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TRANSLATION

OUTLINE OF OCEANOGRAPHIC CONDITIONS IN THE NORTHWEST PACIFIC DURING THE SUMMER OF 1980

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Introduction

Oceanographic research during the summer of 1980 was conducted by nine salmon research vessels using mainly bathythermographs from April to July. Observations were made at 30 stations in April, 128 in May, 80 in June and 217 in July.

Much previous work has pointed out that distribution and migration of salmon in the northwestern Pacific Ocean is influenced by the Alaskan Stream and Western Subarctic Water. Therefore, we assessed the distribution and features of these water masses.

1. Western Subarctic Water

The cold water mass west of 180^{o} around the Kamchatka Peninsula, the Kuril Islands and a part of the Okhotsk Sea, including the central Bering Sea is known as Western Subarctic Water and is characterized by temperatures less than $3.0^{o}C$ at 100 m depth.

April (Fig. 1)

Oceanographic observations to determine the 3.0°C isotherm, which is an indicator of the Western Subarctic Water, have not been conducted in recent years in April. The 3.0°C isotherm as obtained from data in 1971 extended through the points of 41°N at 150°E, 45°N at 155°E, 43°N at 157°30'E, 46°N at 160°E, and southward to Attu Island.

In the waters of 41°N, 150°E and 43°N, and at 157°30'E, where the 3.0°C isotherm appeared in 1971, the 6.0°C and 5.0°C isotherms were also observed. When we looked at waters east of 160°E and south of 45°N, we could not observe water less than 3.0°C in 1971, but we could observe this water near 43°N, 165°E in 1980. Therefore, if we compare the temperature in 1980 at 100 m depth with that in 1971, it was generally high in waters west of 160°E and low in waters near 165°E in 1980. No particular differences were observed in the southward extension of the Western Subarctic Water.

May (Fig. 2)

The 3.0°C isotherm in the research area showed a zigzag phenomenon at 44°N, 158°E which extended to the northwest and reached 50°N, 175°E. According to Fig. 5, which shows the extension of the 3.0°C isotherm in 1975 to 1980, the annual fluctuation of the 3.0°C isotherm in waters west of near 165°E seemed to be minor and we did not recognize any particular change in 1980 compared with previous years.

The annual fluctuation of the Western Subarctic Water in the fishing grounds for salmon in the northwestern Pacific Ocean was generally large in the area of the Komandorskie Cold Tongue which extended to near 165°E to 172°E. Annual latitudinal and longitudinal fluctuations were apparent in that Cold Tongue. The Komandorskie Cold Tongue in 1980 showed a somewhat southward trend in comparison with

that in 1975 and 1976, but was relatively minor in comparison with that in 1978 and 1979, and thus, in general, showed a similar trend to that in 1975 and 1976.

June (Fig. 3)

The 3.0°C isotherm which extended to near 45°N, 160°E in May was observed in the same position in June. Although the same extension in June was observed, there was some change in the zigzag condition in comparison with May, but the southernmost latitude did not change. Therefore, the Komandorskie Cold Tongue in June extended somewhat further, but the extrusions were similar.

July (Fig. 4)

The 3.0°C isotherm in waters west of 165°E extended from 41°N, 150°E to 47°N, 165°E and showed a similar extension to that in June. The horizontal extensions of the 3.0°C isotherm at 100 m depth in 1975 to 1980, as indicated in Fig. 6, did not show any particular changes in waters west of 165°E and was the same as in June. However, the southerly extension of the Komandorskie Cold Tongue was remarkable compared with June and the southerly trend of the Komandorskie Cold Tongue in July was the most pronounced since 1975 (no information available for 1977).

2. Alaskan Stream

The Alaskan Stream which flows westward south of the Aleutian Islands is characterized by the warm current of 4.0°C which is associated with salinity of more than 33.3 °/oo. The warm current area of more than 4.0°C in waters deeper than 100 m depth shows the existence of water which has some relationship to the Alaskan Stream. We determined the westward extension of the Alaskan Stream from the western tip of the 4.0°C isotherm.

