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A Biomass Estimate from a Hydroacoustic Survey for Capelin (Mallotus villosus) in NAFO Division 3N and Observations on the Soviet Fishery for Capelin in Divisions 3NO

by

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Introduction

This paper presents the results of an acoustic survey conducted on the capelin stock in Division 3N during the period June 24 to July 3, 1989. Capelin biomass was estimated at 28,852 tons. A small directed fishery for mature capelin was conducted by the U.S.S.R. in Divisions 3NO in 1989 and catch rates and sampling data are presented for this fishery.

Acoustic survey methodology

All acoustic data were collected using the hydroacoustic data acquisition system (HYDAS) described by Stevens (1986). The area to be surveyed was covered by one survey block (Figure 1) and 18 parallel transects were randomly selected within this block as per the recommendations of CAFSAC Pelagic Subcommittee, Atkinson and O'Boyle (1989). Estimates of mean biomass and associated sampling variance were calculated in the same manner as for the 1988 survey, Miller and Carscadden (1989).

Midwater trawl fishing sets were conducted on an opportunistic basis throughout the survey with the aim of having at least one set for each acoustic transect. A random sample of 200 capelin was obtained from each midwater trawl set for length, sex, and maturity determination and a stratified age sample was subsampled from each random sample of 200 fish to provide an age/length key.

Acoustic survey results

Table 1 provides a summary of the acoustic survey results for the 3NO survey. Total biomass was estimated at 28,852 tons with a standard deviation of 22,800 metric tons. Table 2. provides estimates of biomass and numbers broken down by age class over the historical series of acoustic surveys for this stock. Table 3. gives the age composition, mean length at age, and percent mature at age from samples taken during the survey.

Although the 1989 estimate is the lowest on record over the series of acoustic surveys for this stock, it may not reflect the true stock abundance. Some commercial fishing outside the zone had already finished prior to the survey suggesting that spawning may have occurred earlier than usual in 1989. Consequently, the timing of the survey may have been too late to cover the peak spawning concentration of capelin.

U.S.S.R. commercial fishery

During 1988 and 1989, licenses were issued to Soviet trawlers to fish for capelin in the Canadian zone in Divisions 3NO. Canadian observers collected samples and catch rate information (Foreign cooperative research, D. Kulka, pers. comm.). Observers reported a directed capelin catch of 3390 tons in Division 3O and 1 ton in Division 3N during May, 1989. Catch rates from observer data for this fishery are as follows:

Year	Tons/hour	Tons/day
1988	2.8	33.0
1989	3.5	36.5

The age composition and proportion of mature capelin in the commercial catch are as follows:

Year	Age	1	2	3	4	5	6
1988	% at age	0.2	11.4	69.1	8.2	10.2	0.9
	% mature	4.4	84.8	98.5	99.9	99.7	99.7
1989	% at age	0.0	1.1	77.0	19.2	1.3	0.6
	% mature	0.0	93.2	97.3	100.0	100.0	100.0

References

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

Miller, D. S., and J. E. Carscadden. 1989. Biomass estimates from two hydroacoustic surveys for capelin (Mallotus villosus) in NAFO Divisions 3L and 3N and observations of the Soviet fishery for capelin in Divisions 3NO. NAFO SCR Doc. 89/52.

Stevens, C. R. 1986. A hydroacoustic data acquisition system (HYDAS) for the collection of acoustic data from fish stocks. Can. Tech. Rept. Fish. Aquat. Sci. No. 1520.

Table 1. Acoustic results for the 1989 NAFO Divisions 3NO survey.

		Unit Statistics				
Strata	Biomass	Sampled	Total	Area	Biomass	Std. Deviation
E	28852	18	75	292.9	384.7	304
Total	28852					22800

Transect No.	1	2	3	4	5	6	7	8	9
Density (g/m)	1.5	0.8	2.1	2.1	3.9	2.3	0.2	0.9	0.9
Transect No.	10	11	12	13	14	15	16	17	18
Density (g/m)	2.8	0.8	2.0	0.3	1.0	1.2	0.1	0.5	0.2

Table 2. Numbers (billions) and biomass (thousands of tons) at age of capelin from NAFO Division 3NO hydroacoustic surveys.

Year	Cruise	Age	1	2	3	4	5+	Total
1989	169	Numbers	<0.1	<0.1	1.1	0.1	<0.1	1.4
		Biomass	<1	<1	24	4	<1	28
1988	153	Numbers	2.6	11.9	11.2	1.6	2.2	29.5
		Biomass	12	166	250	56	76	560
1987	139	Numbers	2.1	0.7	2.4	4.5	0.4	10.1
		Biomass	3	12	63	139	13	230
1986	126	Numbers	1.1	0.6	15.0	5.9	0.2	22.8
		Biomass	2	9	319	160	5	495
1985	111	Numbers	0.2	5.9	6.5	0.5	0.1	13.2
		Biomass	<1	59	135	16	2	212
1984	96	Numbers	1.6	0.3	2.2	0.8	0.2	5.1
		Biomass	3	4	48	27	6	88
1983	80	Numbers	0	0.2	3.6	3.8	0.5	8.1
		Biomass	0	2	85	115	17	219
1982	66	Numbers	0	0.1	16.8	0.6	0.1	17.6
		Biomass	0	1	396	17	5	419
1981	52	Numbers	<0.1	0.6	7.8	1.8	0.4	10.6
			<1	3	158	49	13	223

Table 3. Age composition, mean length at age, and percent mature from sampling data for the Division 3N survey.

