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OCEANOGRAPHIC SURVEYS BY JAPANESE RESEARCH VESSELS IN THE BERING SEA JUNE-AUGUST 1979

Far Seas Fisheries Research Laboratory
Fisheries Agency of Japan
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The oceanographic survey was carried out for 48 days from June 11 to July 28 and 35 days from June 29 to August 2 in 1979 respectively by Yakushi maru No. 21 and Shotoku maru No. 35.

Water temperature at the surface and various strata were recorded by means of mercury thermometer and XBT immediately on the completion of each trawl operation.

The surface temperature data were observed at 377 stations in all, 111 stations in June, 258 in July and 8 in August. The water temperature at the bottom layer was recorded totally at 140 stations, 52 in June and 88 in July.

No observation was made as for salinity and direction and speed of current.

This survey does not necessarily provide sufficient data for clarifying all of the environmental aspects due to differentiation in the area and period of the survey in view of its primary object to estimate the biomass of groundfish.

The survey results are summarized as follows:

1. Surface Temperature Distribution

As a result of the survey, the horizontal distribution of surface temperature is isothermally depicted as shown in the Fig. 1 - 2.

It is observed that the water temperature distribution in the Bering Sea considerably varies subject to survey period and meteorologic and oceanographic conditions even in the season of June through August when the meteorologic condition is comparatively stable. It was therefore, necessary to study the temperature data by month.

Distribution of Surface Temperature during June (Fig. 1)

Surface temperatures ranged from 5.8°C to 9.2°C. With the survey area confined only to the continental slope south of 60°N latitude, the surface temperature still remains to be unknown as for the strata above the continental shelf.

Temperature distribution ranging from 6.5°C to 7.0°C was observed along the line of 200 m depth on the continental slope. On the other, water temperature distribution of 7.0°C to 9.0°C was observed east of Unimak Pass because of intrusion of the Alaskan Stream.

Distribution of Surface Temperature during July (Fig. 2)

Surface temperature range was from 6.2°C to 14.1°C apparently wider than in June. The area north of Pribilof Islands was prevailed by the temperature distribution of 6.5°C to 8.0°C, one to two degrees centigrade higher than the temperatures recorded during June. The water temperature distribution south of Pribilof Islands presented rather complicated phases influenced by the water flowing from the high temperature area of 14.0°C off Cape Newenham and at the same time by the Alaskan Stream intruding through Unimak Pass.

2. Distribution of Bottom Water Temperature

Unlike the case with the surface temperature, not so great change as such was not observed as to the bottom temperature which is likely to affect the distribution of groundfish. Temperature data, however, were analized by month as the temperature distribution still varied from month to month.

Distribution of Bottom Temperature during June (Fig. 3)

There was observed the 3°C water temperature distribution north of St. Paul Island, which was supposed to have intruded from the northwestern area. The 4°C distribution was observed west of St. George Island. In the area west of Unimak Island, on the other hand, was observed the temperature distribution of 3.5°C to 4.0°C supposedly originated from Alaskan Stream.

Distribution of Bottom Temperature during July (Fig. 4)

The distribution of bottom temperature was different from that of surface temperature on the continental shelf south of 59°N latitude. The distribution of isotherm in the bottom strata showed a pattern of parpendicularing to the surface isotherm under the influence of Alaskan Stream intruding north bound from off Cape Newenham and south bound from Unimak Pass with the temperature distribution of 2.0°C to 4.0°C flowing from the north area between them.

Discussion

There are many reports on the oceanographic conditions in the eastern Bering Sea, on which Favorite, Dodimead and Nasu (1979) recently outlined preliminary results of the surveys made from 1960 to 1971.

Maeda (1979) reported on the ocean structure and oceanographic condition on the continental shelf of the Bering Sea by applying the data obtained from the surveys carried out during the period of June through August from 1956 to 1976. The report describes the 0°C and 2°C isotherms as the intension of the cold water at the bottom layer which indicate the location as far east as Bristol Bay expressed in longitude counted from 175°W. This is shown in the Fig. 4 supplemented with data obtained by the Japanese research vessels as for the years since 1977. According to the figure, a considerable variation was seen both in the 0°C and 2°C isotherms with the same changing pattern in common. The westward intension of the isotherms was observed in such years of 1955, 1958, 1961, 1963, 1965, 1967, 1969 through 1970, 1973 and 1975 as the warm water intension was recorded, while the broad eastward shift of the isotherms occurred in 1956, 1959, 1960, 1962, 1964, 1966, 1968, 1971, 1972, 1974 and 1976 when the cold water intension was strong.

