Northwest Atlantic   Fisheries Organization

SCIENTIFIC COUNCIL MEETING - JUNE 1983

Results of Instrumental Assessment of Capelin Abundance

in Divisions 2J and 3K in October 1982

by

V. S. Bakanev

Polar Research Institute of Marine Fisheries and Oceanography (PINRO)
6 Knipovich Street, Murmansk, USSR

Abstract

The results of instrumental assessment of capelin abun-
dance and biomass in Divisions 2J and 3K, carried out by the
RV "Suloy" (MB-2645) from 14 to 25 October 1982 have been
presented in the paper. The results are indicative of the in-
tensive renewal of stock abundance at the cost of entry of
highly abundant 1979 and 1980 year classes, one after anot-
her, into the stock.

In October 1982 the capelin abundance over Division 2J
investigated, constituted over 36·4 milliards of specimens,
the biomass was about 611 thou. tons.

Introduction

The intensive Newfoundland capelin fishery in mid-seven-
ties coincided with the appearance (after 1973) of a set of
poor and the poorest year classes of that fish. That resulted
in reduction of the stock abundance and biomass by 1980.
In 1980 during the hydroacoustic survey of capelin in Divi-
sions 3LNO an unusual great quantity of the 1979 year class
young capelin was registered (Bakanev, 1981).

Next year, during a similar survey that year class at age
of 2 constituted the bulk of the capelin stock in Division
3LO and the prediction concerning the successful recruitment
by that year class came absolutely true (Bakanev and Ermol-
chev, 1982; Miller, Nakashima and Carscadden, 1982). In ad-

dition   the investigations conducted in 1981, showed that
the 1980 year class at age of 1 was also highly abundant.
The rational exploitation of capelin in fishery is assumed
to reveal the capelin abundance dynamics at all stages of
life cycle. That survey was the continuation of the annual
Soviet acoustic surveys on capelin stock abundance assess-
ment in Divisions 2J and 3K.

Methods

An instrumental assessment of capelin abundance and bio-
mass in Divisions 3K (Notre Dame) and 2J (South Labrador) was
carried out from 14 to 25 October 1982 aboard the RV "Suloy"
(MB-2645). The area from $50^{\circ}00'N$ to $55^{\circ}00'N$ between $53^{\circ}20'W$
and $56^{\circ}00'W$ was covered with investigations.

This year the methods of the instrumental survey were al-
most similar to those applied in that area earlier aboard the
Soviet research vessels and were described in detail by some
authors (Serebrov, Bakanev, Kovalev, 1975; Bakanev, Seliver-
stov, Serebrov, 1976). In particular, the obtaining of the
final result on capelin abundance and biomass was based on
measurements of the following main parameters:

a) specific volume of the shoals per 1 square mile of the
area;

b) mean absolute density of the shoals in the day-time
and at night;

c) estimation of the total square, occupied by concentra-
tions of different specific abundance.

The data on the capelin shoals density were obtained by
the underwater photography method by means of automatic ca-
mera "Triton". The camera directed down by lens at an about
45° angle was lowered just into the shoals of capelin during
free vessel's drift. In order to direct the camera ahead along
the vessel's course, a stabilizer was installed on the back

side of the camera case. The best pictures of capelin shoals were obtained during the drift with a speed of 1-1°5 miles per hour.

An echo sounder survey was conducted by means of hydro-acoustic apparatus "Kalmar". The tacks in the survey were plotted in the latitudinal direction in 20 miles of Canadian coastal line. The distance between the tacks varied depend-ing upon the concentrations density: it constituted about 5 miles - on denser concentrations, but - 10-15 miles - on the scattered concentrations or in the case of their lack.

18 control trawlings with midwater trawl of small-meshed insertion were simultaneously carried out.

Results

In the period of the acoustic survey the main capelin concentrations were registered in Division 2J (Fig.1). An insignificant quantity of capelin with the young Polar cod was observed in Division 3K. In the area at $51°20'N$ $54°51'W$, 0°5 t. was caught per 1 hour trawling, capelin constituted only 10°7% of the total quantity. In Division 2J the densest concentrations distributed along the southern slope of the Hamilton Bank near the buffer zone. In the day-time the cape-lin schools were registered at a 100-170 m depth, at night those concentrations lifted to a 20-50 m depth.

