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Water Temperature in the Newfoundland and Labrador areas in 1979

by

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Abstract

In 1979 water temperature on the main standard oceanological sections in Newfoundland and Labrador areas in April was close to the mean long-term norm and was almost 1° lower than in 1978; in May it was 0.5° above normal, but was still lower than in 1978. Positive anomalies prevailed in the main branch of the Labrador Current in the South Labrador area in November, and temperature was higher as compared with 1978. In the coastal branch of the Labrador Current and in the 200-500 m near-bottom layers the temperature has dropped below the mean long-term norm and 1978.

In April, May and November 1979 maximal positive anomalies and the highest rise of temperature against 1978 were observed in the 0-50 m layer, minimal positive anomalies and fall of temperature as compared with 1978- in the 50-200 and 200-500 m layers.

On the whole water temperature for the year was insignificantly above the mean long-term norm.

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The thermal state of water masses in Newfoundland and Labrador areas in March - June and September - November 1979 was analysed as before (Elizarov, 1962; Burmakin, 1972) following the mean water temperature of different layers and branches of the Labrador Current on standard oceanological sections (Fig. 1).

Materials and methods

In 1979 observations were conducted at 312 trawl stations by the FRV "Suloy" in Cruise 19 (March-June), at 206 stations of hydrological sections by the RV "Gemma" in Cruise 17 (April-May) and at 203 trawl stations and those of the section 8-A by the FRV "Suloy" in Cruise 20 (September-November).

In all 721 hydrological stations including observations at standard depths up to 2000 m were analysed.

The mean weighted temperature of water was calculated for the layers of 0-50, 50-200^{0-200 m} and 200-500 m for separate parts of sections limited by square brackets shown in Fig.1.

For the dates of observations temperature anomalies were determined for the layers of 0-200 and 200-500 m by the diagrams of normal (average) annual fluctuations which were drawn up earlier (Burmakin, 1972, 1976). For some sections the mean temperature was reduced by definite dates (Burmakin, 1969) and anomalies were calculated from the average norm.

Results

According to four-year quasi-periodicity of water temperature fluctuations in the 0-200 m layer the decrease of heat content of water masses in Newfoundland and Labrador areas to the level of moderately warm years was expected by 1979 (Burmakin, 1979).

Really, in April-May 1979 temperature anomalies corresponded to the mean long-term value on standard sections 3-A and 4-A across the south-^seastern slope of the Grand Bank of Newfoundland both in the 0-200 m layer and in the 200-500 m layer (Tables 1, 2). However, north of sections 6-A, 7-A, a triangle and 8-A across the north-eastern slope of the Grand Bank, the North Bank of Newfoundland and the shelf of the South Labrador anomalies were 0.4-0.7° above the mean long-term norm in the 0-200 m layer and 0.0-0.9° - in the 200-500 m layer. Negative anomalies up to -0.9° were observed on the western slope of the Flemish Cap Bank (section 6-A-H₂).

As is seen from Tables 1 and 2, in April water temperature was almost equal to the mean long-term norm and in May it was

on the average 0.5° above it. This corresponded to two types of weather, which were detected by facsimile charts of atmospheric pressure near the ground: cyclonic in April, and anticyclonic in May. In the first case northern winds intensifying the cold Labrador Current prevailed, and in the second one - southern winds intensifying the warm North Atlantic Current. Negative anomalies on the western slope of the Flemish Cap Bank in May were brought about by the cold Labrador waters diffuence and deceleration caused by the prevalence of southern winds, the same phenomenon being registered in 1978 (Burmakin, 1979).

In April and May 1979 as compared with 1978 water temperature of different layers lowered mainly by $0.02-1.10^{\circ}$, excluding the Flemish Pass area and the eastern slope of the Grand Bank of Newfoundland (section 6-A, parts H₁ and G) where in May the rise of temperature by $0.16-1.74^{\circ}$ occurred as a result of the inflow of warm Atlantic waters (Table 3). The maximal rise of temperature was observed in the surface layer of 0-50 m, the fall of it - in the 50-200 m layer, the core of the Labrador Current.