May (Fig. 2)

The location of the Alaskan Stream was unknown because of lack of observations.

June (Fig. 3)

The warm area of more than 4.0°C around the Aleutian Islands was observed in waters from south of Attu Island to the east and the western tip of the Alaskan Stream was estimated to be at 171°E.

According to the annual fluctuation of the Alaskan Stream, as indicated in Fig. 7, the westward extension in 1980 was as remarkable as in 1963, 1976, 1978 and 1979 (most remarkable in 1963 and 1979). Also, a warm current of 4.5°C was observed in waters south of Attu Island and this was warmer than in previous years. The increase in surface temperature became significant from mid June.

July (Fig. 4)

Isotherms of 4.0°C around the Aleutian Islands were observed at 178°W to 176°W, but the westward extension was not determined because of lack of observations. However, if we estimate the location of the 4.0°C isotherm in waters south of Attu Island in July from the location and distribution of the 3.0°C isotherm in June, which was distributed around 51°N, 170°E to 50°N and 175°E south of Attu Island, we could not observe any particular change.

3. Surface conditions

The low temperature area with waters lower than 2.0°C which had been observed in waters east of the Kuril Islands in May each year extended to near 180°, almost to the central Aleutian Islands, in 1980. The distribution of low temperature water differed from the previous year and was divided by the warm current area (4.0° to 5.0°C) at 167°E to 180°.

The low temperature area which extended from the Kuril Islands to the east was observed clearly until the period of June 21 to 25, and the extension reached nearly to Attu Island and was 2^{o} to 3^{o}C lower than that in the same period in the previous year. The low temperature area almost disappeared in July and the surface temperature chart (issued by Fishery Information Service Center) showed that areas which had temperatures lower than 5.0^{o}C in late June had risen to 6^{o} to 7^{o}C in early July.

The distribution of atmospheric pressure showed a generally normal pattern until June. However, in July the Okhotsk high pressure zone grew and extended to the south. As a result, the cold air originating from that high pressure area, brought unusual low temperatures to Japan which were observed in some offshore areas of Hokkaido to Sanriku. However, in the salmon fishing grounds in the North Pacific, a somewhat high temperature trend was observed at least in late July (data after late July not yet analyzed) and we did not observe the unusual low temperature phenomenon.

Oceanographic conditions in the summer of 1980 are summarized as follows--

1. Western Subarctic Water

We could not observe any particular changes in waters west of 165^{o}E but the southerly trend of the Komandorskie Cold Tongue was significant in July.

2. Alaskan Stream

The westward extension of the Alaskan Stream was remarkable.

3. Surface conditions

The Okhotsk high pressure area developed in July and extended to the south and a low temperature phenomenon was observed in some offshore areas of Hokkaido to Sanriku. However, on the salmon fishing grounds, a somewhat high temperature trend was found in late July (data after late July not yet analyzed) and the lower temperature phenomenon was not observed.