Size composition of capelin in the catches taken during control trawlings did not remain to be constant. Mean length of the fish analysed from the catches fluctuated from 13°4 to 15°0 cm, and mean mass of one specimen - from 13°3 to 21°6 g. This is related to the fact that in some catches the speci-mens of the 1980 year class prevailed, in the other ones the specimens of the 1979 year class dominated. Summarized data on size-age compositions of capelin are given in Tables 1 and 2.

The comparison of data (obtained by means of underwater photography in 1982) on mean absolute density of capelin

shoals with the data for 1974-1977 showed that no essential differencies were observed (Table 3).

Total abundance of capelin in Division 2J over the area observed constituted over 36·4 milliards of specimens, and biomass - about 611 thou.t. (Table 4). The comparison between these data and the long-term means is conclusively indicative of the fact that at present an intensive renewal of capelin stock takes place and their stocks are approximately at the level of 1976-1977 (Table 5).

As in previous years the lack of the data on the fish inhabited in a coastal 2o-mile zone was the main fault in the investigations undertaken. The data on instrumental survey did not also take into account dispersedly distributed capelin, not forming the schools. Similar fish occurred both in the area investigated, particularly at night, and beyond its limits. A bottom trawling in the North Labrador area (58°24'N 60°04'W) can serve as a confirmation of this, where the capelin catch taken at a 270 m depth constituted about 0·3 t., and there were no registered the echo recordings typical for capelin concentrations. In this area an active feeding of Greenland halibut on capelin was observed.

Relative to this, the abundance and biomass of capelin, obtained by instrumental method, can be assumed as minimum stock size.

References

Bakanev, V.S., A.S.Seliverstov and L.I. Serebrov. 1976. Preliminary instrument estimate of abundance and biomass of capelin off North Labrador and the North Newfoundland Bank (Div. 2J, 3K). ICNAF Res. Doc., No.54, Serial No.3840, 16 p.

Bakanev, V.S. 1981. Results of Soviet Investigations on Capelin in Northwest Atlantic in 1980. NAFO SCR Doc., No.10, Serial No.N274, 10 p.

Bakanev, V.S., Ermolchev, V.A. 1982. Hydroacoustic Assess-
ment of Capelin Abundance in NAFO Divisions 3LNO in
May-June 1981. NAFO SCR Doc., No.61, Serial No.N554,
10 p.

Miller, D.S., Nakashima, B.S. and I.E. Carscadden. 1982.
Capelin Acoustic Surveys in NAFO Divisions 2J+3K,
3LNO and 3L, 1981-82. NAFO SCR Doc., No.54, Serial
No.N547, 12 p.

Serebrov, L.I., Bakanev, V.S., Kovalev, S.M. 1975. The sta-
te of Newfoundland Capelin stock. ICNAF Res. Doc., No.7,
Serial No.3435.

Table 1 Length composition of capelin in October in
Divisions 2J and 3K and in December 1982 in
Division 2G, %

Length, cm	Division					
	Notre Dame /3K/		South Labrador/2J/		North Labrador/2G/	
	males	females	males	females	males	females
9,5		0,2	+		+	
I0,0		0,5	+	0,I		
I0,5	0,2	0,7	0,I	0,3		
II,0	I,2	I,9	0,3	0,4		
II,5	I,2	2,I	0,9	I,0		
I2,0	I,4	2,6	I,3	2,3		
I2,5	I,2	4,6	2,6	4,7		
I3,0	2,I	5,9	5,9	I0,2		0,2
I3,5	2,6	4,2	7,I	9,7		0,2
I4,0	I,4	4,6	5,9	8,0	0,5	
I4,5	I,9	5,4	4,2	5,2	I,8	2,6
I5,0	I,7	8,I	3,6	4,6	8,3	8,6
I5,5	I,7	I0,4	2,7	3,6	II,9	8,3
I6,0	0,9	I3,2	2,7	3,0	I4,6	I0,0
I6,5	0,2	I0,6	2,5	I,7	II,8	4,7
I7,0		5,2	2,2	I,0	7,8	3,4
I7,5		2,I	0,9	0,5	2,I	0,8
I8,0			0,4	0,2	2,I	0,3
I8,5			0,I	0,I		
I9.0			+	+		
Total	I7,7	82,3	43,4	56,6	60,9	39,I
No. of spec.	75	348	3333	4345	234	I50

