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Salinity of the waters in the Labrador and Newfoundland areas in 1971-1972

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**ABSTRACT**

Charts of salinity distribution in the surface layer and near the bottom in the area off Labrador and Newfoundland are represented in the paper; the charts were compiled on the basis of data obtained during the three cruises of research vessels of PINRO in 1971-1972.

There are shown the curves of annual course of mean salinity in the 0-50, 0-200 and 200-500 m layers at Section 4-A, compiled on data of the International Ice Patrol for 1955-1963 and PINRO for 1960-1972. The values of salinity anomalies of the Labrador Current in the 0-200 m layer at sections 8-A, 6-A, 4-A and 3-A are given; they are represented on the basis of the observations carried out by the PINRO vessels in separate months for 1971-1972. These data show that in late 1971 - early 1972 in Divisions 3L-3N the salinity was decreased as a result of intensified influx of the cold low salinity waters of the Labrador Current into these areas.

**INTRODUCTION**

Some features of salinity distribution in the areas of the South Labrador and Newfoundland during the first half of 1971 were considered by our researchers in the paper submitted to the previous ICNAF Meeting (Kudlo & Sarmakin, 1972). During the second half of 1971 and in

early 1972 the new observations on standard hydrological sections (Kudlo & Burmakin, 1972) were carried out by research vessels of PINRO "Perseus III" and "Protsion", which were the basis for characteristics of salinity in the ICNAF area during that period.

#### SPIATIAL SALINITY DISTRIBUTION

As was mentioned in the paper by Kudlo & Burmakin (1972), the features of the spatial salinity distribution in the area off Labrador and Newfoundland in 1971 were considered. In the present paper the charts of salinity distribution at the surface and near the bottom in Subareas 2, 3 and 4V<sub>s</sub> in 1971-1972 according to the observations of the PINRO vessels (Fig. 1-4) are given. Salinity charts are compared to the charts of dynamics topography compiled on data of the same cruises (Kudlo, 1972a, 1973). The results of comparison confirmed for the second time our previous conclusions (Kudlo & Burmakin, 1972) which were the following: the salinity field in the Labrador and Newfoundland areas mainly formed by waters circulation system.

#### SALINITY OF THE LABRADOR CURRENT

Salinity values will be probably more perspective for the analysis and comparison with other hydrological parameters and biological phenomena. For this purpose the mean values of salinity on the separate parts of the hydrological sections by layers characterized the salinity regime of the Labrador Current were calculated. Long-term mean curves of annual course of salinity on Sections 8-A, 5-A and 3-A permitted to assess the salinity anomalies due to each observation at the section were compiled (Burmakin & Kudlo, 1971, 1972).

Analogous curve for Section 4-A and, corresponding to it, section of the International Ice Patrol T in the area from the first to twelfth station (from 46°20'N, 49°05'W to

45°20'N, 47°22'W) for the 0-50, 0-200 and 200-500 m layers are represented in Fig. 3. Data for 18 observations at Section T of the Ice Patrol in 1955-1963 (U.S. Coast Guard bull. 1956-1964) and for 26 observations of the PINRO research vessels in 1960-1972 were used for compiling these curves. These observations are combined into one set and they characterize the conditions on the southeast slope of the Grand Newfoundland Bank (northern part of Division 3N).

Calculated on the basis of observations for 1971-1972 the mean values of salinity at four sections and also determined per date of observations the values of norm and anomalies (Table 1) have the notion about salinity of the Labrador Current waters during the period considered. As it is seen from the Table in late 1971 inconsiderable positive anomalies of the Labrador Current salinity were observed only in the South Labrador area and in the Flemish Cape Channel. In spring 1972 in Divisions 3L and 3N salinity decreased, negative anomalies reached 0.4-0.5 ‰.

Thus, the result of the increased intensity of the Labrador Current in spring 1972 (Kudlo, 1973) was the following: temperature and salinity of the waters in the area of the Grand Bank decreased and in the spring-summer period 1972 in the Northwest Atlantic severe ice conditions formed.

#### CONCLUSIONS

1. Salinity field of waters in the area of Labrador and Newfoundland mainly forms by waters circulation system.
2. Curves of the annual course of the Labrador Current salinity in Section 4-A (T) across the southeast slope of the Grand Bank for the 0-50, 0-200 and 200-500 m layers were obtained on the basis of long-term data.
3. In the 1st half of 1972 the Labrador Current waters in Divisions 3L and 3N were characterized with decreased salinity, that was the evidence of the increased intensity of the current during that period.