In November 1979 in contrast to the last year the rise of temperature by $0.19-1.41^{\circ}$ was observed in the main and warm branches of the Labrador Current (Table 4). The temperature lowered only in the coastal branch. The maximal rise was registered in the 0-50 m layer, as in April/May, and the fall \ominus in the 50-200 m layer.

The temperature deviations from the mean long-term norm in the 0-200 m layer for 1964-1979 on the section 8-A were: -0.16° - in the coastal branch (A), 0.35° - in the main branch (B) and 0.55 - in the warm branch (C) of the Labrador Current. So, by the end of 1979, apparently, due to increased anticyclonic activity registered since the middle of May, the rise of temperature as compared with the norm occurred under the influence of prevalent southern and south-western winds in the active 200 m layer of the main and warm constituents of the Labrador Current. However, the temperature was below normal (by 0.2°) and lower

than last year in the 0-200 m layer of the coastal branch, as well as in the 200-500 m layer in the warm constituent of the Labrador Current (Table 4).

On the whole the temperature of the Labrador Current (ABC) as compared with the last year increased significantly in the surface layer (by 0.77°) and insignificantly - in the core of the current (by 0.11°), but it became $0.11-0.20^{\circ}$ lower in the near-bottom layers (200-500m). As compared with the mean long-term norm the temperature was 0.36° higher in the 0-200 m layer and 0.15° higher in the 200-500 m layer, whereas last year it was 0.06 and 0.35° higher respectively.

Conclusions

In April water temperature of the Labrador Current was normal and considerably lower (almost by 1°) than in 1978. In May temperature rose by 0.5° above normal but was lower than last year. Positive anomalies prevailed in the main and warm branches of the Labrador Current in November and temperature rose as compared with 1978. Temperature was below normal and lower than in 1978 in the coastal branch and in the near-bottom layers of 200-500 m.

Maximal positive anomalies and the greatest increase of temperature as compared with 1978 were registered in the surface layer of 0-50 m, minimal anomalies and fall of temperature as compared with 1978 - in the layers of 50-200 m (the core of the Labrador Current) and 200-500 m (frontal zone of cold Labrador and warm Atlantic waters).

Thus, water temperature in Labrador and Newfoundland areas during 1979 was above the mean long-term norm. Negative anomalies prevailed in the Barents Sea in 1979, which corresponds to the antiphase of temperature fluctuations of water in these areas.

References

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Table 1. Temperature anomalies of the 0-200 m layer in 1979.

Sections and dates	: April	: May	: November
8 - A (B) 1 November			0,50
3 November			0,35
Triangle (NW) 21 May		0,4	
Triangle (SW) 26 May		0,4	
Triangle (SE) 20 May		0,5	
7 - A 14 May		0,5	
6 - A (G) 29 May		0,7	
6 - A (H ₂) 29 May		-0,9	
4 - A 27 April	0,0		
3 - A 25 April	-0,1		

Table 2. Temperature anomalies of the 200-500 m layer in 1979.

Sections and dates	: April	: May	: November
8-A(B) 1 November			0,29
3 November			0,26
Triangle (NW) 21 May		0,9	
Triangle (SE) 20 May		0,2	
7-A 14 May		0,4	
6-A (G) 29 May		0,0	
6-A (H ₂) 29 May		-0,1	
4-A 27 April	0,0		
3-A 25 April	0,0		

Table 3. Differences of water temperature in 1979 as compared with 1978 on standard sections in Newfoundland area in April-May.

Standard sections	Dates	Δt (1979-1978) for the layers, m			
		0-50	50-200	0-200	200-500
7-A	15 May	-0,22	-0,02	-0,07	0,26
6-A(H ₂)	May	0,18	-0,84	-0,60	0,02
6-A(G)	May	1,74	0,73	0,99	0,40
6-A(H ₁)	May	1,37	0,16	1,08	-
4-A	27 Apr.	-1,10	-0,84	-0,61	-0,19
3-A	25 Apr.	0,26	-0,82	-0,27	-0,16

Table 4. Mean temperature (its deviations from the long-term mean norm for 1964-1979) and difference of water temperature in 1979 as compared with 1978 on the section 8-A on the basis of data reduced by 1 November.

