

Autumn Temperature Anomalies of the Labrador Current, 1969-80

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Abstract

Hydrographic observations along the NAFO Seal Island Section, during autumn research-vessel surveys off Labrador from 1969 to 1980, indicate a general increase in temperature for both the polar and Irminger components of the Labrador Current from 1974 to 1977 and a decline to 1979. From 1979 to 1980, there was an increase in temperature of the polar component, but a decrease was observed for the warm Irminger component, indicating a cooling of the offshore component at the end of the decade.

Introduction

From the autumn of 1969 onwards, research vessels (*Anton Dohrn* and *Walther Herwig*) of the Federal Republic of Germany have carried out annual (except 1970 and 1978) bottom-trawl surveys off Labrador and collected oceanographic data at stations along the Seal Island Section (ICNAF, 1978). The 1969 survey was conducted near the end of October, whereas the remaining surveys took place in November or at the beginning of December. The oceanographic results of most of the individual cruises were previously reported by Messtorff and Lenz (1970, 1972) and Stein (MS 1975, MS 1976, MS 1977, MS 1978, MS 1980). This time series of hydrographic data enables a closer look at temporal changes in the thermal behavior of the Labrador Current during the decade of the 1970's.

Materials and Methods

From a total of nine stations along the Seal Island Section, Stations 3 to 8 were most frequently occupied by the research vessels. The positions of these stations are as follows: (3) 53°37'N, 55°00'W; (4) 53°55'N, 54°30'W; (5) 54°12'N, 54°00'W; (6) 54°30'N, 53°30'W; (7) 54°38'N, 53°15'W; and (8) 54°47'N, 53°00'W. Until 1977, the data were obtained by means of NANSEN bottles. The 1979 and 1980 results originated from CTD (Conductivity, Temperature and Depth) measurements. Details on the processing of CTD profiles have been reported by Cornus and Stein (1979) and by Stein (MS 1980). As the mean temperatures of the surface (0-50 m) and subsurface (51-200 m) layers exhibited very similar trends, only the data for the surface layer were used in this analysis. The temperature anomalies represent the deviations of the annual mean values from the 1969-80 mean for each of the six stations considered.

Results and Discussion

The polar component of the Labrador Current dominates the continental shelf off Labrador and consequently influences the water temperature at Stations 3, 4 and 5, located on the shelf. The Irminger (warm) component of the Labrador Current, which is found seaward of the shelf, influences hydrographic conditions at Stations 6, 7 and 8. Temperature anomalies for the surface (0-50 m) layer of the Labrador Current at these stations during 1969-80 are shown in Fig. 1, where the "polar" stations are indicated by closed symbols and the "Irminger" stations by open symbols.

During the early 1970's, negative anomalies were evident mainly in the Irminger component of the Labrador Current. Except in 1972, when temperatures were abnormally low but not unusual for the Newfoundland-Labrador area (Bailey, 1975), the temperature of the polar component of the Labrador Current was slightly

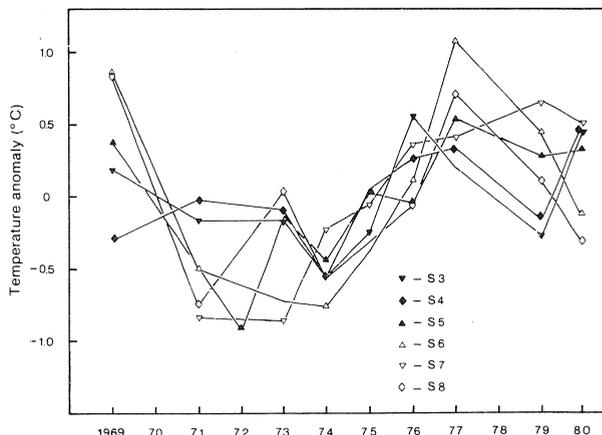


Fig. 1. Temperature anomalies of the surface layer (0-50 m) at six stations on the Seal Island Section, 1969-80. (Closed symbols indicate the polar component and open symbols the Irminger component of the Labrador Current.)

below average. This corroborates the findings of Templeman (1975), who emphasized that temperatures of the upper 200 m of the water column along the Seal Island Section in the summer of 1972 were below average. Furthermore, his results indicated that temperatures in 1973 were somewhat higher than in 1972 but still below average. A general increase in temperature began after 1974 and continued to 1977 (Fig. 1). Because of the lack of data for 1978, it cannot be ascertained here whether the subsequent cooling of the Labrador Current components started in 1977 or 1978. However, a declining trend was observed in 1979 and 1980 for the Irminger component, whereas increasing temperatures were found in 1980 for the polar component.

Conclusions

From the data reported here, three outstanding events were observed in the thermal composition of the Labrador Current during 1969-80:

1. Abnormally low temperatures prevailed in the early 1970's, especially in the Irminger part of the Labrador Current. The largest negative anomalies occurred in 1972 which coincided with severe ice conditions.
2. A general increase in temperature was characteristic of the period from 1974 to 1977 or 1978.
3. The temperature anomalies behaved differently at the end of the decade, as indicated by warming of the polar component and cooling of the Irminger component of the Labrador Current.

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