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Autumn temperature anomalies of the Labrador
Current between 1969 and 1980

by

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Abstract

Hydrographic observations during annual groundfish surveys off Labrador were used to calculate mean temperatures along the NAFO Standard Seal Island Section. The data indicate a general increase in temperature for both the polar and Irminger components of the Labrador Current from 1974 to 1977 or 1978, followed by a decline in 1979 and 1980. There was an increase in anomalies for the polar component from 1979 to 1980, whereas 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, the Federal Republic of Germany carried out an annual groundfish survey off Labrador with the research vessels Anton Dohrn and Walther Herwig and collected oceanographic data along the standard Seal Island Section, except in 1970 and 1978. The 1969 survey was conducted at the end of October, whereas the remaining cruises took place in November or at the beginning of December. The oceanographic results of the individual cruises were previously issued as ICNAF or NAFO research documents (Messtorff and Lenz, 1970, 1972; Stein, 1975, 1976, 1977, 1978, 1980, 1981). Meanwhile the time series of hydrographic data enables a closer look at temporal changes in the thermal behaviour of the Labrador Current.

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:

S3	53°37'N, 55°00'W	S6	54°29'N, 53°30'W
S4	53°55'N, 54°30'W	S7	54°37'N, 53°14'W
S5	54°12'N, 54°00'W	S8	54°47'N, 53°00'W

Until 1977, the data were obtained by means of NANSEN bottles. The 1979 and 1980 results originate from CTD (Conductivity, Temperature and Depth) measurements. Details on data processing of the CTD profiles are given by Cornus and Stein (1979) and Stein (1980).

Comparison of the mean values of the surface (0-50 m) and subsurface (50-200 m) layers indicates a very similar trend in the curves along the Section. This implies that changes in mean hydrographic characteristics in the upper layer may be representative for the entire 200 m water column. Positive or negative temperature anomalies were obtained by calculating for the surface layer the deviations of the annual means from the decade mean.

Results and Discussion

The water mass analysis of data since 1974 indicates that stations S3 to S5 were mostly under the influence of the polar component of the Labrador Current which dominates the whole bank area. The Irminger, or the warm component of the Labrador Current, which is found off the shelf break, has influenced the hydrographic situation at stations S6 to S8. Fig. 1 delineates the temperature anomalies of the upper layer of the Labrador Current between 1969 and 1980. The "polar" stations are indicated by "closed" symbols and the "Irminger" stations by "open" symbols.

During the early 1970's, the negative anomalies were present mainly in the Irminger component. Except 1972, which was abnormally cold but not unusual for the Newfoundland-Labrador region (Bailey, 1974), the temperature of the polar component of the Labrador Current was slightly below average. This corroborates the findings of Templeman (1974) who emphasized that during 1972 the temperatures

of the upper 200 m of the water column along the Seal Island Section were well below average. Furthermore, his results indicate that temperatures in 1973 were higher than those in 1972 but still below average. A general increase in temperature started in 1974 and continued until 1977. 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 decreasing 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 present material, it may be concluded that three outstanding events were observed in the thermal composition of the Labrador Current during the decade of investigation:

1. Abnormally low temperatures prevailed in the early 1970's, especially in the Irminger part of the Labrador Current. Largest negative anomalies were found 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 increasing temperature of the polar component and cooling of the Irminger component of the Labrador Current.

Future investigations along the Seal Island Section will show whether the cooling of the Irminger component is persistent in the early 1980's. Interaction between year-class strength of demersal fish and environmental conditions should be worthwhile to study on the basis of these inter-annual changes.

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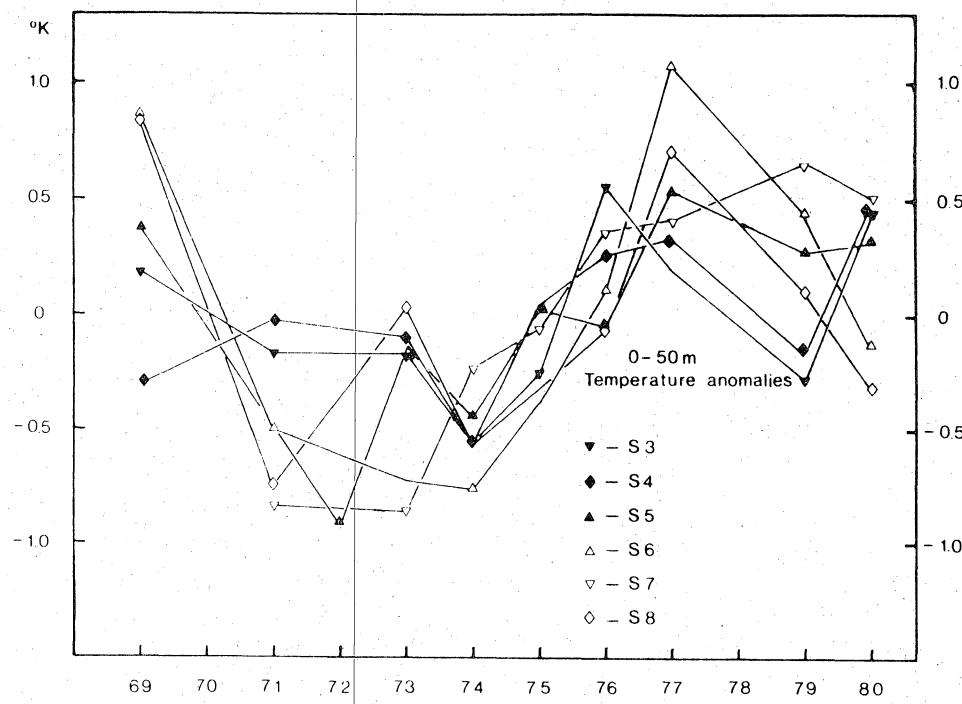


Fig. 1 Temperature anomalies of the surface layer (0-50 m) along the Seal Island Section, 1969-80.