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Table I The Labrador Current waters salinity and its anomalies  
on some standard sections in the 0-200 m layer in 1971-1972  
(‰)

Section part of section (Division)	Date of observations	S a l i n i t y		
		observed	normal	anomaly
8-A, (B) (Division 2J)	July 29-30, 1971	33.67	33.41	+0.26
	November 08-09, 1971	33.65	33.58	+0.07
6-A, (G) (Division 3L)	May 24-25, 1971	33.01	33.77	-0.46
	December 14-15, 1971	34.21	34.16	+0.05
	April 10, 1972	33.46	33.91	-0.45
	May 01-02, 1972	33.76	33.80	-0.04
	May 25-26, 1972	33.64	33.77	-0.13
4-A (1-12 stations) (Division 3N)	May 18-19, 1971	33.97	34.04	-0.07
	July 02-03, 1971	33.26	33.68	-0.42
	December 19-20, 1971	33.88	34.16	-0.28
	April 24-25, 1972	33.85	34.09	-0.24
	May 20-21, 1972	33.82	34.02	-0.20
3-A (4-10 stations) (Division 3N)	May 15-16, 1971	33.23	33.71	-0.48
	June 26, 1971	33.30	33.87	-0.57
	December 24-25, 1971	33.91	34.09	-0.18
	April 18-19, 1972	33.44	33.87	-0.41
	April 22-23, 1972	33.34	33.84	-0.50
	May 16-17, 1972	33.37	33.70	-0.23

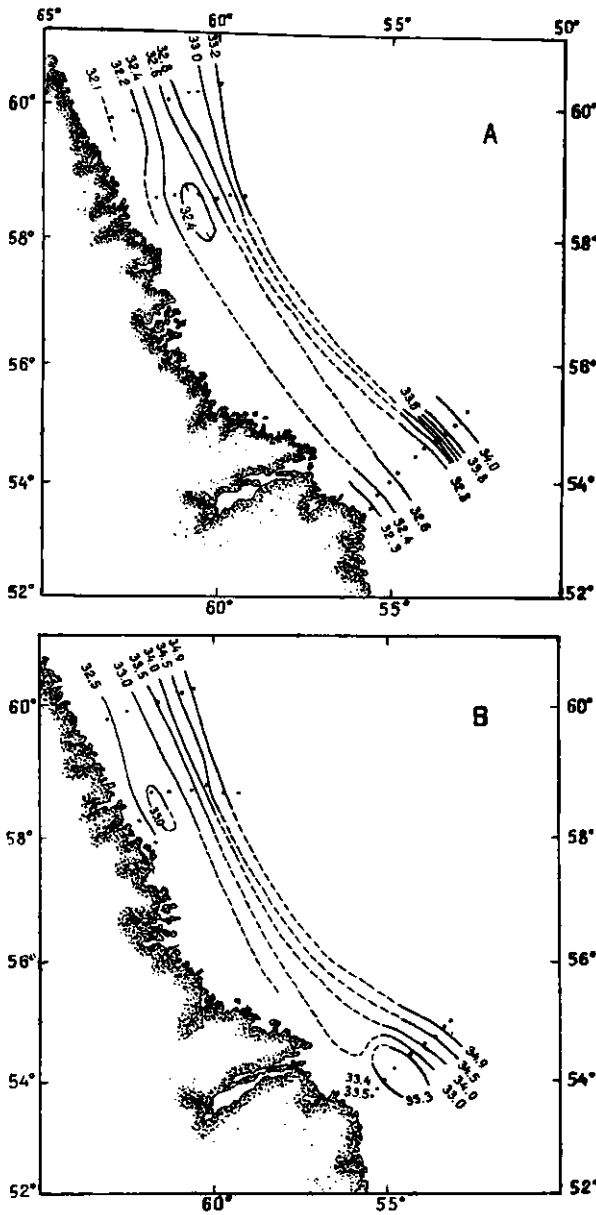


Fig. 1. Salinity distribution in the Labrador area from data of the 7th cruise of FRV *Perseus III* (8 November-7 December 1971). (A) surface; (B) near bottom (to 2,000-m depth).

