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Seasonal Distribution of Water Temperature, 1962-76, along Standard
AtlantNIRO Transects on the Northwest Atlantic Shelf from
Laurentian Channel to Hudson Canyon

by

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Abstract

From the data of the seasonal surveys made by AtlantNIRO in the 1962 to 1976 period and a series of the ICNAF surveys conducted in 1974-1976 the mean long-term seasonal values of the water temperature along 11 standard AtlantNIRO transects of the Northwest Atlantic shelf between 56° and 73°30' W have been estimated. The transect pattern, grid of stations and long-term seasonal distribution of the water temperature along the transects are presented.

The data may be useful for the comparison with the on-going observations, for estimating the background temperature variations in the same seasons by year and for revealing the anomalous thermal conditions by year and season.

Introduction

The observations along the standard transects are necessitated by the study of the hydrological regime of any one oceanic area and by the investigation of the variability on its characteristics in space and time. The multi-year regular observations along the standard transects lay the basis for obtaining the mean long-term values of hydrological factors and estimating their fluctuations within certain time intervals. The present report attempts to estimate the mean long-term seasonal values of the

water temperature along the standard AtlantNIRO transects in the Northwest Atlantic shelf area between the St. Lawrence Channel to Hudson Canyon (fig. 1).

Materials and Methods

The observations along the standard AtlantNIRO transects in the given area cover the period from 1962 to 1976. As a general rule, the observations were made once a season. Following introduction of the economic fishing zones by USA and Canada in 1977, the oceanographic studies in this area^{are} conducted on new grids of stations in accordance with research programs of bilateral USSR-USA and USSR-Canada agreements. Some transects of new grids and individual stations coincide with the former positions or are close to those, which is especially true for the New England area. This enables us to continue the observation series in some cases.

To estimate the mean long-term seasonal values of the water temperature, the observations from 11 standard AtlantNIRO transects for the 1962 to 1976 period and random BT casts of the USSR research vessels in points approximating the standard stations occupied in the same period were used. In addition, the data on the water temperatures obtained on the AtlantNIRO vessels during the ICNAF surveys on Georges Bank larval herring and similar data of some US vessels for 1974-1977 kindly submitted by Dr. V.R.Wright from the Northeast Center of the National Marine Fisheries Service, Woods Hole, were processed. A total of 13 000 temperature measurements has been made. The observations are grouped by season: January-March (winter), April-June (spring), July-September (summer), September-December (fall). During the entire investigation period the minimum and maximum observation numbers in a single season, at a single station and depth were 2 and 25 respectively. The cases of the minimum observations are rectangle-framed in figures depicting transects.

Results and Discussion

The results of calculations of the mean long-term seasonal values of the water temperature are presented in figs. 2-15 as a vertical distribution of isotherms and water temperatures along the transects.

The distribution of the water temperature along the transect reflects the mean long-term inter-seasonal variability in different parts of the shelf, indicates spatial differences in three-layered structure of the water masses over the shelf between the St. Lawrence Channel and Hudson Canyon, and shows their mean seasonal extreme temperatures. The produced values may be used for comparison with the on-going observations of transects or those made in selected regions and stations that are situated near the standard ones.

The work accomplished by AtlantNIRO is the first attempt of generalization of the water temperature data by standard transects for the fifteen-year period in the given area. We cannot insist, however, that all existing observations have been analysed since the data of the foreign vessels were not numerous in our backlog. Still we believe that in spite of this shortcoming the mean values produced ^{may} be useful for comparison with the future observations of selected surveys, transects and stations, as well as for establishing the trends of heat content and its anomalies by year and season. Besides, the mean long-term seasonal values of the water temperature along the transects may prove useful in studying the reasons of fluctuations in the plankton and fish distribution and abundance.

Undoubtedly, the obtained values will be specified with further accumulation of data, so that they might reflect different variability phases in thermal conditions of the area under study.

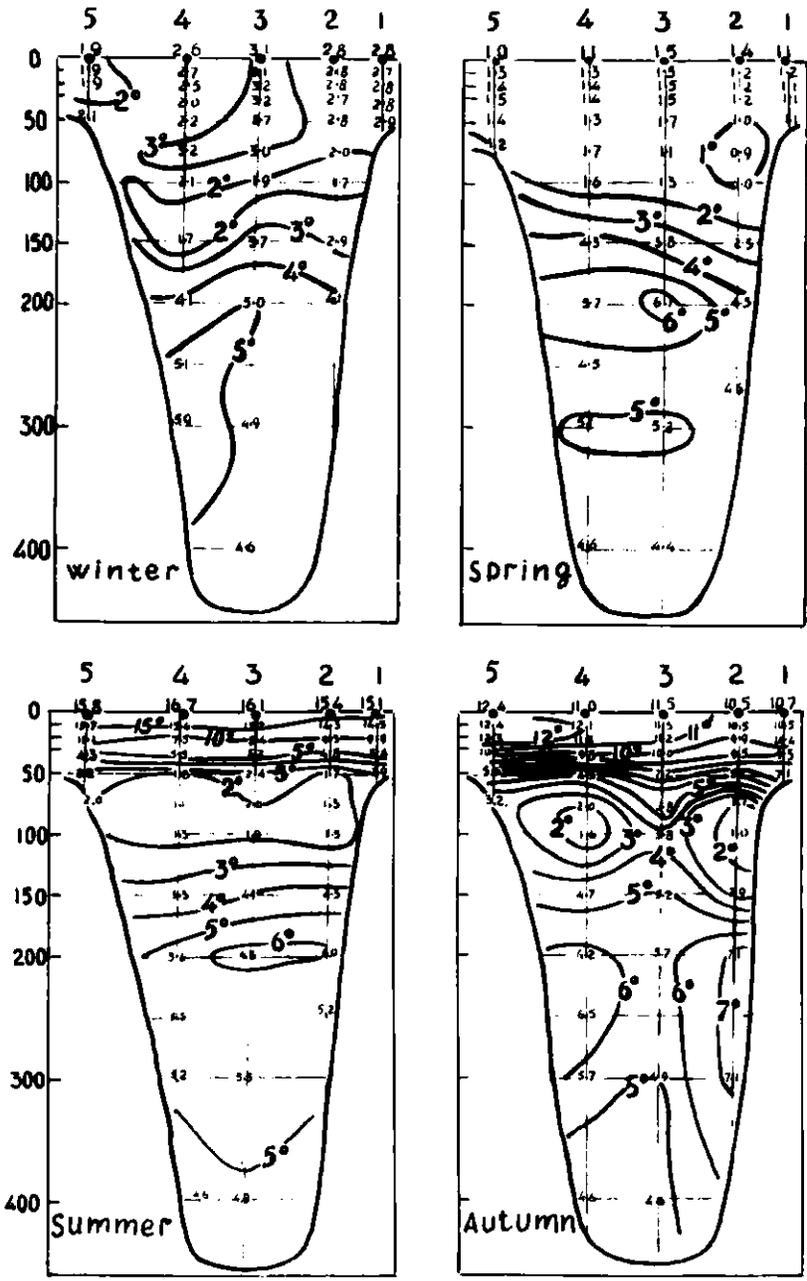


Fig. 2. Mean long-term seasonal water temperatures for Transect I.

