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Water Temperature in the Newfoundland and Labrador Areas in 1981

by

W. V. Burmakin

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

Abstract

The paper deals with changes of water masses temperature in the areas of Labrador and Newfoundland in April-May and October-November 1981, compared with mean long-term norm and with that in 1980 according to Soviet vessels observations on standard sections.

Considerable rise in temperature in the uppermost 50 m layer compared with the norm, insignificant fall of temperature in the Labrador Current core and close to the norm temperature in 200-500 m layer are registered.

It got much warmer in 1981 compared with 1980 in surface layers of the Labrador Current, especially in its coastal branch, and colder in 50-200 m layer on the northeast and southeast slopes of the Grand Bank and in the Flemish Cap Channel.

In November 1981 temperature in the Labrador Current in layers 0-200 m and 200-500 m was on the level of moderately warm years.

Material and methods

In 1981 observations on standard oceanologic sections were carried out during 23 trip of R/V "Gemma" on 391 hydrologic stations (October/November).

Average weighted temperature for layers 0-50, 50-200, 0-200 and 200-500 m was calculated for parts of sections suggested by A.A.Elizarov (1962) and V.V.Burmakin (1972). Temperature anomalies for layers 0-200 and 200-500 m per date of observation were taken from diagrams of normal (average) annual curves (Burmakin, 1972, 1976). For section 8-A temperature anomalies were obtained relatively to long-term average norm for 1964-1981 according to data reduced to November 1 (Burmakin, 1969).

Results of observations

As it may be seen from the Table 1 in the layer 0-200 m negative anomalies of water temperature in the Flemish Cap Channel were registered in April/May (section 6-A, part G), and those close to the norm - on the Grand Bank southeast slope (sections 4-A and 3-A). Over the North Newfoundland Bank these anomalies fluctuated in June

from 0.0° to 0.6° (section "triangle"), they were considerably lower than the norm over the Grand Bank northeast slope (section 7-A) and in the Flemish Cap Channel, but higher than the norm by 1.5° over the edge of the Grand Bank shelf (section 6-A, part H₁).

On the west slope of the Flemish Cap Bank in April/May the anomalies were higher than the norm by 1.0° and in June they were close to the norm (section 6-A, part H₂).

Anomalies higher by 0.2° than the norm were registered in July on the "tail" of the Grand Bank (section 2-A).

In October/November anomalies close to the norm were observed in all branches of the Labrador Current on the Hamilton Inlet Bank (section 8-A), though, over the Grand Bank edge they were similar to those in April/June at the level higher than the norm. They were abnormal over the Grand Bank northeast slope and in the Flemish Cap Channel, approximating the norm over the western slope of the Flemish Cap Bank.

From the Table 2 it is evident that in 200-500 m layer negative anomalies in April/May were observed in the Flemish Cap Channel, and positive ones - on the southeast slope of the Grand Bank. In June close to the norm anomalies were registered on section "triangle", 7-A and 6-A. Positive anomaly of 0.7° was registered in June on the southern slope of the Grand Bank. In October and November negative anomalies were dominating in 200-500 m layer over the slopes of the Hamilton Inlet Bank, Grand Bank and in the Flemish Cap Channel, excluding only one part of the Hamilton Bank slope (section 8-A, part B).

Compared with 1980 it got considerably colder in May/June 1981 on the southeast slope of the Grand Bank and in the Flemish Cap Channel, mainly in the core of the Labrador Current in the layer 50-200 m (Table 3). In October 1981 on the northeast slope the temperature of the Labrador Current was almost similar to that in 1980; in November it was higher over the Hamilton Inlet Bank, especially in the surface layer 0-50 m (section 8-A).

Table 4 gives water temperature in different layers and branches of the Labrador Current on section 8-A over the Hamilton Inlet Bank reduced to 1 November (according to R/V "Protsion" observations) and also its fluctuations from average long-term norm in 1964-1981. As it may be seen from the Table changes of water temperature in coastal (A) and offshore (C) branches of the Labrador Current were of similar character: they were considerably higher than the norm in the surface 50 m layer (anomalies $+1.60^{\circ}$ and $+1.16^{\circ}$ respectively), lower than the norm in the core of the Current in the layer 50-200 m (-0.30° and -0.21°) and about the norm in the layer 0-200 m ($+0.29^{\circ}$ and $+0.11^{\circ}$). In the main branch of the Current (B) anomalies considerably higher than the norm kept in the layer 0-50 m but in the core (50-200 m layer) they were higher than the norm (by 0.23°), hence, in the 0-200 m layer there was an anomaly $+0.46^{\circ}$, that is greater than in the coastal and offshore branches.

In the 200-500 m layer the temperature was by 0.18° higher than the norm in the main branch of the Labrador Current, by 0.30° lower than the norm in the offshore branch.