FIGURES 1 TO 7 ARE IN ENGLISH IN THE JAPANESE DOCUMENT

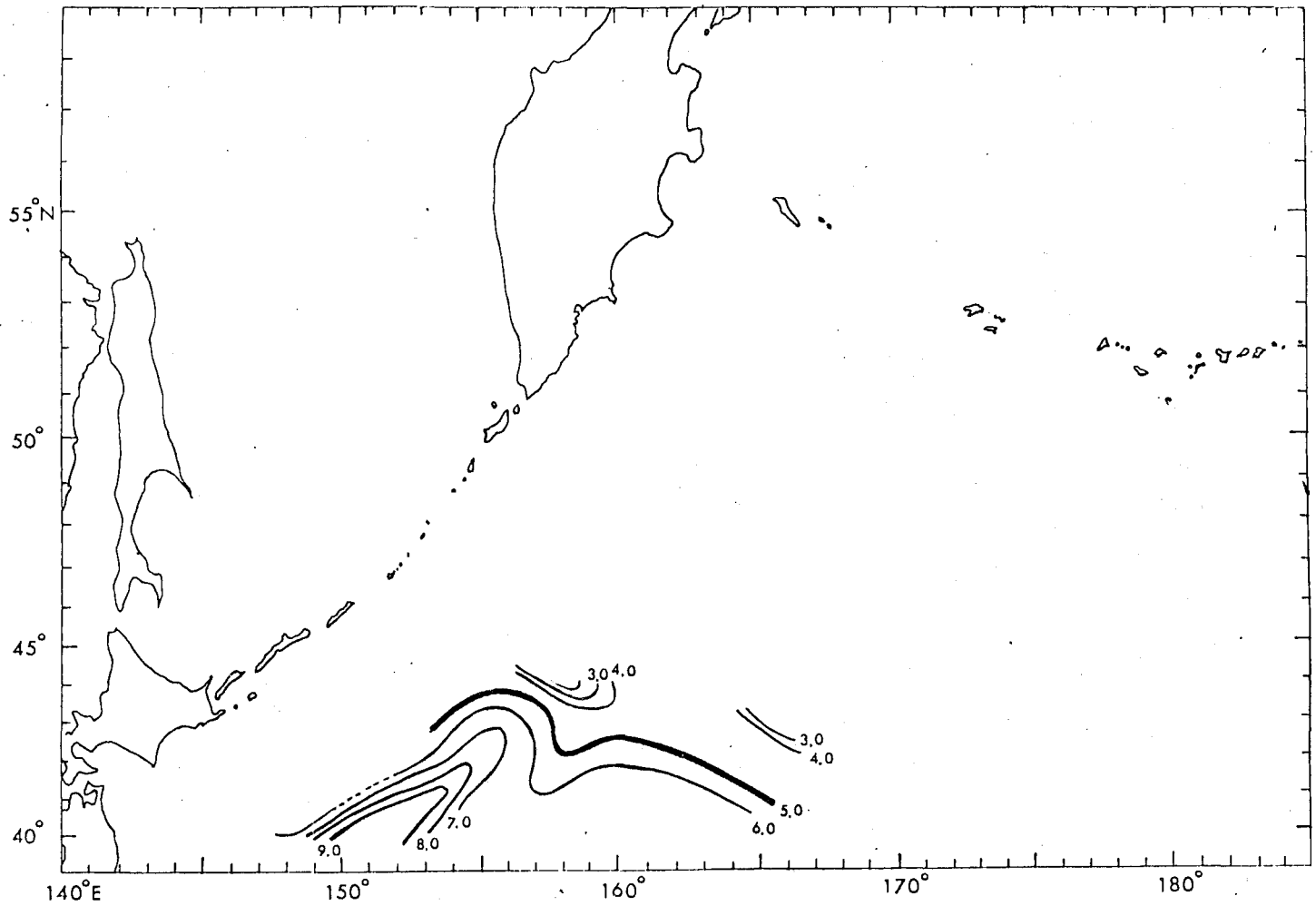

Fig. 1 Temperature (°C) at 100 m in April 1980.