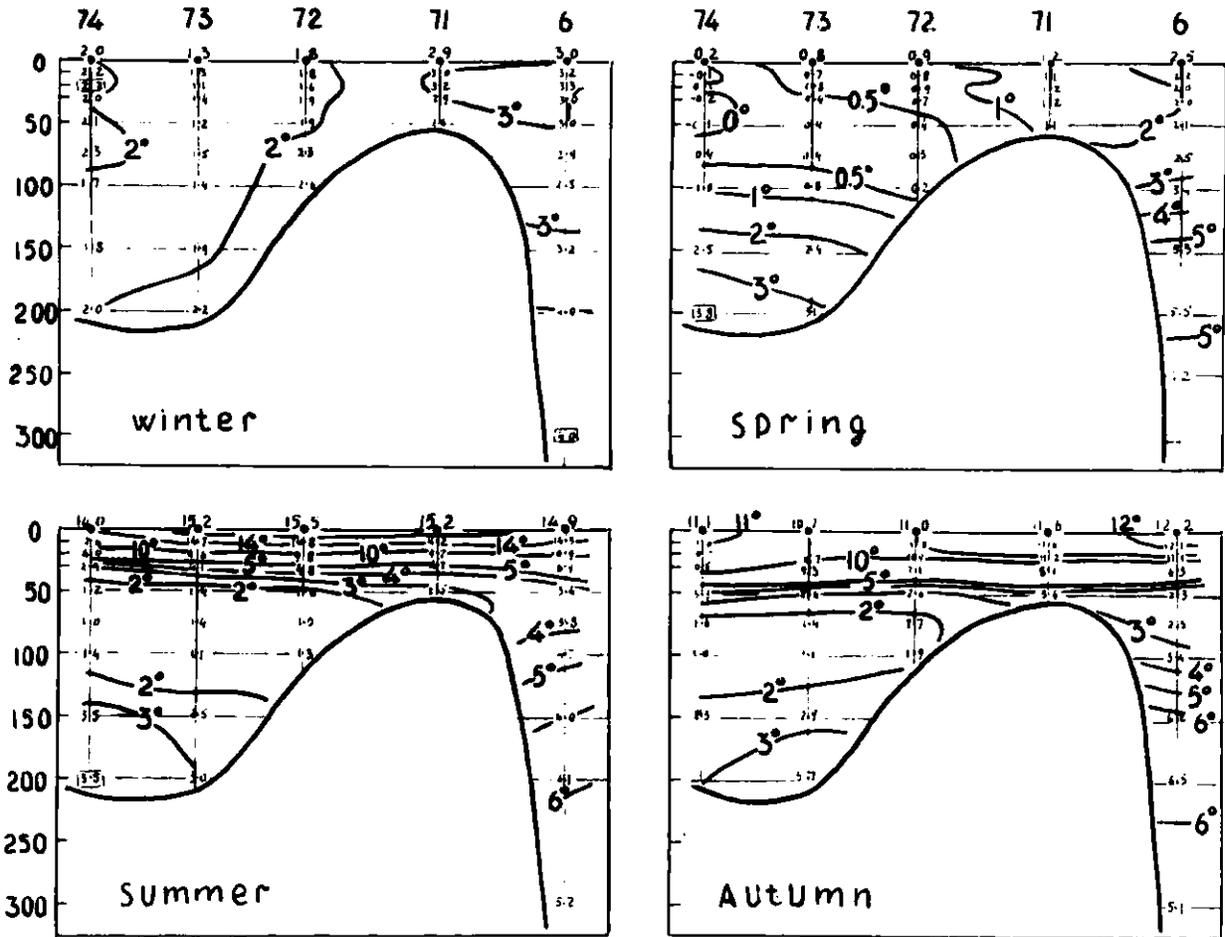


Fig. 3. Mean long-term seasonal water temperatures for Transect XII.