Since 1977, on the other hand, the cold water intension has been inclined to become loose with such a particular feature shown in 1979 (Fig. 4) that it was presumably very warm year with no station in the survey area at which the below zero degree was observed.

As for pollock, yellowfin sole and other major species inhabiting in the eastern Bering Sea, such a trend was observed that year classes incubated in the warm water years were predominant while the incubation of year classes was inclined to be lower during the cold water years. And, thus, it calls attention what sort of influence the warm water year of 1979 shall gather on the future trend of groundfishes.

Reference Cited:

MAEDA, Tatsuaki. 1977. Relationship between annual fluctuation of oceanographic conditions and abundance of year classes of the yellowfin sole in the eastern Bering Sea. Res. Inst. N. Pac. Fish., Hokkaido Univ., Spe. Vol., 259-268.

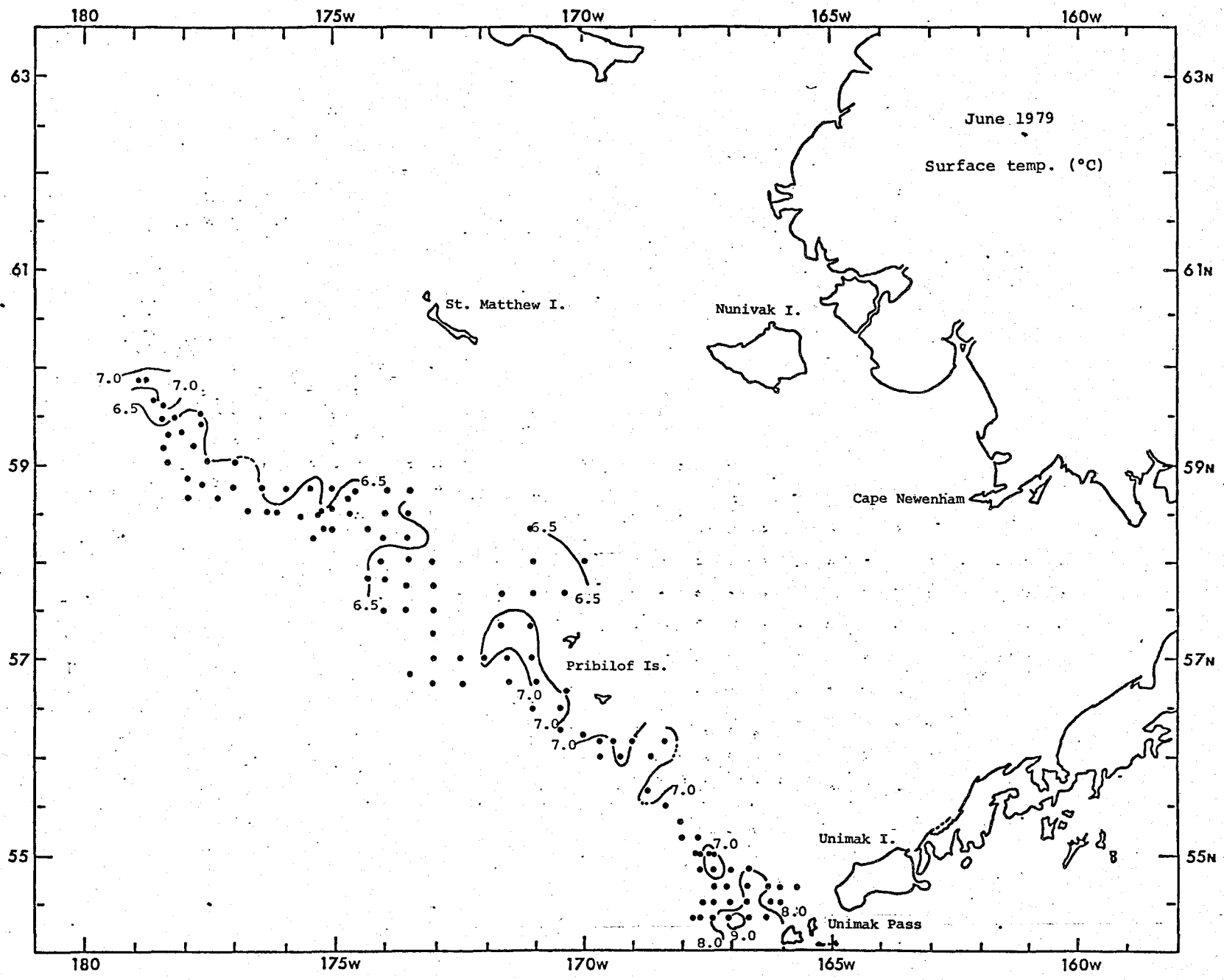

Fig. 1. Horizontal distribution of surface water temperature (°C) observed during June 1979.

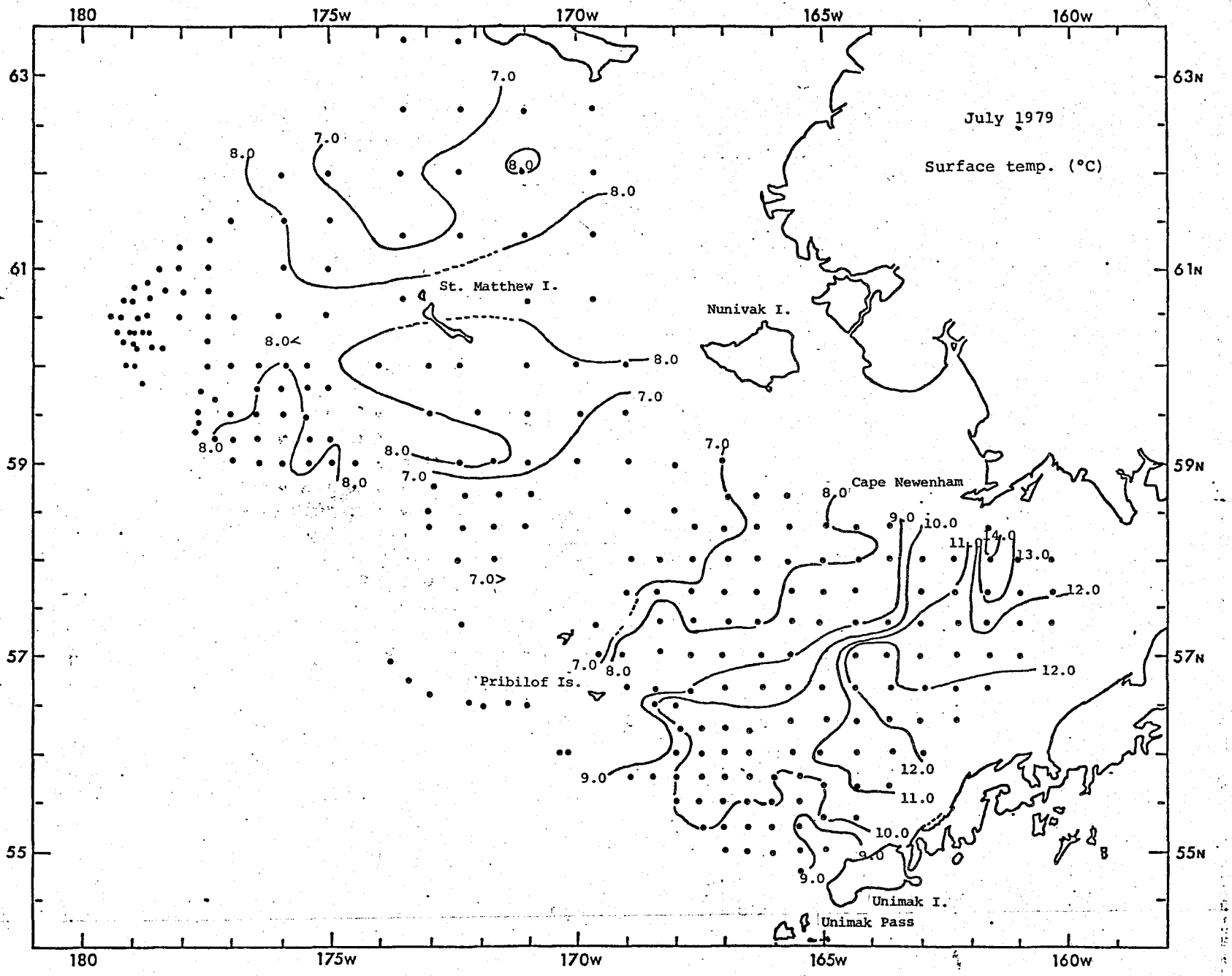

Fig. 2. Horizontal distribution of surface water temperature (°C) observed during July 1979.