Strata	Age	1	2	3	4	5+	Total	Number of samples
E	%	4.7	4.9	79.7	10.2	0.6		13
	L	99	144	160	171	193	157	
	%M	0.0	98.0	99.7	99.9	100.0	100.0	

Table 4. Calibration parameters for Gadus Atlantica Cruise 169.

Parameter	Value
Source level	125.1 dB
Receive sensitivity	-73.0 dB
Fixed gain	5.7 dB
Beam pattern	-29.4 dB
Target strength	-34 dB/kg
Pulse length	0.6 milliseconds
Attenuation	.0120 dB/meter

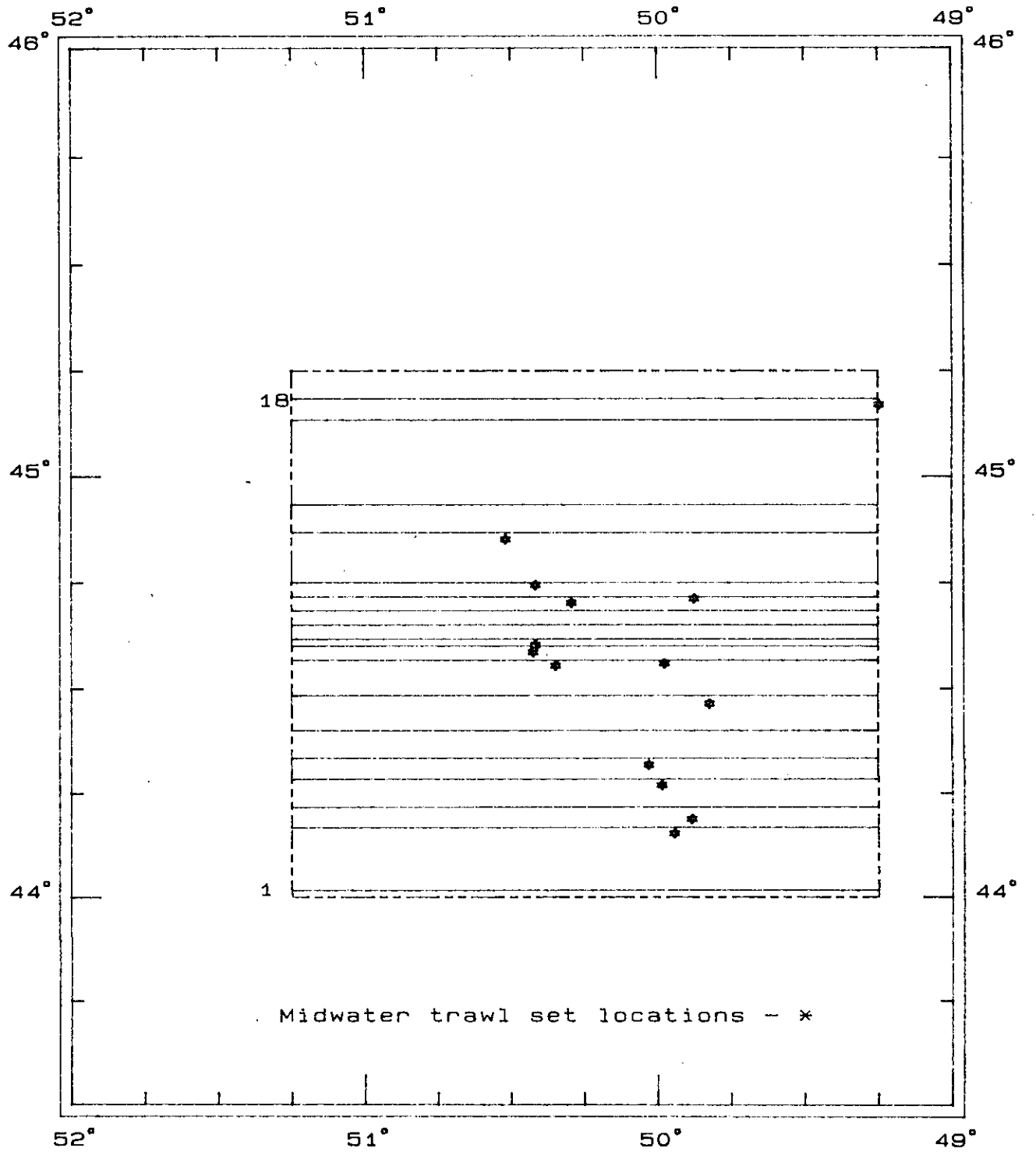

Figure 1. Div. 3NO capelin survey - transect and set locations