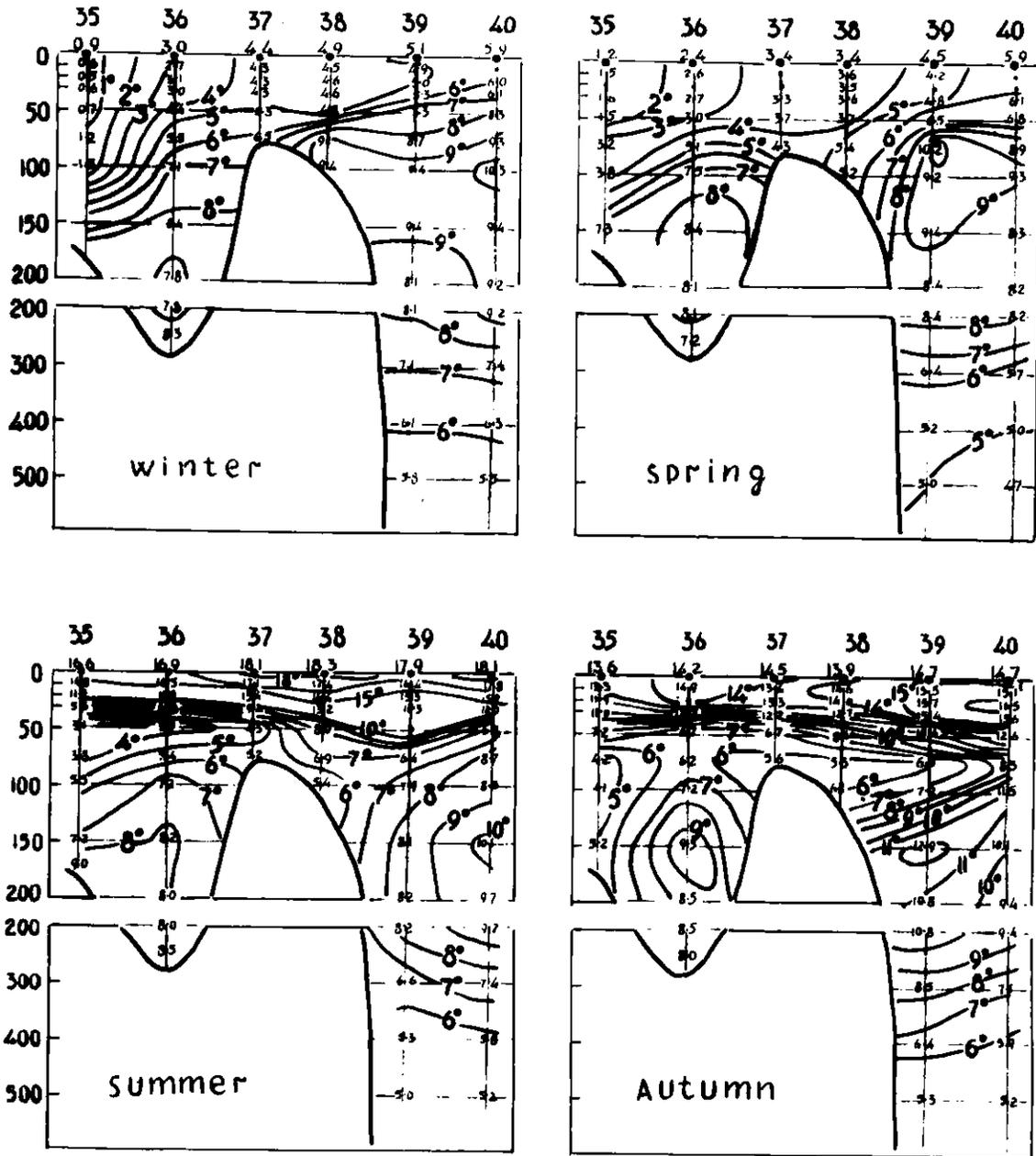


Fig. 4. Mean long-term seasonal water temperatures for Transect VI.

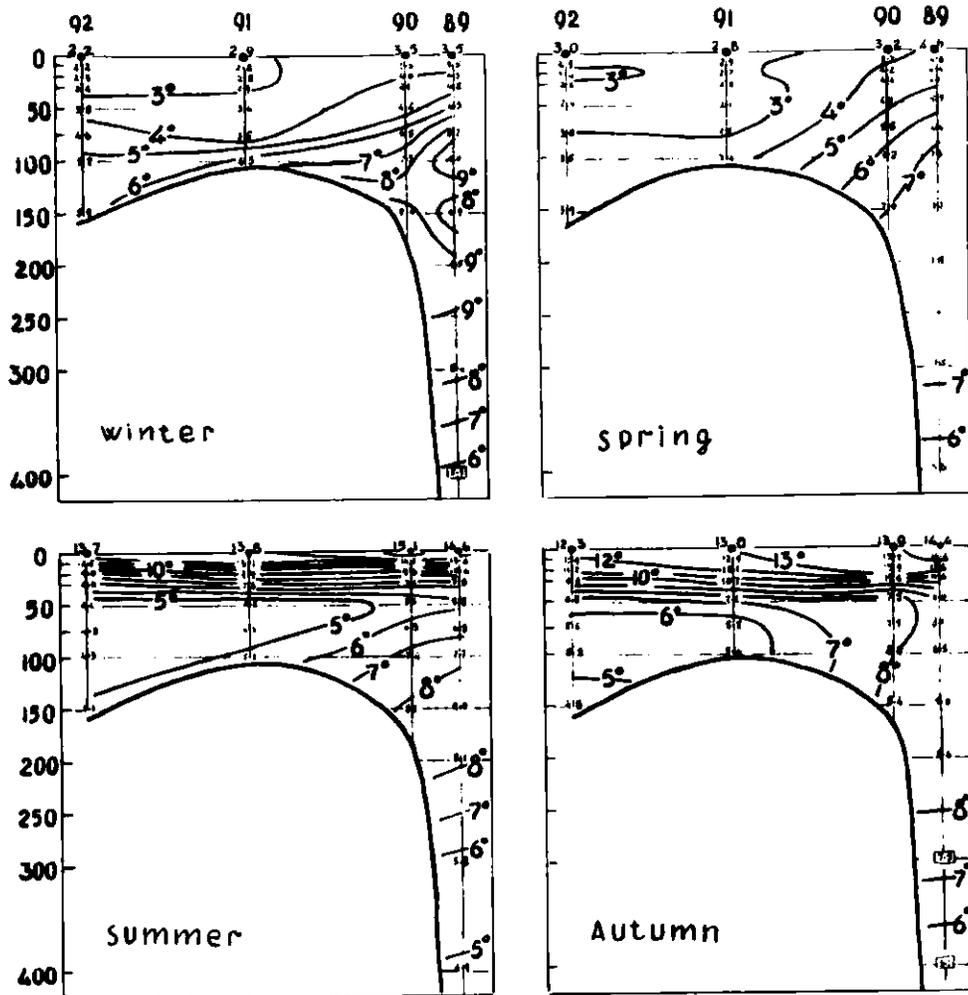


Fig. 5. Mean long-term seasonal water temperatures for Transect XVII.

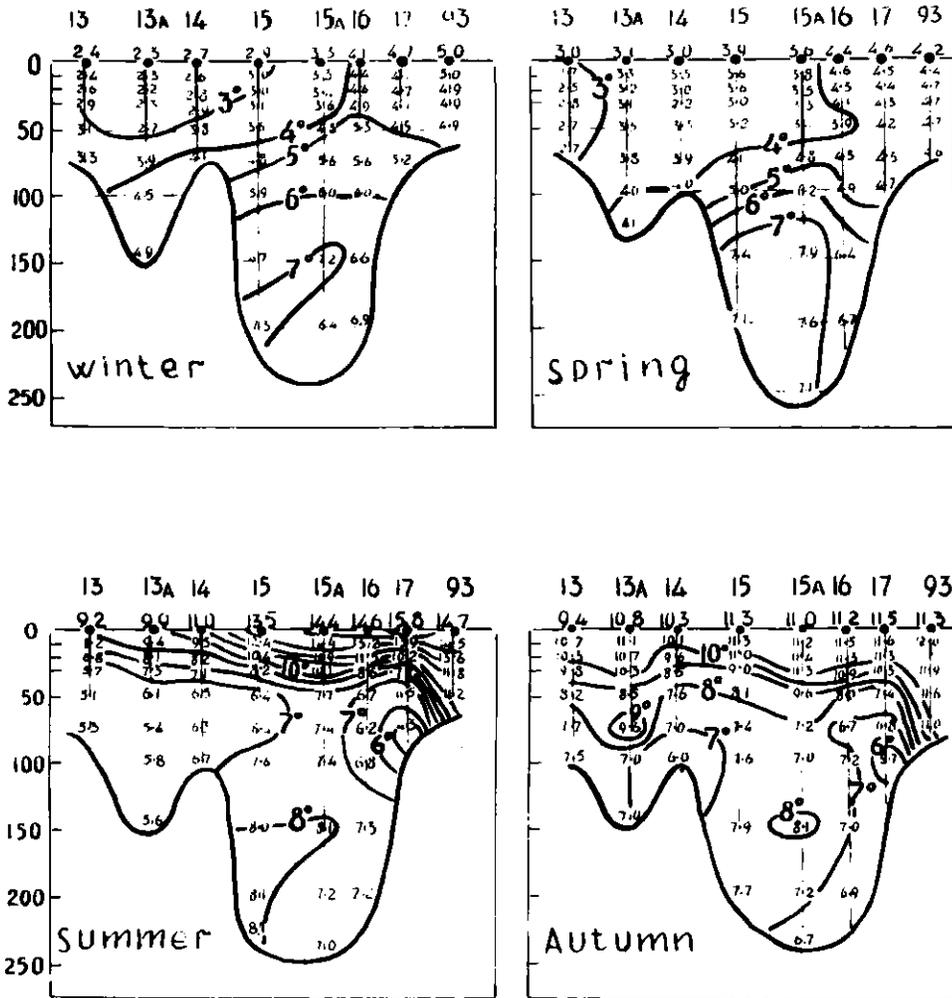


Fig. 6. Mean long-term seasonal water temperatures for Transect III.