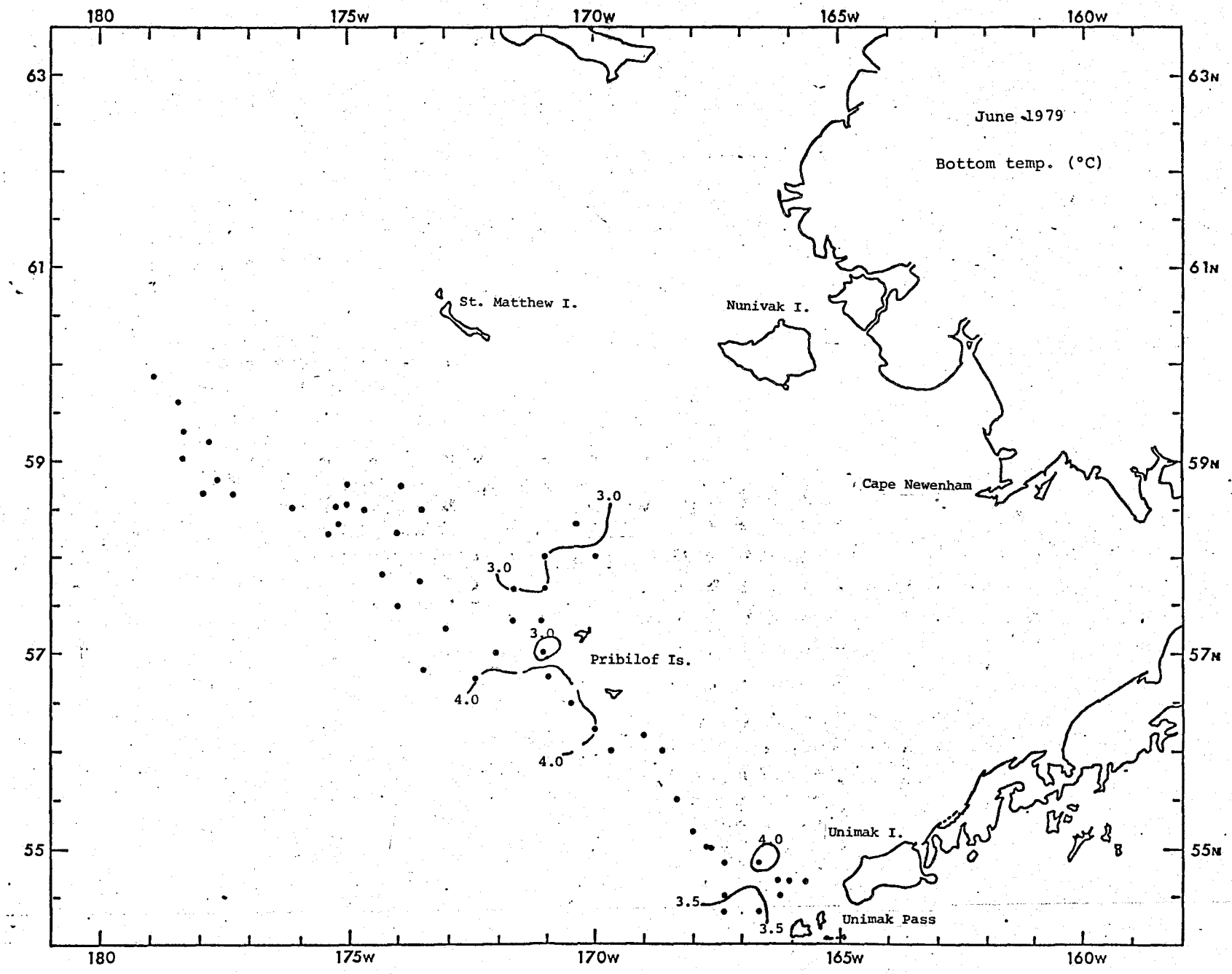

Fig. 3. Horizontal distribution of bottom water temperature (°C) observed during June 1979.