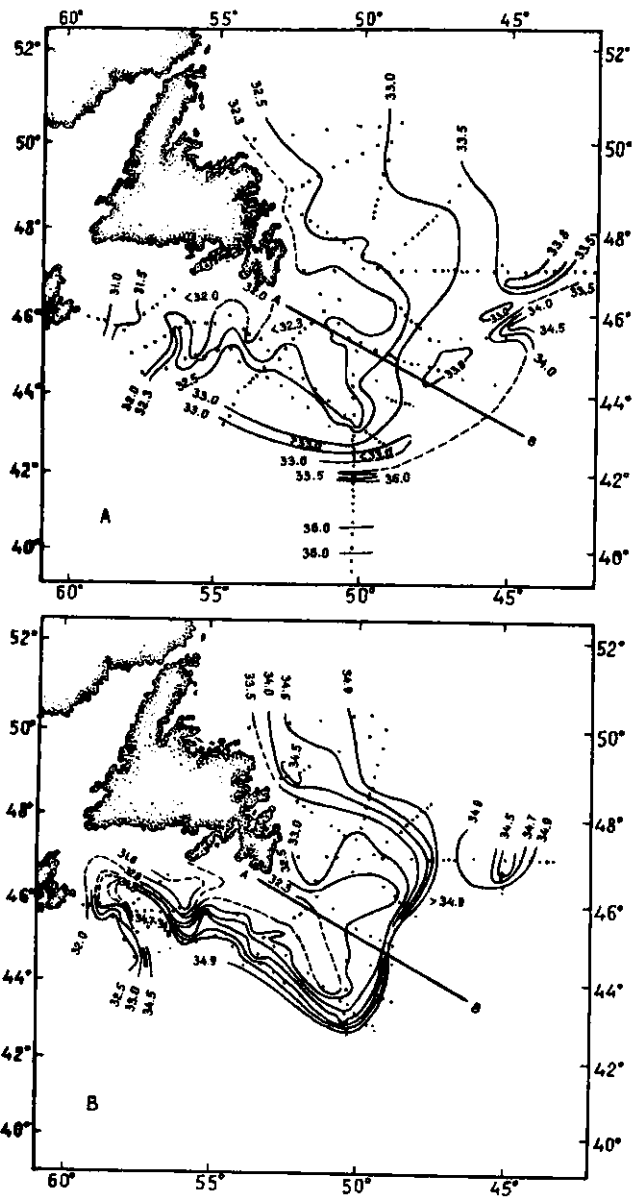


Fig. 2. Salinity distribution from data of the 6th cruise of R/V *Protsion* in 1971: southward of line AB (22 March-11 April); northward (19 April-11 May) - 1st survey. (A) surface; (B) near bottom (to 2,000-m depth).