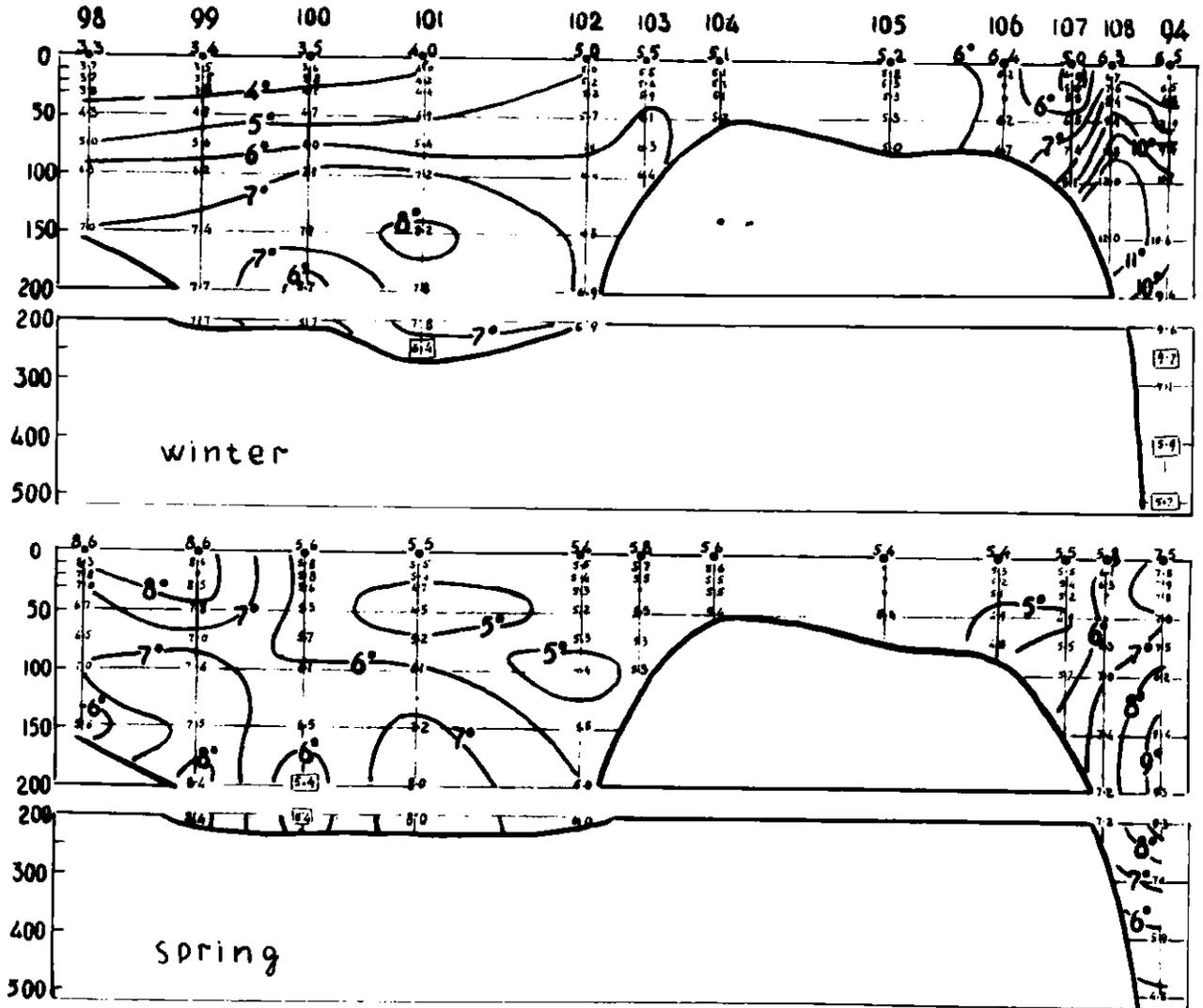


Fig. 7. Mean long-term seasonal water temperatures for Transect XXI (winter and spring).

