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Oceanographic Conditions in Some Areas of the Northwest Atlantic in 1992

by

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ABSTRACT

Sea surface temperature (SST) values in the Labrador Sea, Grand Bank off Newfoundland and Scotian Shelf are presented as well as anomaly indices for water boundary location between 59° and 65°W. Analysis of SST anomalies showed that within the Scotian Shelf sea surface temperature values in winter, spring and summer of 1992 were lower and in fall higher as compared to those of 1991. In the Grand Banks region sea surface temperature was higher in winter and almost the same level in spring, summer and fall as compared to those of 1991. Within the Labrador Sea a marked winter increase of temperature occurred. Anomalies of water boundary location indices proved the boundaries of the cold shelf waters, slope waters and northern edge of the Gulf Steam front to be displaced greatly to the north during winter as compared to the situation observed in 1991. In other seasons difference between 1991 and 1992 was insignificant.

INTRODUCTION

Studies on the oceanographic conditions in the Northwest Atlantic were continued in 1992. They were based on data on SST and boundary location for different types of waters. They supplement the traditional environmental overviews by Drinkwater, Trites, Stein and all. The 1992 data on the above-mentioned characteristics are compared to those for 1991.

MATERIALS AND METHODS

As previously monthly means of anomalies for SST in the junctions and centres of 5-degree grid within the shelf areas of the Labrador Sea, Grand Banks and Nova Scotia were used as well as monthly means for boundary location of the cold shelf waters, slope waters and northern edge of the Gulf Stream front. SST anomalies were calculated basing long-term means for 1977-1991. Boundary location indices were calculated basing mean values for 1978-1987. Disposition of the selected squares is shown in Fig. 1. Designations of junctions and centres of the squares correspond to those mentioned in the tables. Positive anomalies are drawn with a line for suitable reading.

RESULTS AND DISCUSSION

The Scotian Shelf SST anomalies presented in Table 1 show that SST decreased in winter, spring and summer. Amount of the 1992 positive anomalies was lower as compared to that of 1991. Tha fall anomalies prove a slight SST increase at the outer shelf edge (c) and within the slope waters (NE, NW).

In the Grand Banks area the number of positive anomalies increased during the winter period; in spring, summer and autumn the conditions observed were close to those of 1991 (Table 2). In the Labrador Sea squares (Table 3) the same peculiarity can be traced: winter is characterized by considerable SST increase.

For the square to the north of Labrador the 1992 SST anomaly sign almost did not differ from that observed in 1991. Here as well as in the above-mentioned squares the negative anomalies prevailed during the year, though the ice conditions differed greatly from those of the previous year. As it can be seen from Table 5 the central part of the square in 1991 was only occupied by ice in January. As far as 1992 is concerned the ice cover was observed from January to May.

Boundary location indices at the sea surface between 59 and 65°W showing the availability of the advective processes within the Scotian Shelf in 1992 did not differ greatly from those observed in 1991 (Table 6). Intraannual variations for the cold shelf water boundary were similar to those observed during the two previous relatively cold years. Their peculiarity was as follows. Since May the boundary displaced to the south of its long-term mean position demonstrating the increase of the cold water advection from the north-east to the Scotian Shelf.

Boundary variations of the slope waters and the northern edge of the Gulf Stream during 1992 did not differ noticeably from those observed in 1991.

Summing up the above-mentioned it should be stressed that the negative anomalies prevail in the 1992 data. Thus, this year can be referred to the series of the relatively cold ones. Two periods of SST decrease (1977-1982 and 1988-1992) and one period of SST increase (1983-1985) can be traced within the interannual variability of SST on the Scotian Shelf from 1977 to 1992. Possibly, the tendency to the temperature increase in the Grand

Banks and the Labrador Sea areas found in 1991 and 1992 will be continued in 1993 as well. It may result in the increased influx of the Labrador Sea waters to the Scotian Shelf and increase of the water value within the cold intermediate layer.

