

ANNUAL MEETING - JUNE 1973Water temperature in Labrador and Newfoundland areas at the end of 1971 and 1972

by

V.V. Burmakin
PINRO, Murmansk, USSR**Abstract**

The paper describes average water temperatures on different standard hydrological sections in Labrador and Newfoundland areas in 1972. It was found that the year mentioned was very cold and temperature anomalies were the lowest over the whole period of observations since 1936. Maximum negative anomalies were recorded in the 0-50 m layer. Positive anomalies were observed in the 200-500 m layer of the southern slope of the Grand Bank.

The paper includes data on the comparison of average temperatures in different layers in 1971 and 1972.

The paper deals with hydrological observations on 1035 stations on standard sections (Fig.1) made up to the depth of 2000 m by R/V "Protsion" (in December 1971-February 1972 and in April-June 1972) and by "Perseus III" (in April-July and October 1972).

In Fig.1 square brackets indicate boundaries of sections suggested by Elizarov (1962) for which an average temperature in different layers was calculated.

To determine temperature anomalies in the 0-200 m layer on Sections 2-A,3-A,4-A,6-A,7-A,8-A and 44-A there were used curves of the annual course of temperature (Burmakin,1972).

As it is evident from Table 1, considerable negative

anomalies of temperature, from -0.1 to -2.2° , were found over the whole area observed. Southern and south-western slopes of the Grand and St. Pierre banks are as an exception, as in these areas were registered positive anomalies, from $+0.3$ to 2.2° (Sections 1-A, 2-A and 44-A).

The greatest negative anomalies were observed in cold waters of the Labrador Current and the greatest positive anomalies were in the south of the Grand Bank.

Table 2 includes an average temperature in the 0-200 m layer and its anomalies which are relative to certain dates. This method of estimation of temperature conditions was used in our previous publications (Burmakin, 1967-1972).

As it is stated previously (Burmakin, 1972) interannual changes in average temperature in the Labrador Current usually have cycles of 3-4 years. The last cycle started in 1968 and probably ended in 1972. This cycle included two temperate warm years, 1968 and 1969, one warm year, 1970, and two cold, 1971 and 1972. In 1972, the temperature in this area was the lowest throughout the period of observations beginning from 1936. In 1972, the temperature in the 0-200 m layer on different sections was $0.55-1.17^{\circ}$ lower (Table 3) comparing with the average value over the period 1968-1972.

One can see in Table 4 what great cooling of waters in different layers was in 1972 compared to the cold 1971. It was the greatest in the surface 0-50 m layer on the eastern slope of the Grand Bank in April and May (Sections 6-A /H₁/ and 4-A) and in the near-bottom 200-500 m layer on the south-eastern slope of this bank in April (Section 3-A). In the core of the Labrador Current in the 50-200 m and 0-200 m layers cooling was lower by $0.5-1^{\circ}$ than in the 0-50 m layer.

On Section 1-A, across the south-western slope of the Grand Bank, and on 44-A, across the Cabot Strait, the water temperature in the 0-50, 0-200, 50-200 and 50-100 m layers was lower in January, May and June 1972 than in 1967, 1970 and 1971 but in the near-bottom layer, 100-200 m, and especially in the 200-500 m layer of these sections the temperature was higher.

Thus, during the last three years the heat effect of the Gulf Stream waters in near-bottom layers in the south of the Grand and St. Pierre banks was the highest in 1972 and it being known that it took place simultaneously with the maximum winter cooling (registered over the whole period of observations) in the rest area of the Grand, North-Newfoundland banks and in Labrador.

Conclusions

In 1972, the water temperature in Labrador and Newfoundland areas in the 0-500 m layer was lower the normal by $-0.8-2.2^{\circ}$ and about 1°C lower than in the cold 1971. Such a low temperature was not found throughout the period of investigations since 1936.

Comparing with the last year, in 1972 the surface (0-50 m) and near-bottom (200-500 m) layers were cooled to the highest rate, in the 50-200 m layer, in the core of the Labrador Current, decreasing of temperature was not considerable.

On the southern and south-western slopes of the Grand Bank and in the Cabot Strait there were observed positive temperature anomalies in the 0-200 m layer. The temperature in the 200-500 m layer was also higher the normal.

References

- Burmakin, V.V., 1967. Hydrological conditions in the Labrador and Newfoundland areas, 1965-66. Ann. Meet. ICNAF, Res. Doc. 67/116, Serial No. 1918.
- Burmakin, V.V., 1968. Hydrological conditions in the Labrador and Newfoundland areas, 1967. ICNAF Redbook, Part III.
- Burmakin, V.V., 1969. Hydrological conditions in the Labrador and Newfoundland areas, 1968. Ibid, Part III.
- Burmakin, V.V., 1970. Hydrological conditions in the Labrador and Newfoundland areas, 1969. Ann. Meet. ICNAF, Res. Doc. 70/49, Serial No. 2381.
- Burmakin, V.V., 1972. Seasonal and year-to-year variability of water temperature in the areas of Labrador and Newfoundland. ICNAF, Spec. Publ., No. 8.