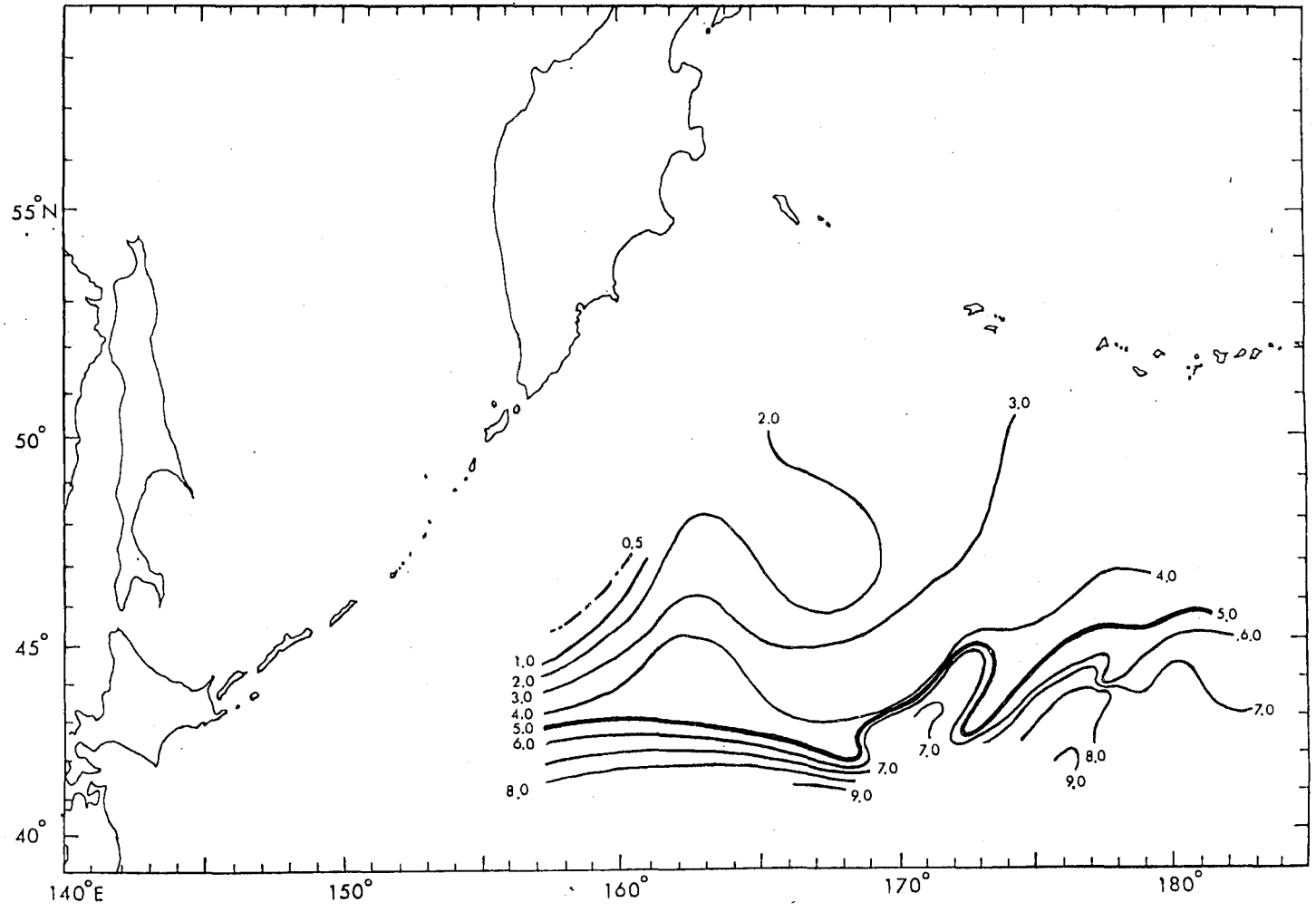

Fig. 2 Temperature (°C) at 100 m in May 1980.