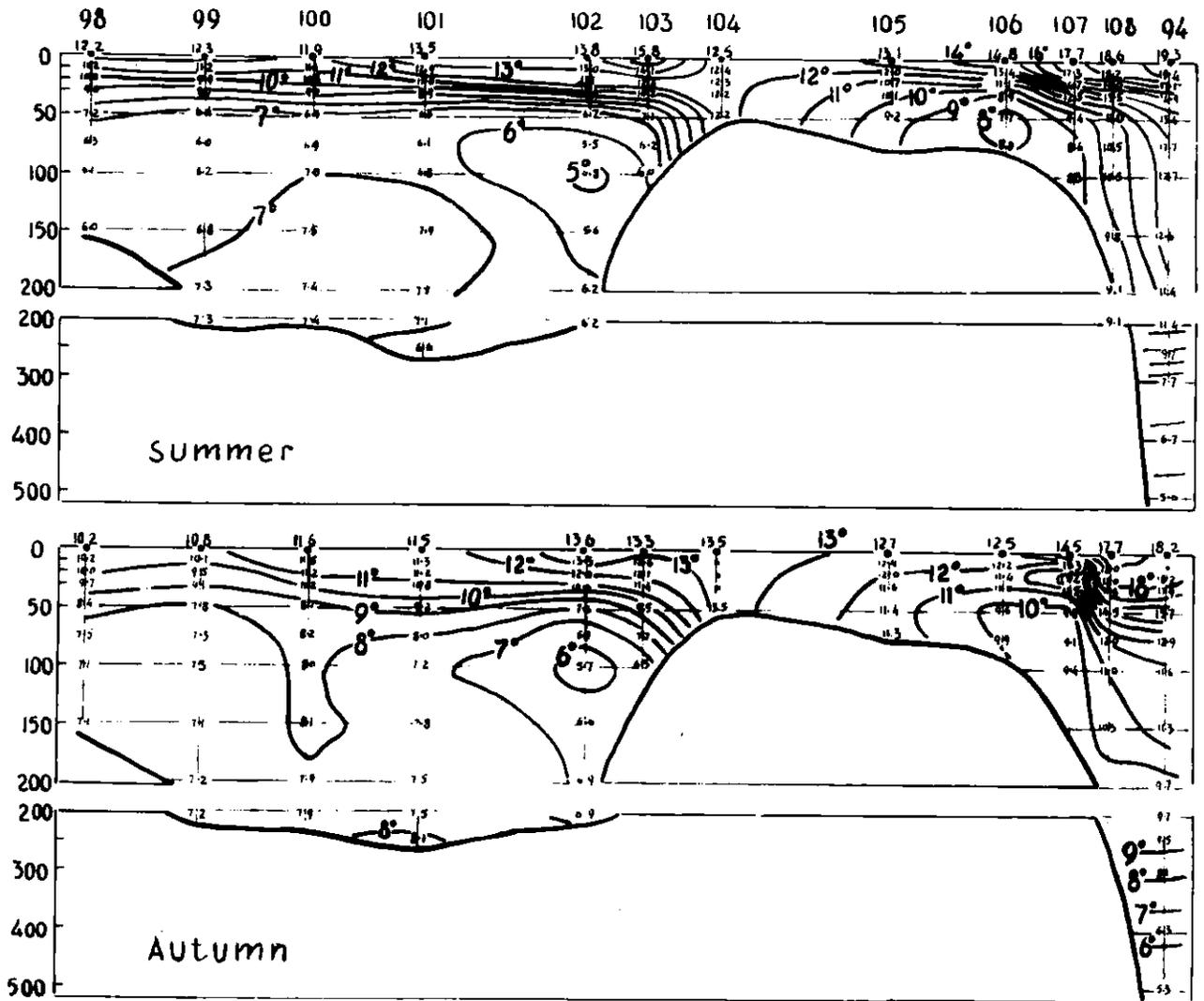


Fig. 8. Mean long-term seasonal water temperatures for Transect XXI (summer and autumn).

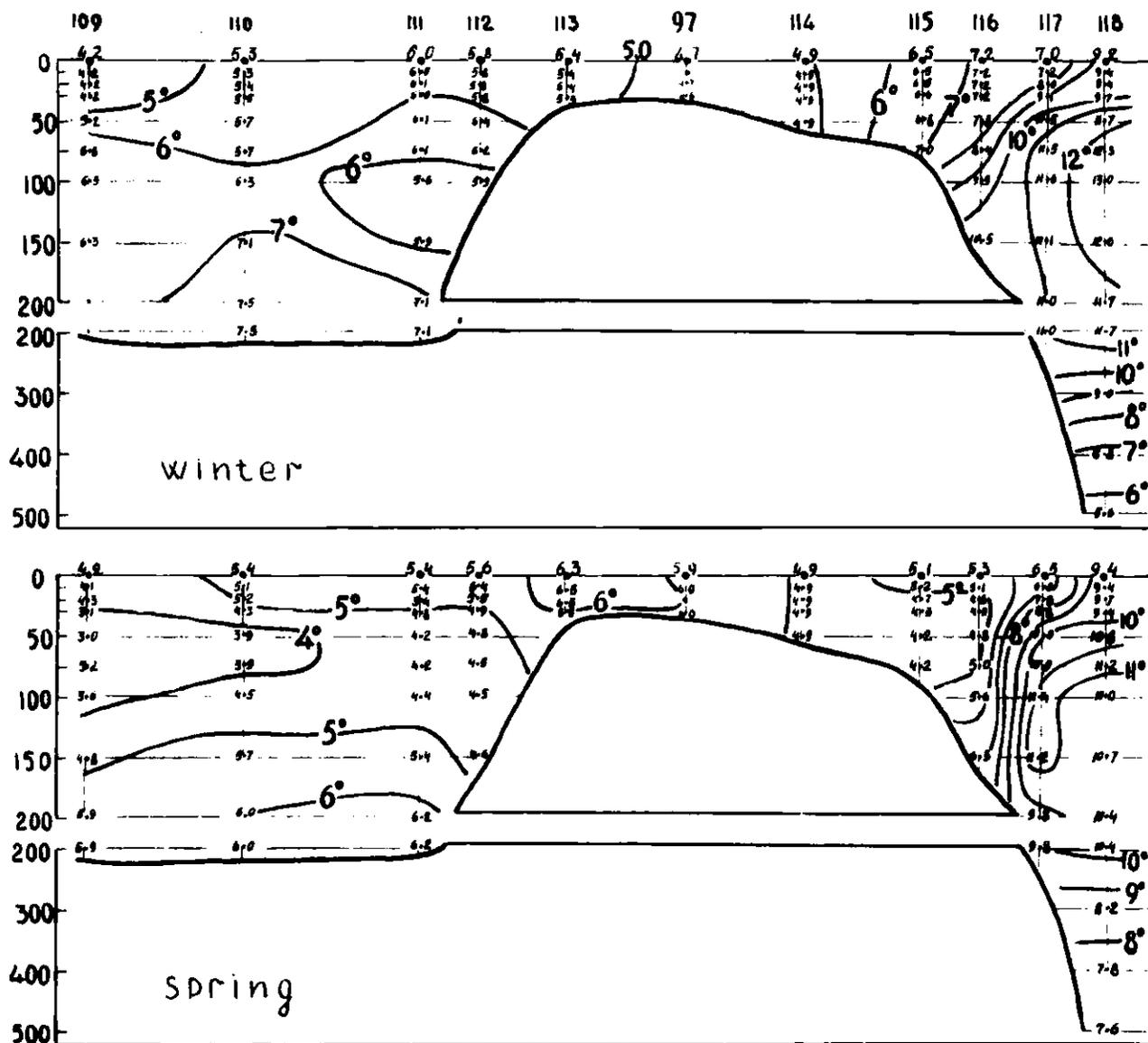


Fig. 9. Mean long-term seasonal water temperatures for Transect XXII (winter and spring).