Burmakin, V.V. and B.P. Kudlo, 1971. Hydrological conditions in the Northwest Atlantic in 1970. ICNAF Redbook, Part III.

Elizarov, A.A., 1962. On the inter-annual fluctuations of intensity in the Labrador and West Greenland currents and on the possibility of temperature prognosis in the commercial areas of the Northwestern section of the Atlantic Ocean. Okeanologiya, vol. 2, No. 5.

Kudlo, B.P. and V.V. Burmakin, 1972. Hydrological conditions in Labrador and Newfoundland areas in 1971. ICNAF Redbook, Part III.

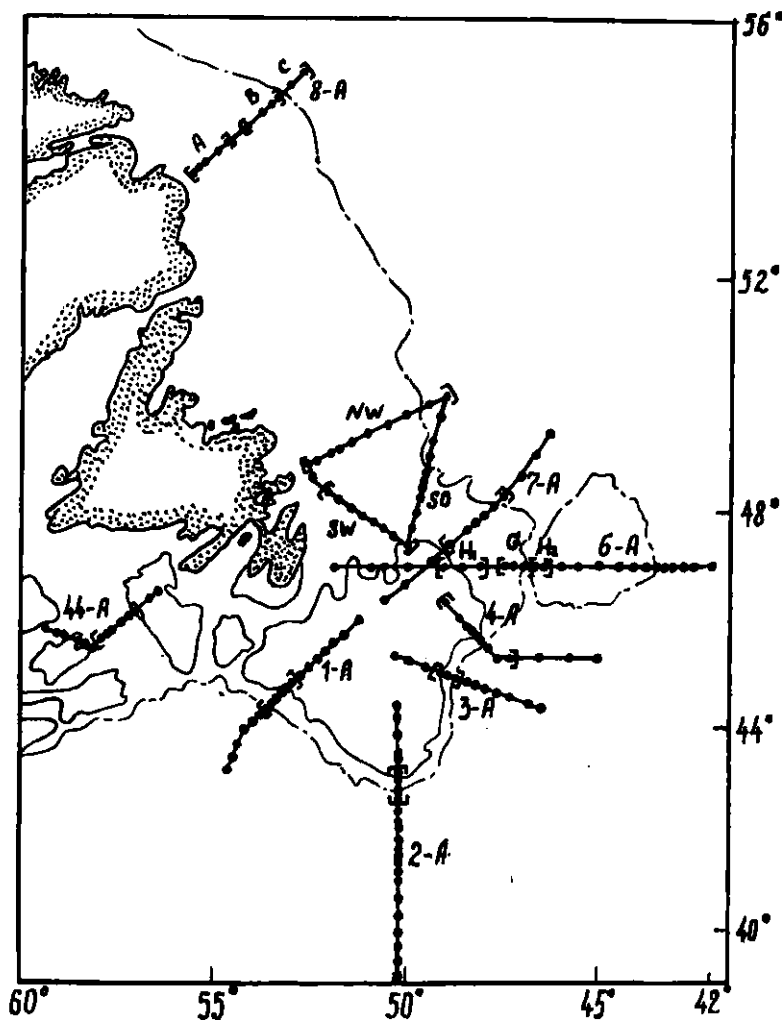


Fig. 1. Position of standard hydrological sections in Labrador and Newfoundland areas. Square brackets indicate sectors of sections where average temperature was calculated.

Table 1. Temperature anomalies in the 0-200 m layer ($^{\circ}\text{C}$) according to observations at the end of 1971 and during 1972.

	1971	1972					
	Dec.	Jan.	Feb.	Apr.	May	June	Oct.
8-A(B) 27-th of October	-	-	-	-	-	-	-1,4
7-A 9-th of Dec., 7-th Feb., 5-rd May	0,0	-	-0,8	-	-1,5	-	-
6-A(G) 14-th Dec., 10-th April, 1-st of May, 26-th of May	-0,9	-	-	-2,2	-1,1;-1,9	-	-
4-A 20-th of Dec., 25-th of April, 20-th of May	-1,3	-	-	-0,8	-0,9	-	-
5-A 25-th of Dec., 18-th of April, 16-th of May	0,0	-	-	-1,3	-0,8	-	-
2-A 27-th of Dec., 23-rd of April, 5-th of June	+2,2	-	-	+0,5	-	+1,0	-
1-A 8-th of January, 7-th of May, 19-th of June	-	-0,1	-	-	+0,3	+0,8	-
44-A 20-th of January, 18-th of May, 27-th of June	-	-0,6	-	-	+1,2	-1,0	-

Table 2. Average temperature in the 0-200 m layer ($^{\circ}\text{C}$) which are relative to certain dates and its anomalies in 1972

Sections	15 April	15 May	15 June	15 Nov.
8-A (AB)	-	-	-	-0.15 (-1.05)
7-A	-	-0.52 (-1.36)	-	-
6-A (G)	-	0.01 (-1.17)	-	-
4-A	0.33 (-0.50)	1.04 (-0.22)	-	-
3-A	-0.93 (-1.28)	-0.14 (-0.62)	-	-
2-A	1.67 (+0.62)	2.39 (+1.01)	3.13 (+1.14)	-

Table 3. Average temperatures in the 0-200-m layer (°C) and its anomalies on Sections 8-A on 1 November and on Sections 7-A, 6-A (G), 4-A, 3-A on 15 May, 1968-1972.