Table 2 Age composition of capelin in October 1982
in Division 2J, %

| Sex | \multicolumn{6}{c}{A g e} | No. of spec. |
	1	2	3	4	5	6	
Males	0,4	20,4	20,2	0,6	–	–	206
Females	0,2	28,1	28,3	1,8	–	–	289

Table 3 Mean absolute density of capelin shoals due to underwater
photosurveys, spec./m^3

| Time of day | \multicolumn{5}{c}{Y e a r} | Mean |
	1974	1975	1976	1977	1982	
D a y	0,810	1,188	1,320	2,210	1,190	1,344
Night	0,480	0,873	0,380	0,820	0,660	0,643

Table 4 Abundance and biomass of capelin in Division 2J
in October 1982

Density range, spec./sq.mile $\cdot 10^6$	Mean abundance, spec·sq mile·10^6	Square of concent- rations, sq.miles	Total abundance, spec.·10^6	Mean mass, 1 spec./g	Total biomass, thou.t.
<10	1,2 1,3 2,1 7,0	262 175 500 9	314,4 227,5 1050,0 63,0	16,7	5,3 3,8 17,5 1,1
Total		964	1654,9		27,7
10,1– 25,0	13,0 17,5 17,7 18,0 23,0	56 37 18 46 19	728,0 647,5 318,6 828,0 437,0	16,7	12,2 10,8 5,3 13,8 7,3
Total		176	2959,1		49,4
25,1– 50,0	28,8 29,7 33,8 49,9	212 150 50 9	6105,6 4455,0 1690,0 449,1	16,7	102,0 74,4 28,2 7,5
Total		421	12699,1		212,1
50,1– 100,0	54,6 66,2	44 37	2404,6 2301,4	16,7	40,2 40,9
Total		81	4706,0		81,1
>100,1	110,0	131	14410,0	16,7	240,6
In total		1755	36428,2		610,9

Table 5 Assessment of capelin stocks in Divisions 2J3K for
1974-1982

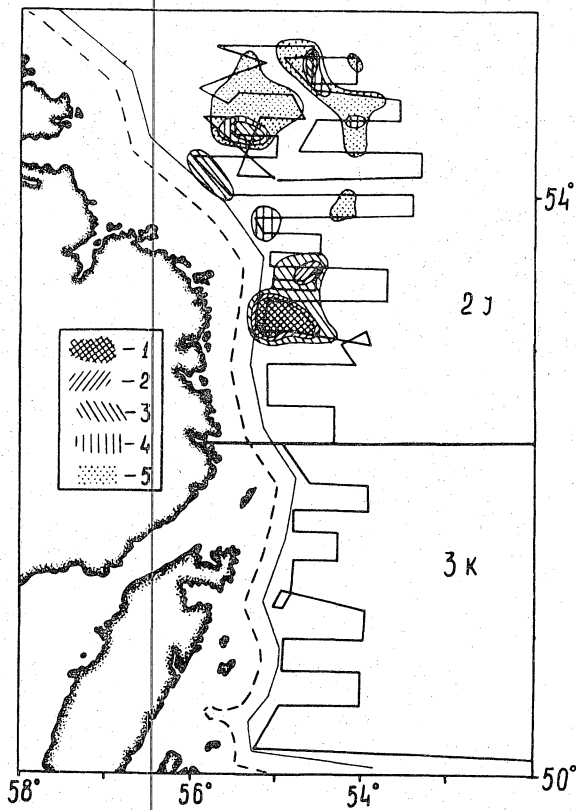| Indices	Year								
	:1974	:1975	:1976	:1977	:1978	:1979	:1980	:1981	:1982
Square, sq.miles	2990	2867	4841	1267	771	39	52		1755
Abundance, mill.spec.	43660	45670	34999	20126	2537	736	782		36487
Biomass, thou.t.	1334	982	749	506	59	14	20		611

Fig. 1 Survey route and capelin concentrations
distribution in October 1982.

Density range, spec./sq.mile:

1 - $< 10 \cdot 10^6$;

2 - $10 \cdot 1 - 25 \cdot 0$;

3 - $25 \cdot 1 - 50 \cdot 0$;

4 - $50 \cdot 1 - 100 \cdot 0$;

5 - $> 100 \cdot 1$