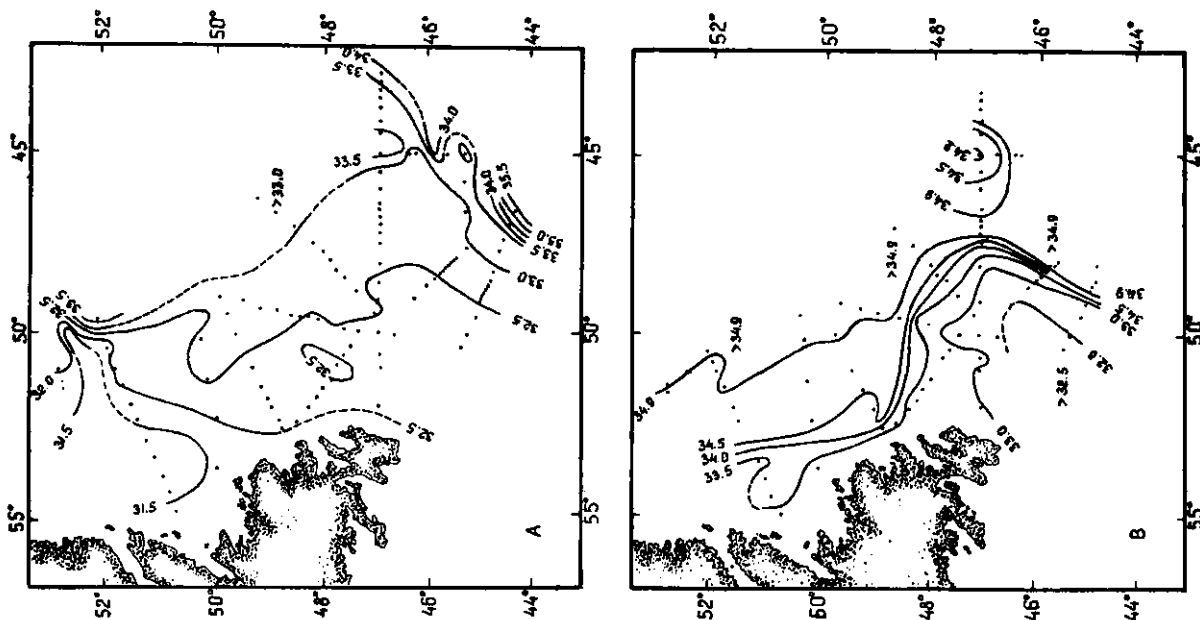


Fig. 3. Salinity distribution from data of the 6th cruise of R/V Protston (15 May-9 June 1971) - 2nd survey. (A) surface; (B) near bottom (to 2,000-m depth).

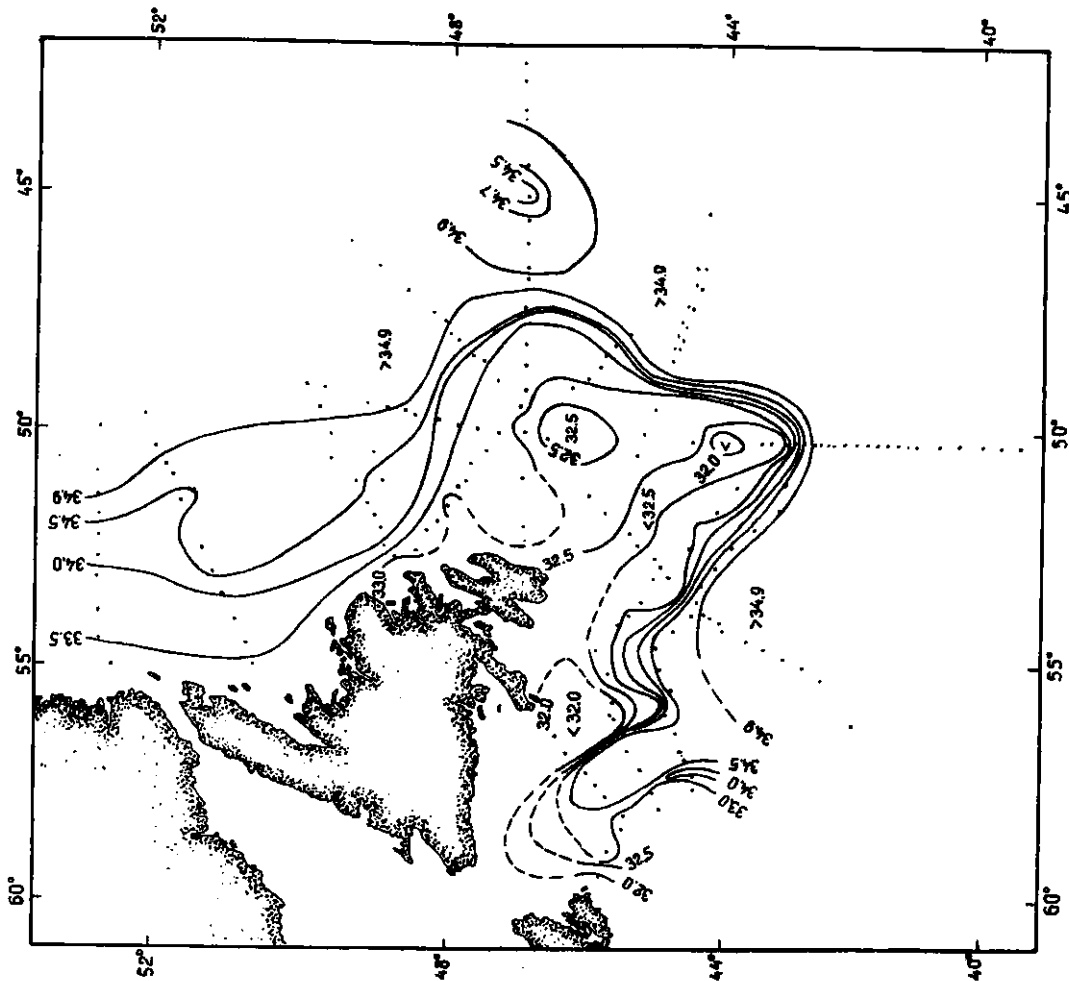


Fig. 4. Salinity distribution near the bottom due to data of the 7th cruise of R/V Protston (23 November 1971-11 February 1972).