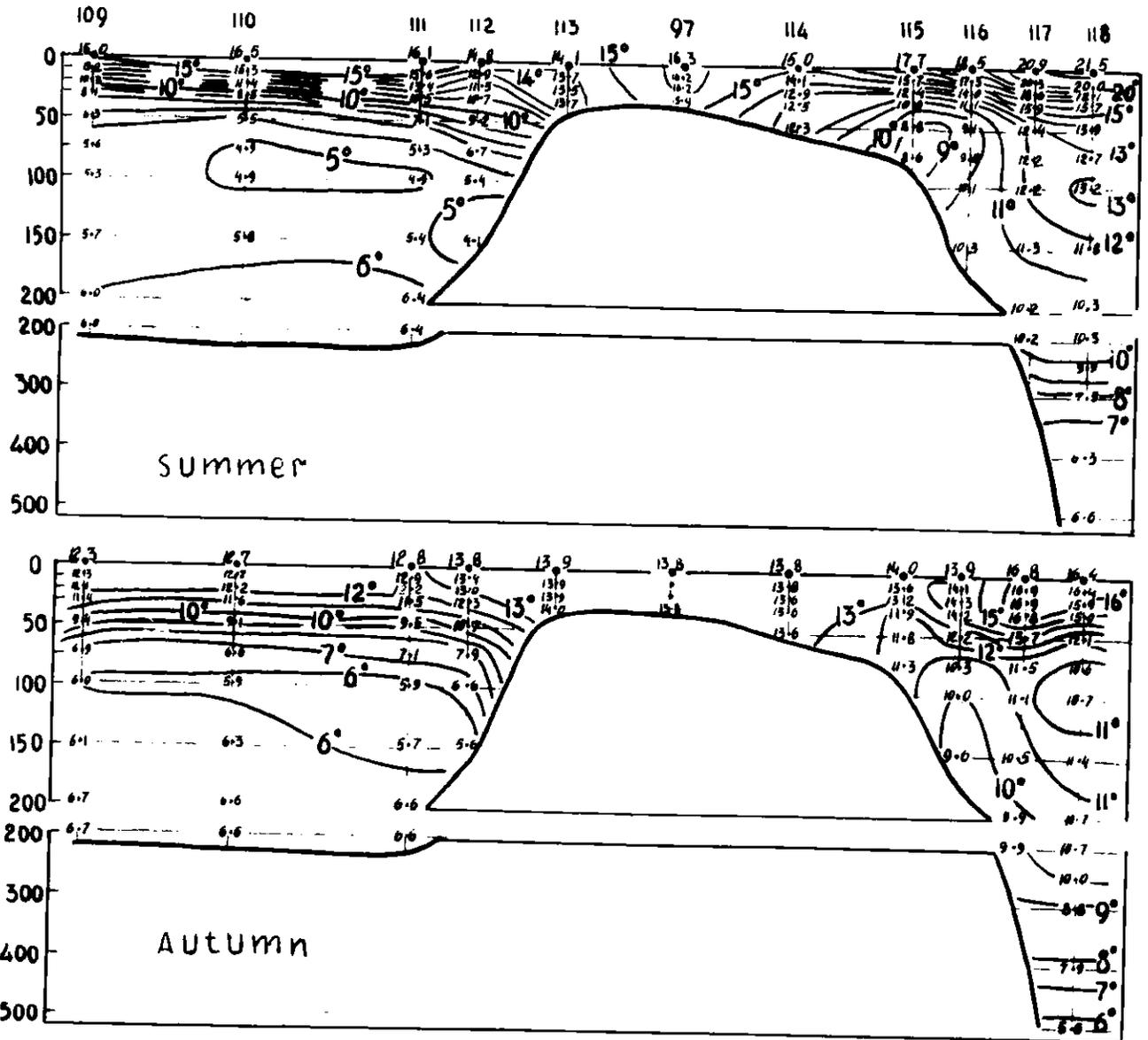


Fig. 10. Mean long-term seasonal water temperatures for Transect XXII (summer and autumn).

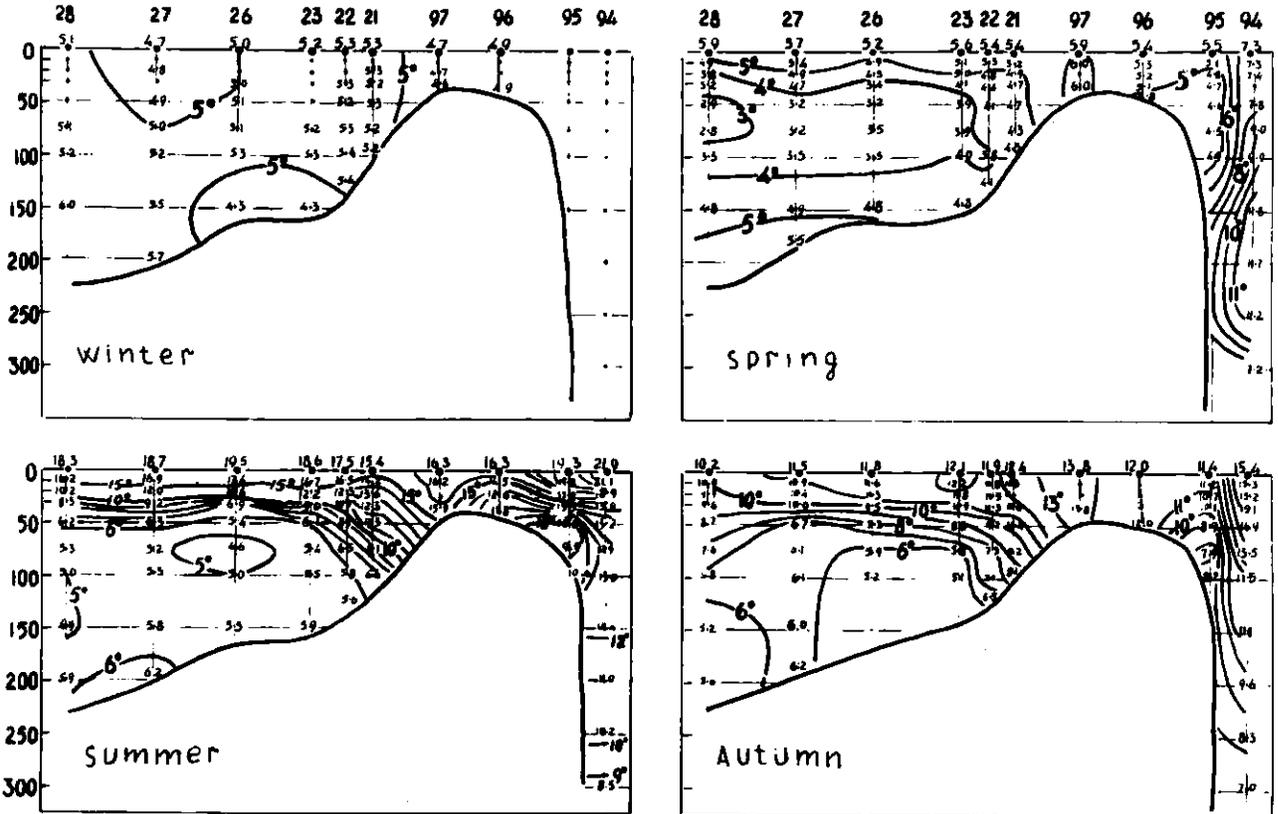


Fig. 11. Mean long-term seasonal water temperatures for Transect XVIII.