To check the reliability of our data on the year-to-year changes of SST in the selected points an attempt was made to compare them with the diagrams by Drinkwater (1992). As a result a qualitative similiarity was found for the appropriate areas of the Scotian Shelf, Grand Banks and Labrador Current.

References

1. Drinkwater K.F., 1992. Overview of Environmental Condition on Eastern Canadian Continental Shelves in 1991. CAESAC Research Document. 92/102, 15 pp.

Table 1 SST anomalies on the Scotian Shelf in 1991-1992 (40-45°S, 60-65°W)

	I	II	III	IУ	У	УI	УII	УIII	IX	X	XI	XII
						1991						
NE	-0.3	0.5	1.6	0.2	0.5	1.9	0.8	-0.2	0.1	0.0	1.5	0.1
C	0.6	-2.8	-2.2	-2.8	-0.4	0.9	0.2	-0.2	-0.7	0.2	0.6	0.3
SE	0.7	1.1	1.0	-0.5	-1.5	-0.6	-0.5	-0.5	-1.3	-1.2	-0.6	-0.2
SW	-0.7	-0.7	0.2	-0.3	0.6	0.6	0.2	-0.6	-0.9	-0.8	-2.1	0.8
						1992						
NE	1.3	0.0	-0.1	0.2	-0.8	-0.3	-0.4	-0.5	1.8	0.9	0.7	0.7
C	0.4	-0.2	0.2	-0.6	-0.2	0.8	0.6	-0.3	0.7	1.0	1.0	0.5
SE	-1.5	-1.5	-0.9	-2.5	0.8	-0.3	-1.3	-0.4	0.4	-0.2	0.0	-0.2
SW	-1.0	-0.8	-2.0	-0.9	-1.2	0.4	-0.2	-0.5	0.6	1.0	-1.0	-0.4

Table 2 SST anomalies in the Labrador Sea in 1991-1992 (45-50°S, 45-50°W)

	I	II	III	IУ	У	УI	УII	УIII	IX	X	XI	XII
						1991						
C	0.2	0.4	-0.5	-1.1	0.2	-1.3	-1.4	-1.7	-1.5	0.1	1.4	1.6
SW	-0.4	1.1	0.0	-0.2	-0.7	-2.1	-2.7	2.0	-1.0	-0.3	0.6	0.8
						1992						
C	0.7	0.3	0.6	0.1	-0.3	-0.3	-1.1	-2.4	-0.7	0.8	0.2	1.3
SW	0.9	0.0	0.5	0.4	-0.6	-0.5	1.0	-2.1	-0.8	-1.2	-1.8	0.0

Table 3 **SST anomalies in the Labrador Sea in 1991-1992 (50°-55°S, 50°-55°W)**

	I	П	Ш	IУ	У	УI	УП	УШ	IX	X	XI	XII
						1991						
C	-0.7	-I.4	-0.8	-I.3	I.3	0.8	-0.2	0.2	-I.0	0.5	I.4	I.3
NW	I	-I.2	-I.2	-I.3	I.2	3.4	-I.6	0.0	-0.6	0.3	-0.5	-0.I
NE	0.2	-I.7	-I.6	-I.8	0.2	0.2	-0.9	-I.7	-I.2	-I.2	-0.6	-0.9
SW	-2.4	-0.4	-0.8	0.4	-0.2	-0.6	0.0	-I.I	-I.3	0.3	I.I	I.3
						1992						
C	0.3	2.6	I.7	0.0	3.3	0.8	-0.2	-0.3	0.I	I.0	0.3	-0.5
NW	I.5	2.3	I.4	0.0	2.7	I.5	0.5	0.7	-0.2	-0.3	-0.5	-0.5
NE	-0.9	0.9	0.4	-I.3	I.6	-I.0	-0.6	-0.8	-2.4	0.8	0.7	-I.3
SE	-0.6	2.4	-0.I	-0.4	-0.4	-0.9	-I.3	-0.6	0.4	0.2	0.0	0.4