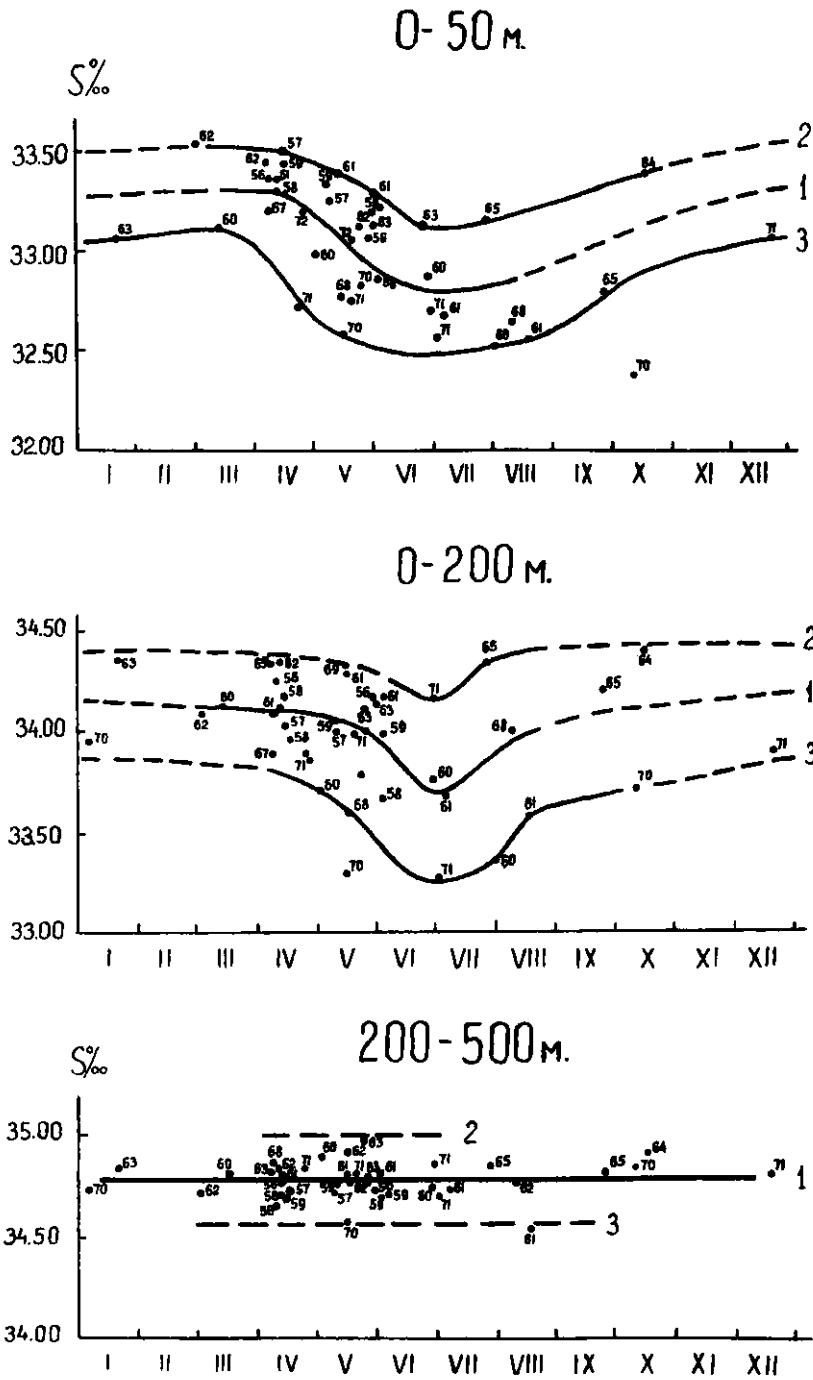


Fig. 5. Annual course of mean (1) and extreme (2, 3) values of the Labrador Current waters salinity in the different layers on Section 4-A due to the long-term data.