Year	8-A 1.11	7-A 15.05	6-A(G) 15.05	4-A 15.05	3-A 15.05
1968	0.50	1.25	1.48	2.25	1.85
1969	0.50	0.70	1.99	3.46	0.80
1970	0.60	0.87	1.95	2.05	0.44
1971	0.57	0.26	0.46	2.01	0.65
1972	-0.15	-0.52	0.01	1.04	-0.14
Average	0.40	0.51	1.18	2.16	0.72
Anomaly	-0.55	-1.03	-1.17	-1.12	-0.86

Table 4. Average temperatures in different water layers (°C) on Sections: "triangle", 6-A, 4-A, 3-A in spring and summer, 1971-1972.

Section	Date	Water layer (in m)			
		0-50	0-200	50-200	200-500
"triangle"	7-th May 1971	0.83	0.23	-0.45	-
(SO -side)	14-th May 1972	-0.64	-0.74	-0.84	-
"triangle"	7-th May 1971	0.92	-0.04	-0.64	-
(SW - side)	14-th May 1972	-0.63	-0.91	-1.08	-
	2-nd June 1971	2.29	0.44	-0.69	-
	28-th May 1972	0.04	-0.56	-1.04	-
	10-th July 1971	4.02	0.87	-0.82	-
	1-st July 1972	3.34	0.66	-1.07	-

Table 4. continued

Section	Date	0-50	0-200	50-200	200-500
7-A	5-rd May 1971	-0.05	0.07	0.07	2.84
	5-rd May 1972	-0.90	-0.70	-0.65	1.22
6-A (H ₁)	1-st May 1971	0.89	0.32	-0.58	-
	2-nd May 1972	-0.48	-0.16	-1.02	-
	25-th May 1971	2.74	1.30	-0.25	-
	26-th May 1972	0.44	0.04	-0.76	-
6-A (G)	30-th April 1971	0.25	0.65	0.74	3.29
	1-st May 1972	-0.19	0.25	0.40	2.43
	24-th May 1971	1.25	0.35	0.05	2.86
	26-th May 1972	-0.35	-0.17	-0.20	2.82
6-A(H ₂)	30-th April 1971	1.35	2.84	3.34	4.48
	1-st May 1972	1.91	2.71	2.97	4.18
	24-th May 1971	2.46	2.74	2.84	4.56
	26-th May 1972	1.72	2.26	2.43	3.68
4-A	29-th April 1971	2.72	2.25	1.63	4.48
	24-th April 1972	0.40	0.57	0.57	3.54
	18-th May 1971	2.60	2.07	1.20	4.28
	20-th May 1972	1.16	1.16	0.94	3.68
3-A	20-th April 1971	0.62	0.32	-0.22	1.78
	23-rd April 1972	-0.88	-0.95	-1.02	-0.27
	19-th May 1971	1.37	0.66	-0.16	2.68
	16-th May 1972	0.38	-0.10	-0.57	1.00

Table 5. Average temperatures in different water layers (°C) on Sections 2-A, 1-A and 44-A in January, April-June 1972, and in 1966, 1967, 1970 and 1971.

Section	Date	Water layers (in m)					
		0-50	0-200	50-200	50-100	100-200	200-500
2-A	3-rd April 1971	1.44	0.77	0.23	-0.11	0.99	2.94
	25-rd April 1972	2.35	1.86	1.53	2.18	2.98	3.41
	13-th June 1966	3.66	2.77	2.26	1.95	2.56	3.30
	5-th June 1972	3.86	2.89	1.62	0.45	4.16	4.84
1-A	12-th Jan. 1970	6.89	6.39	5.51	5.82	7.22	5.94
	8-th Jan. 1972	3.51	4.47	4.86	4.49	8.72	7.68
	1-st May 1967	2.98	2.62	2.45	2.45	2.70	3.37
	7-th May 1972	2.70	2.80	2.60	2.34	5.87	6.84
	19-th June 1971	8.11	6.86	4.96	4.98	7.09	5.29
	18-th June 1972	6.16	5.01	3.66	2.82	6.44	7.02
44-A	17-th Jan. 1970	3.90	3.92	3.93	2.65	4.57	4.96
	20-th Jan. 1972	1.43	2.04	2.25	1.39	2.67	5.33
	24-th May 1971	3.18	3.28	3.59	2.07	3.78	5.18
	18-th May 1972	2.04	3.08	3.43	1.29	4.52	6.57
	20-th June 1970	6.35	4.08	3.32	1.95	4.00	5.36
	27-th June 1972	5.19	3.60	3.07	1.96	3.62	5.80