0
E	1	102.4	189.7	.00	0.	.00	0.	1	0	0
	2	102.4	189.7	.00	0.	.00	0.	0	0	0
	3	102.4	189.7	.00	0.	.00	0.	0	0	0
D	1	233.5	432.5	.00	0.	.00	0.	2	0	0
	2	233.5	432.5	.00	0.	.00	0.	1	0	0
	3	233.5	432.5	.00	0.	.00	0.	0	0	0
С	1	288.6	534.4	.00	0.	.00	0.	2	0	0
	2	288.6	534.4	.07	38.	.18	96.	2	200	32
	3	288.6	534.4	.24	13.	.06	32.	0	0	0
	4	288.6	534.4	.12	62.	.29	155.	0	0	0
В	1	310.4	574.8	.06	34.	. 15	86.	1	0	0
	2	310.4	574.8	.09	53.	.23	132.	1	200	35
	3	310.4	574.8	.11	62.	.27	155.	2	200	37
	4	310.4	574.8	.66	378.	1.65	948.	3	800	139

Year	Cruise	Date/Age	1	2	3	4	5+	Total
1992	223	Oct 2-25	0.1	1.9	0.2	<0.1	0.0	2.3
1991	207	Oct 4-28	4.7	2.5	0.4	0.1	<0.1	7.7
1990	189	Oct 6-28	1.4	2.6	1.6	0.6	<0.1	6.2
1989	173	Oct 13-29	1.9	59.0	35.3	2.5	0.5	99.2
1988	158	Oct 7-24	15.8	96.0	13.6	2.0	3.9	131.3
1987	144	Oct 10-25	0.7	4.4	0.5	0.6	0.1	6.3
1986	130	Oct 18-29	0.1	6.6	12.1	1.1	0.2	20.1
1985	115	Sept 26-Oct 1	9 1.5	54.0	13.5	1.5	0.6	71.1
1984	100	Sept 29-0ct 2	2 6.2	34.7	7.1	4.1	0.4	52.5
1983	85	Oct 2-24	2.6	2.5	1.3	0.2	0.0	6.6
1981	56	Oct 1-19	67.8	59.3	7.4	2.8	0.7	138.0

Table 3. Numbers (billions) at age of capelin from NAFO Division 2J3K hydroacoustic surveys.

Table 4. Biomass (thousands of tons) at age of capelin from NAFO Division 2J3K hydroacoustic surveys.

Year	Cruise	Date/Age	1	2	3	4	5+	Total
1992	223	Oct 2-25	0.5	28.6	4.3	0.6	0.0	34.0
1991	207	Oct-4-28	10.7	32.6	8.8	2.1	0.4	54.6
1990	189	Oct 6-28	1.8	43.8	36.2	14.1	0.5	96.4
1989	173	Oct 13-29	15.4	850.1	791.2	68.9	18.5	1744.1
1988	158	Oct 7-24	76.2	1208.7	336.9	55.1	127.0	1803.9
1987	144	Oct 10-25	3.9	77.8	12.0	15.1	3.0	111.8
1986	130	Oct 18-29	0.7	109.9	284.1	30.2	6.0	430.9
1985	115	Sept 26-Oct19	8.4	686.6	286.3	36.7	17.8	1035.4
1984	100	Sep 29-0ct 22	25.5	497.9	181.9	109.8	11.3	826.4
1983	85	Oct 2-24	17.6	41.1	31.2	4.3	0.0	94.2
1981	56	Oct 1-19	337.8	891.2	172.4	71.9	20.8	1494.1

Stratum	Age	1	2	3	4	5+	Total N/L	Number of samples
C	% L	0.0	73.6 156	26.4 158	0.0	0.0	0.1 156	1
В	% L	3.2 123	86.5 143	8.6 154	1.7 154	0.0	2.1 144	6

Table 5. Age composition and mean length at age ,total number in billions, total mean length, and number of samples by survey stratum.



Figure 1. Survey track and trawl sets for 1992 2J3K capelin survey



Figure 2. Contoured capelin distribution - 2J3K survey 1992