Parts of the section 8-A	t_w °C and its anomalies (0-200m)	Δt (1979-1978) for the layers, m			
		0-50	50-200	0-200	200-500
A	0,35(-0,16)	0,80	-0,52	-0,15	-
B	1,60(0,35)	0,40	0,19	0,25	-0,20
C	4,26(0,55)	1,41	0,82	0,96	-0,11
ABC	1,79(0,36)	0,77	0,11	0,30	-

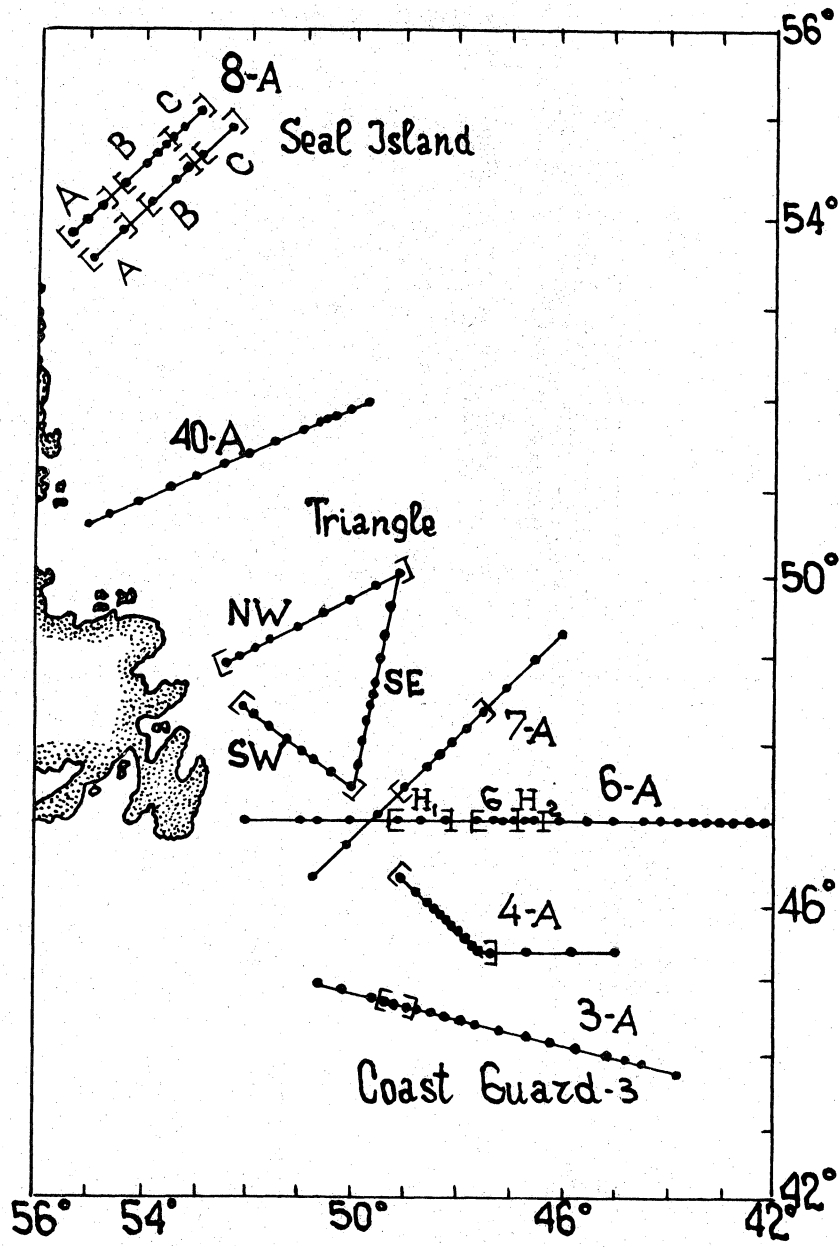


Fig. 1. Position of standard oceanological sections in Newfoundland and Labrador areas in 1979.