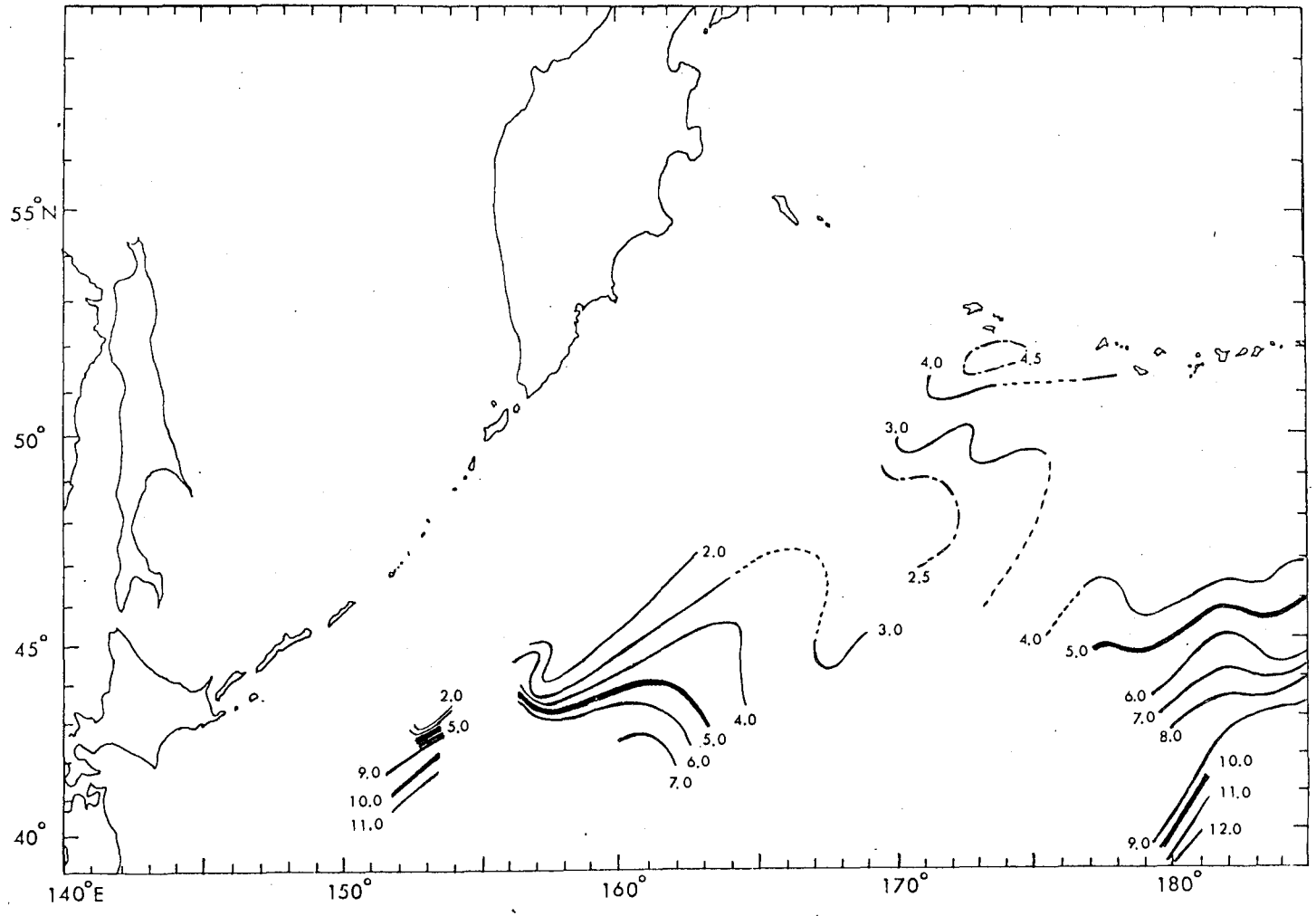

Fig. 3 Temperature (°C) at 100 m in June 1980.