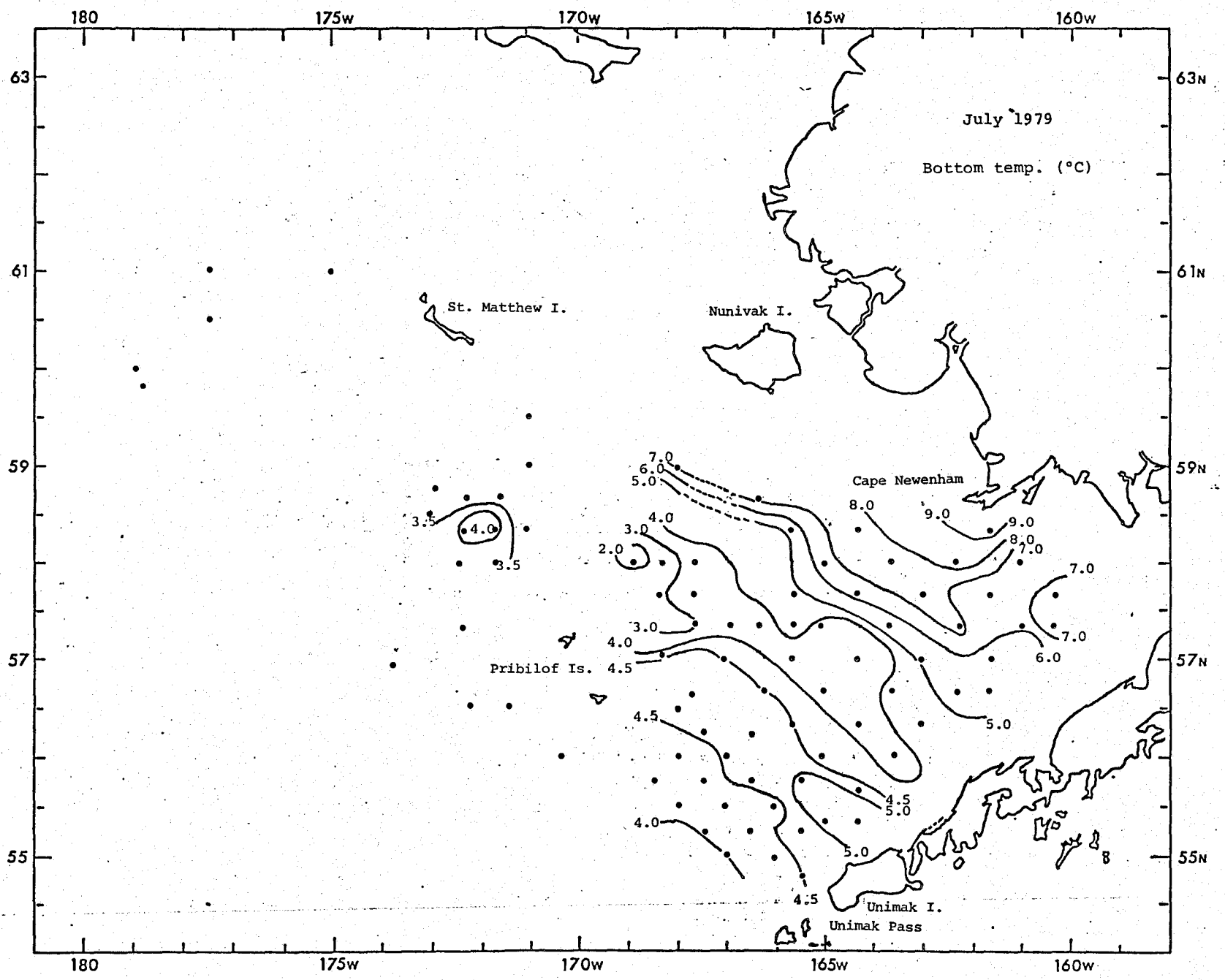

Fig. 4. Horizontal distribution of bottom water temperature (°C) observed during July 1979.