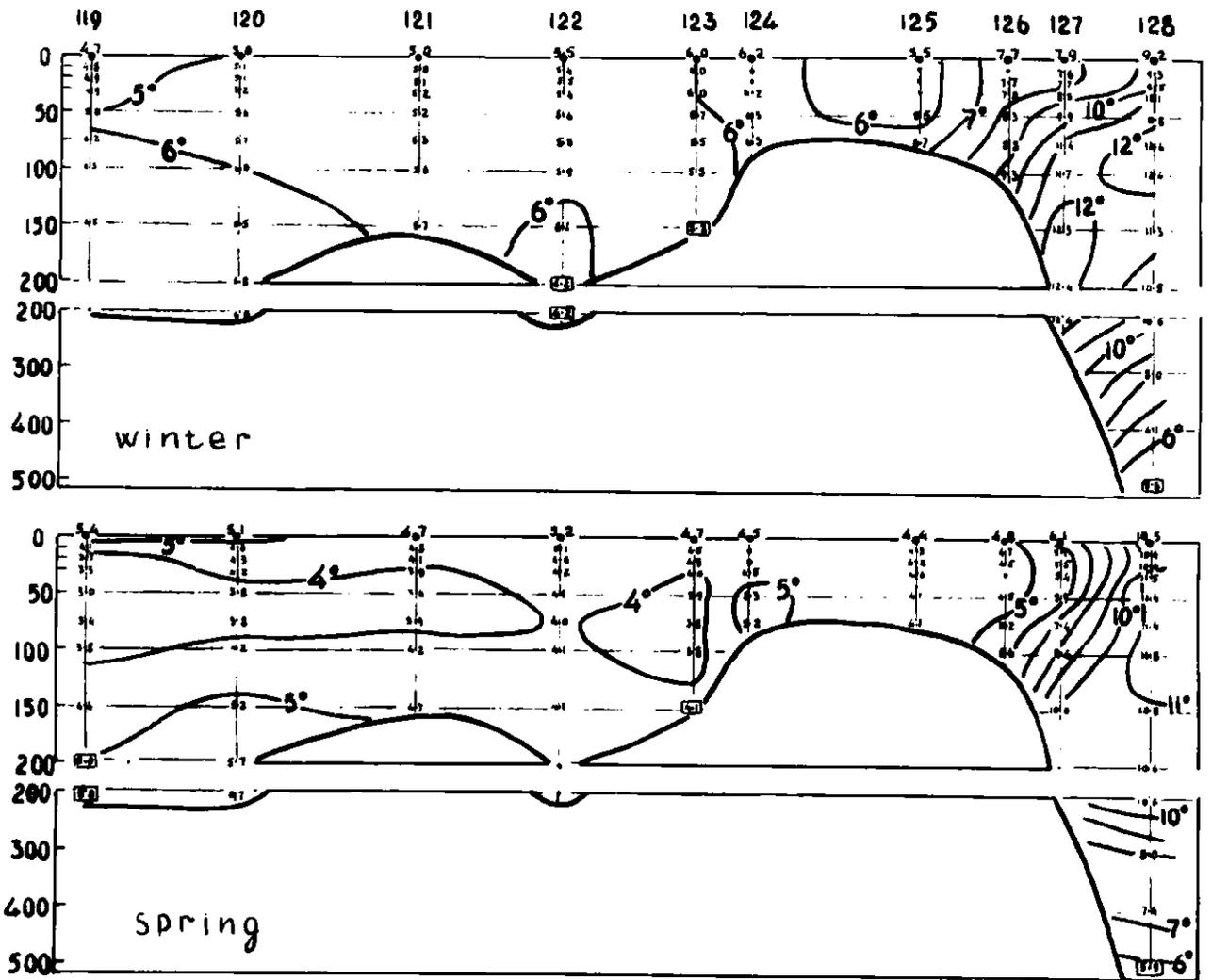


Fig. 12. Mean long-term seasonal water temperatures for Transect XXIII (winter and spring).

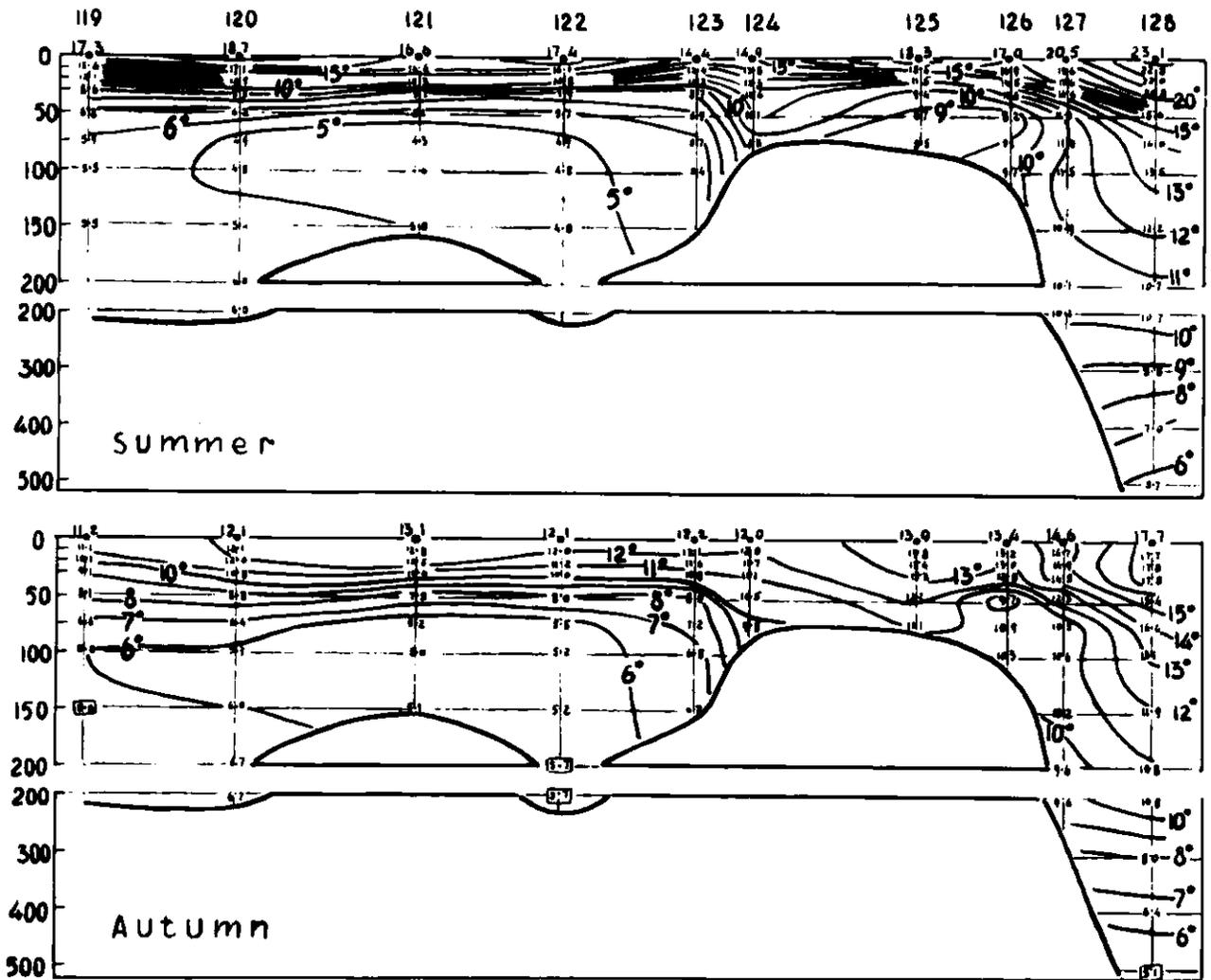


Fig. 13. Mean long-term seasonal water temperatures for Transect XXIII (summer and autumn).