In total, we observed in the Labrador Current (coastal, main and offshore branches) in autumn 1981: getting warmer in uppermost layers, insignificant cooling in the Current core and close to the norm temperature in the 200-500 m layer. General state of the Current was at moderately-warm years level.

Conclusion

Considerable negative anomalies were registered in April/July 1981 in 0-200 and 200-500 m over the northeast slope of the Grand Bank and in the Flemish Cap Channel, whereas considerable positive anomalies were registered over the eastern edge of the Grand Bank shelf and also over the west slope of the Flemish Cap Bank. Temperature close to the norm and higher than the norm was registered over the North Newfoundland Bank, southeast and southern slopes of the Grand Bank.

In October/November in the 0-200 m layer close to the norm anomalies were observed over the Hamilton Inlet Bank, and over the northeast slope of the Grand Bank, in the Flemish Cap Channel and over the eastern edge of the Grand Bank shelf fluctuations of water temperature from the norm were the same as in April/June. In the 200-500 m layer negative anomalies were dominant.

As compared with 1980 in 1981 it got much warmer in the surface 50 m layer of the Labrador Current, especially in the coastal branch, and colder in the 50-200 m layer on the Grand Bank eastern slopes and in the Flemish Cap Channel.

According to data reduced to 1 November 1981 on the section through the Hamilton Inlet Bank water temperature compared with the long-term norm for 1974-1981 was considerably higher in the 0-50 m layer, insignificantly lower in the 50-200 m layer and about the norm in the 200-500 m layer. In general the Labrador Current waters temperature in layers from 0 to 500 m was at moderately-warm years level.

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Table 1. Temperature anomalies in 0-200 m layer in 1981

Section and date	! April !	! May !	! June !	! July !	! October !	! November !
8-A (A) 22 October					0,3	
8-A (B) 23 October					0,4	
8-A (C) 23 October					0,1	
Triangle (NW) 24 June			0,0			
Triangle (SW) 24 June			0,3			
Triangle (SE) 25 June			0,6			
7-A 26 June, 9 October 9			-0,6		-0,3	
6-A (H ₁) 30 June, 1 October			1,5		1,5	
6-A (G) 14 April 19 May 30 June 1 November	-0,4	-0,6	-1,1			-1,2
6-A (H ₂) 14 April 19 May 30 June 1 November	1,0	1,0	0,0			0,0
4-A 9 April	0,0					
3-A 8 April 11 May	0,2	-0,1				
2-A 4 July				0,2		

Table 2. Temperature anomalies in 200-500 m layer in 1981

Section, date	Apr	May	June	July	Oct	Nov
8-A (B) 23 October					0,2	
8-A (C) 23 October					-0,3	
Triangle (NW) 24 June			0,1			
Triangle (SE) 25 June			0,1			
7-A 26 June 9 October			-0,2		-0,4	
6-A (G) 14 April 19 May 30 June 1 November	-0,3	-0,3	0,1			-0,3
6-A (H ₂) 14 April 19 May 30 June 1 November	-0,1	-0,1	0,1			-0,3
4-A 9 April	0,1					
3-A 8 April 11 May	1,3	0,4				
2-A 4 July				0,7		

Table 3. Changes of water temperature in 1981 as compared with 1980 on standard sections in Labrador and Newfoundland areas in May, June, October and November.

Standard sections	Date	Δt (1981-1980) for layers, m			
		0-50	50-200	0-200	200-500
8-A (A)	1 November	1,10	0,21	0,50	-
8-A (B)	1 November	0,95	0,20	0,54	0,52
8-A (C)	1 November	0,96	0,08	0,30	0,03
7-A	May-June	-	-0,21	-	0,30
7-A	October	0,05	-0,01	0,01	0,05
6-A (H ₁)	May-June	-	0,06	-	-
6-A (G)	5 June	-0,01	-0,73	-0,55	-0,07
6-A (H ₂)	5 June	1,12	0,46	0,62	0,00
3-A	May	-0,82	-1,86	-1,44	-0,26

Table 4. Average temperature (t°) and anomalies (Δ) from average long-term norm for 1964-1981 in Labrador area on the 8-A section (1 November 1981).

Parts of 8-A section	Layers, m					
	0-50	50-200	200-500	0-200	200-500	
8-A	t	Δ	t	Δ	t	Δ
A	2,94	1,60	-0,11	-0,30	0,82	0,29
B	2,51	1,13	1,47	0,23	1,74	0,46
C	4,93	1,16	3,43	-0,21	3,81	0,11
AB	2,76	1,39	0,70	0,07	1,28	0,44
ABC	3,32	1,41	1,44	0,13	1,96	0,49