Table 4 **SST anomalies in the Labrador Sea in 1991-1992 (50°-55°S, 45°-50°W)**

	I	П	Ш	IУ	У	УI	УП	УШ	IX	X	XI	XII
						I99I						
NE	0.0	-I.I	-0.I	0.0	-0.6	-0.9	0.0	-I.4	-I.4	-0.5	-0.6	-I.0
SE	I.5	-2.4	-2.6	-2.I	-2.6	-2.0	-2.I	-I.4	-2.0	-I.I	I.I	0.5
C	-0.3	-I.I	-I.4	-I.I	0.3	-I.5	-I.9	-0.7	-I.8	-0.8	0.0	0.7
						I992						
NE	-I.6	-I.0	-0.3	-0.8	-I.2	-0.5	-I.I	-I.9	-2.5	I.2	0.4	-0.7
SE	0.2	0.9	0.2	0.9	-0.8	-I.2	-I.I	-I.8	-I.I	0.0	I.4	-0.3
C	-I.I	0.0	0.8	-0.9	0.6	-I.0	-0.2	-0.2	-I.I	0.0	0.6	-0.8

Table 5 **Anomalies for indices of surface water boundary location between 50°W and 65°W in 199 -1992**

	I	II	Ш	IУ	У	УI	УП	УШ	IX	X	XI	XII
						Cold shelf waters						
1990	4.6	5.2	2.8	4.2	-3.5	-2.9	-I.3	-0.6	-2.3	7.5	-I.6	-3.8
I99I	-5.4	4.6	2.6	3.4	-I.I	-I.9	-I.6	-0.2	-0.2	-0.8	I.6	0.5
I992	3.5	5.6	3.8	2.2	-0.5	-2.I	-3.2	-6.8	-5.8	-I.5	0.9	-I.0
						Slope waters						
1990	2.2	4.4	2.8	3.5	-I.4	-6.I	0.2	-0.I	I.I	-0.6	-2.6	-2.7
I99I	-9.6	7.I	I.9	4.I	2.5	-2.5	0.0	-0.5	-3.5	-0.4	I.6	2.3
I992	2.6	3.2	3.6	4.4	2.6	-I.5	-0.I	0.2	0.6	-0.2	I.2	I.5
						The Gulf Stream front						
1990	0.0	3.I	-0.6	I.3	-2.2	-7.6	-6.4	-9.3	-4.7	-8.5	-3.9	-I.9
I99I	-4.2	3.8	4.2	0.0	-I.8	-3.0	-4.8	-8.7	-7.5	-8.2	-2.7	-5.7
I992	0.8	4.9	2.6	0.3	0.2	-0.4	5.5	-9.7	-6.8	-5.0	-I.3	-0.3

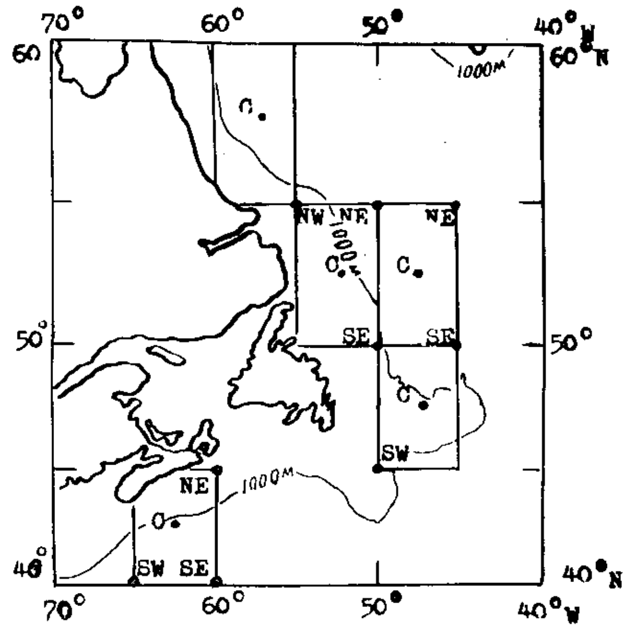

Fig. 1. The scheme of squares and points distribution which are used for the control over the ocean surface temperature.