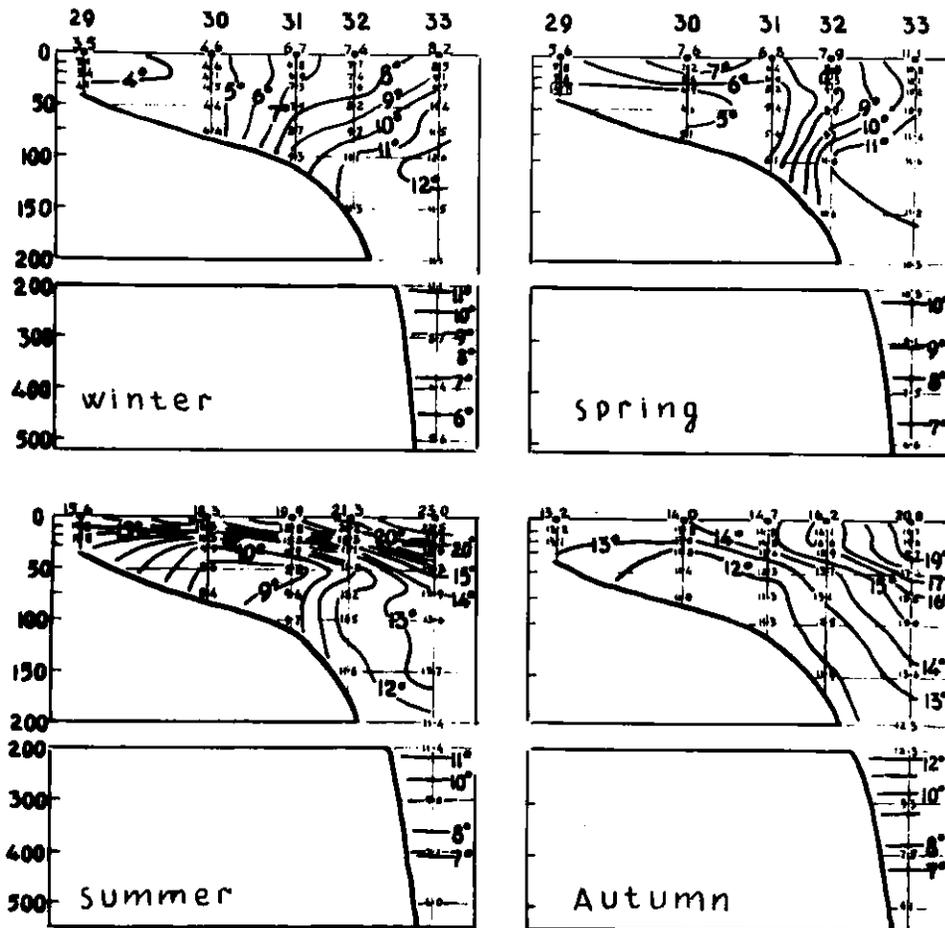


Fig. 14. Mean long-term seasonal water temperatures for Transect V.

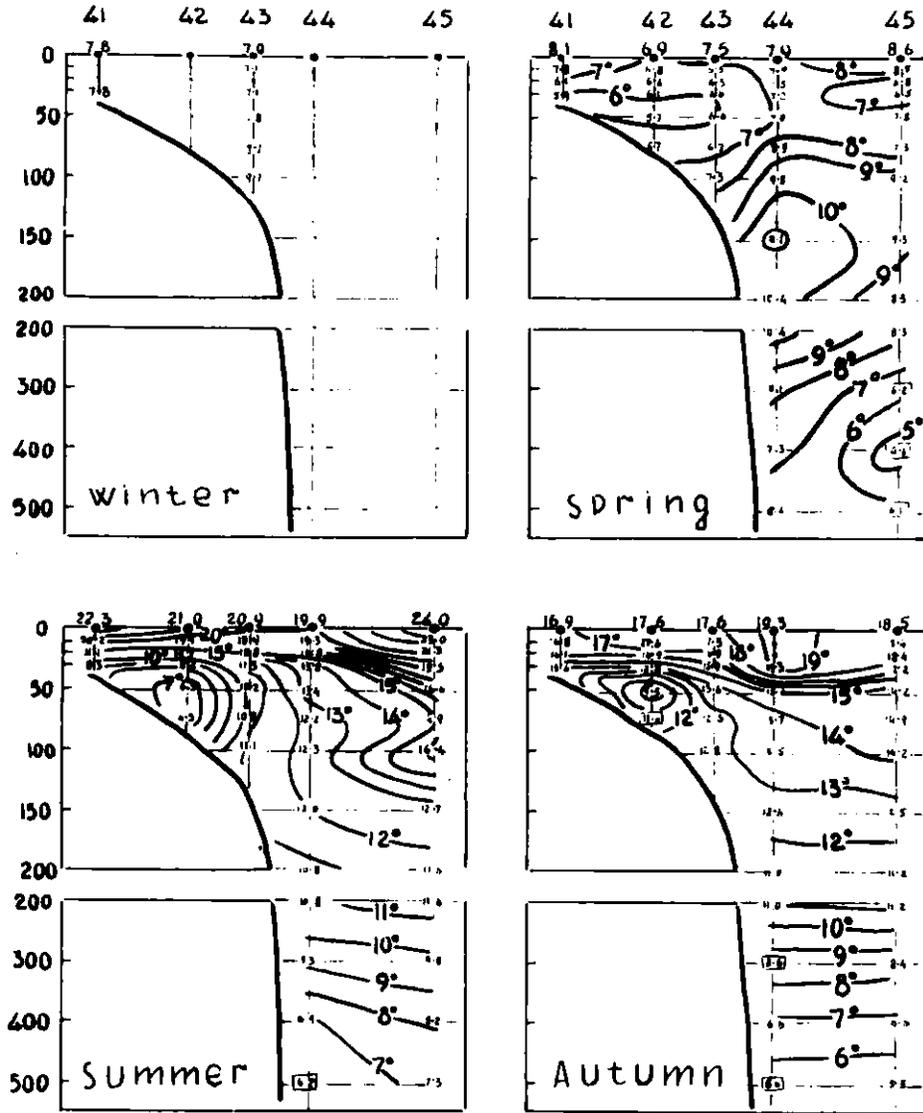


Fig. 15. Mean long-term seasonal water temperatures for Transect XXV.