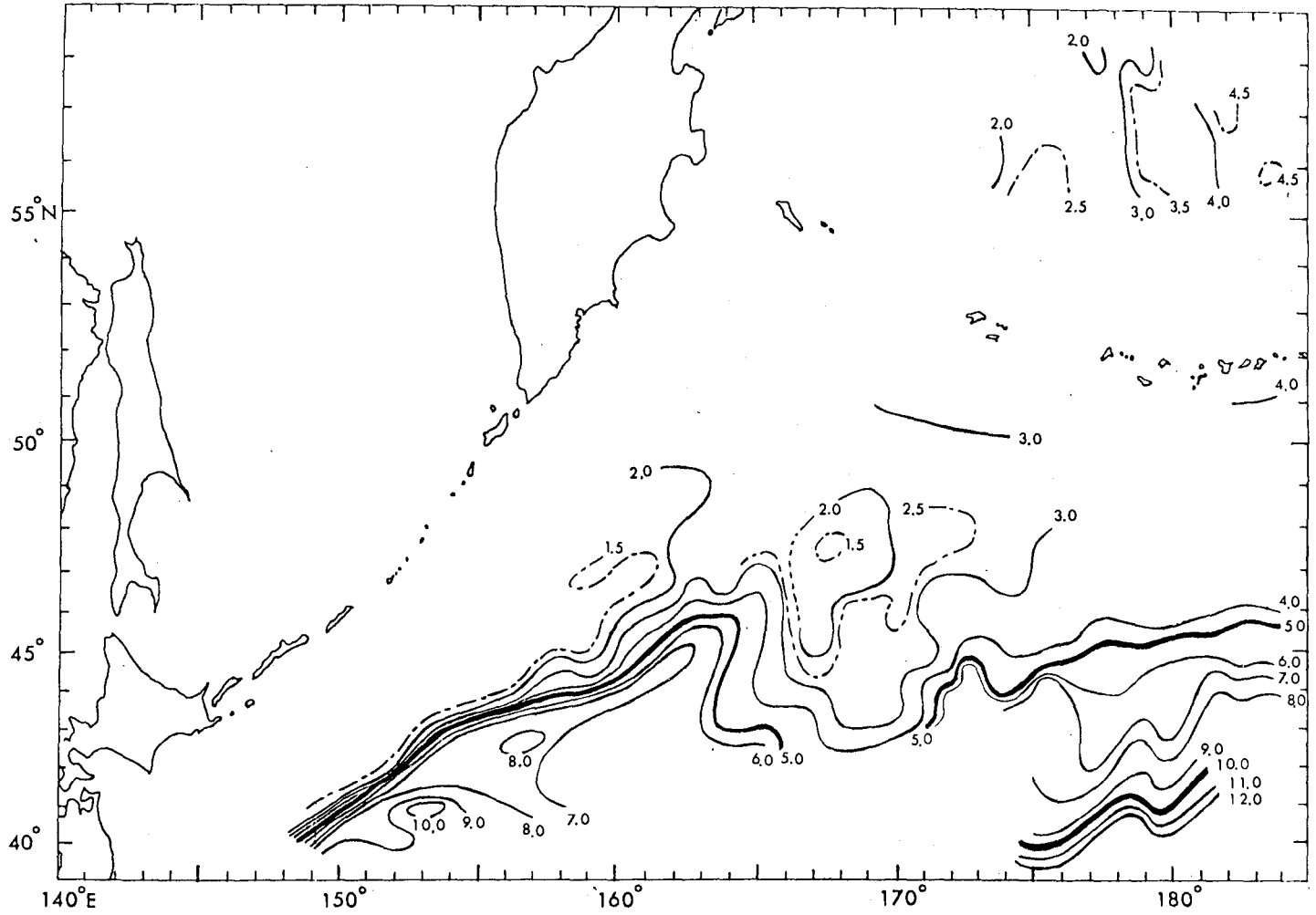

Fig. 4 Temperature (°C) at 100 m in July 1980.