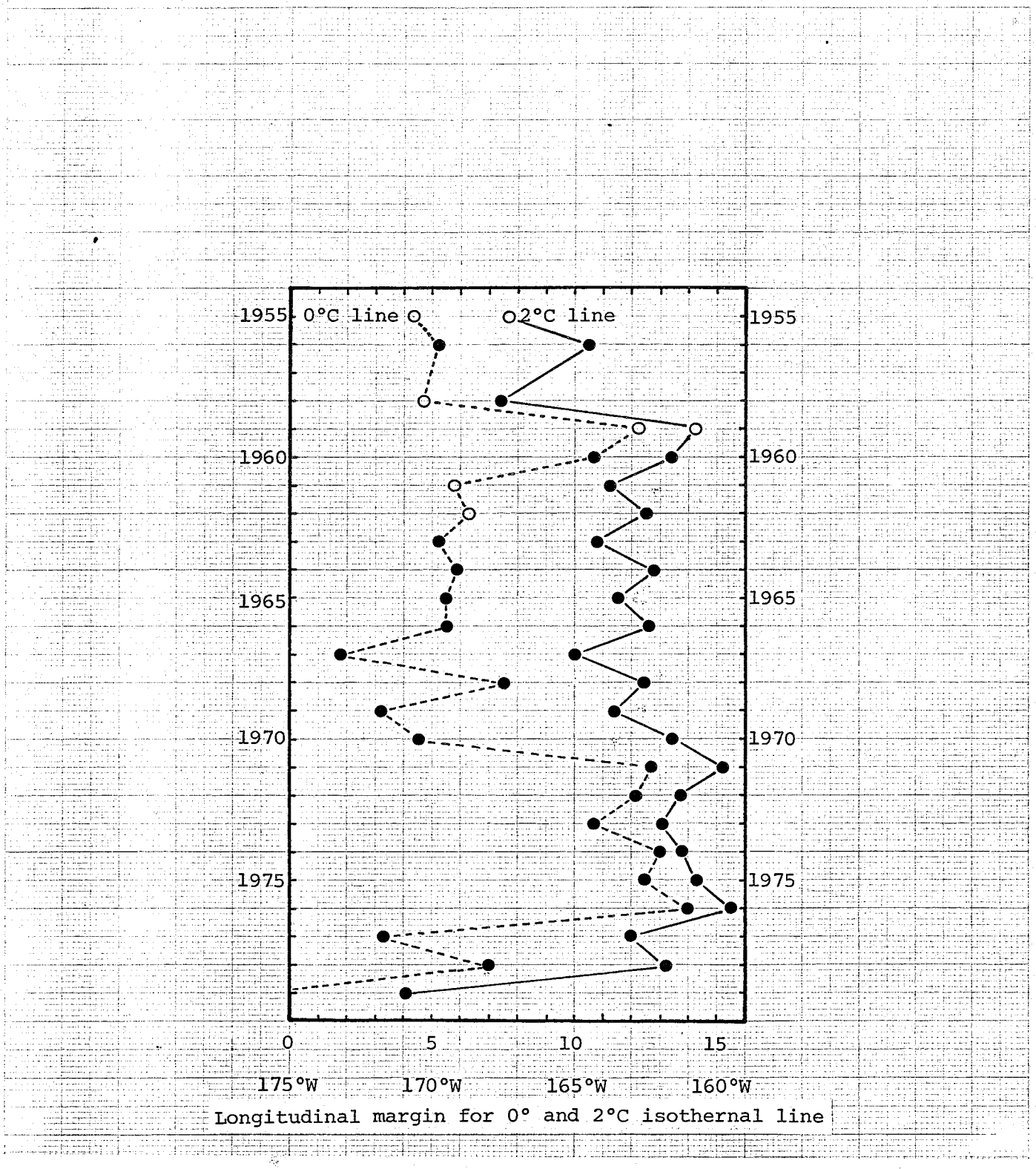

Fig. 5. Annual fluctuation of the eastern margines for the 0°C and 2°C isothermal lines on the bottom water temperature.

Open circle: Estimated position from another informations.

Solid circle: Observed position from oceanographic surveys