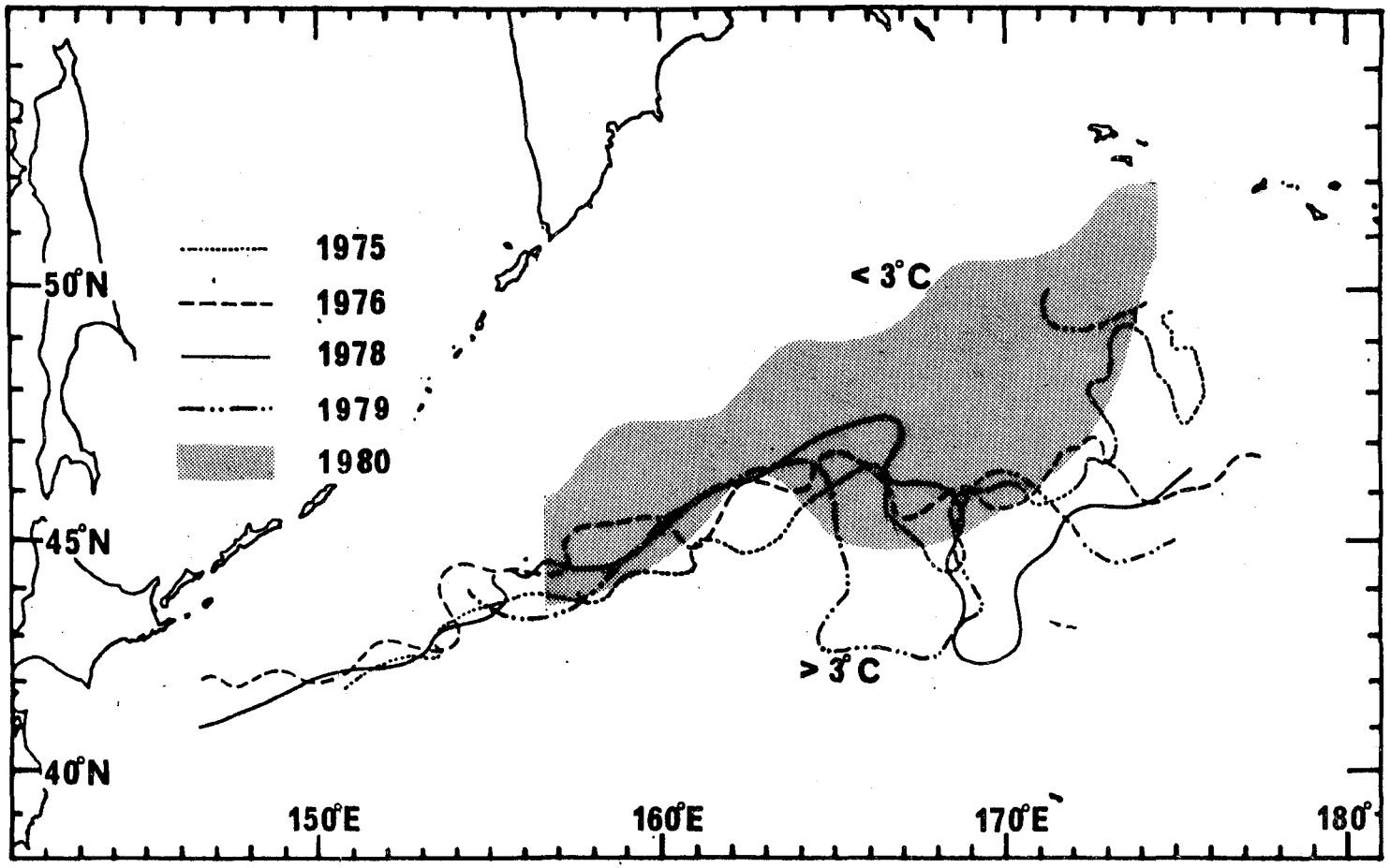

Fig. 5 Isotherm of 3.0°C at 100 m in May in the year of 1975 to 1980 except for 1977.

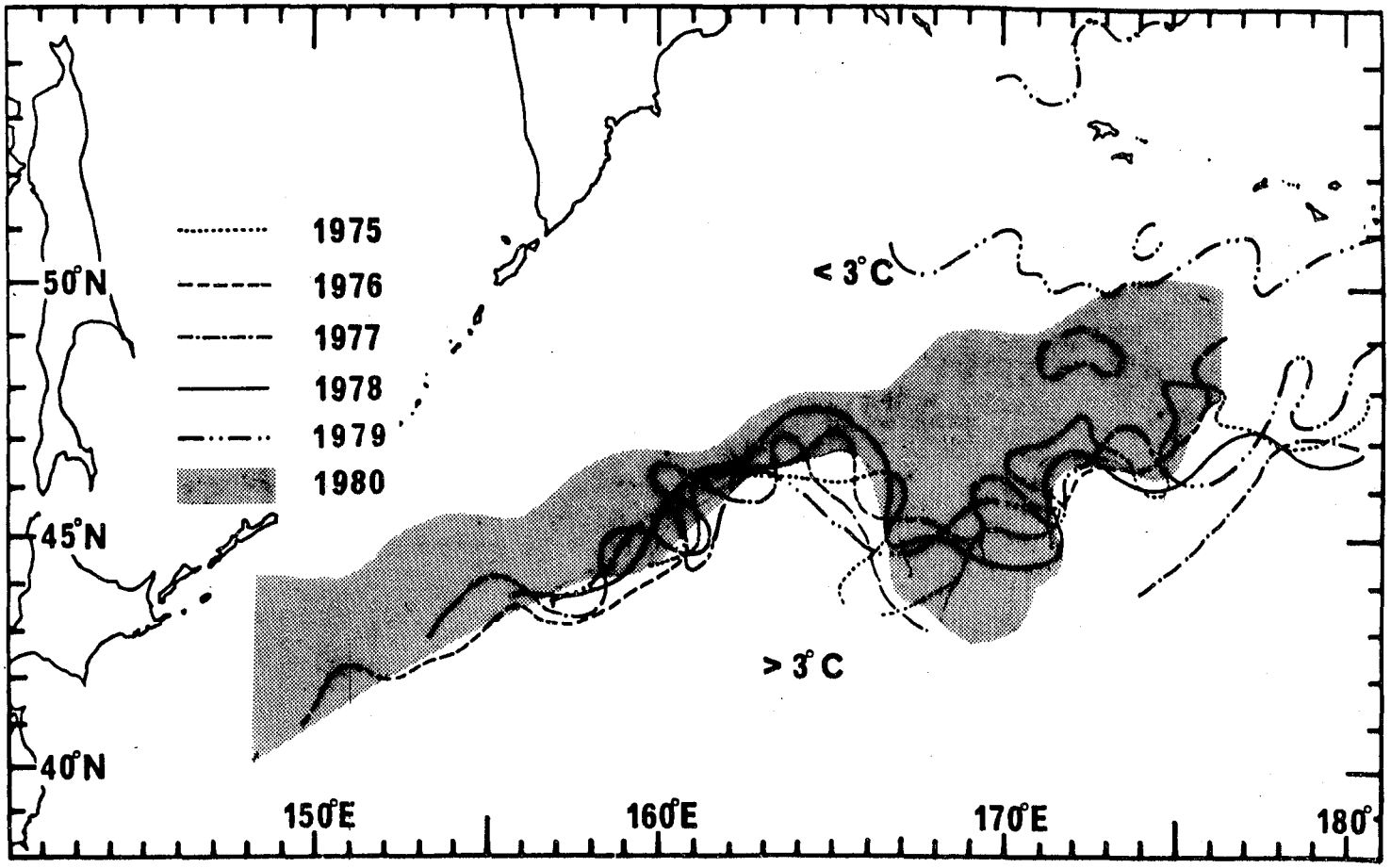

Fig. 6 Isotherm of 3.0°C at 100 m in July in the year of 1975 to 1980.

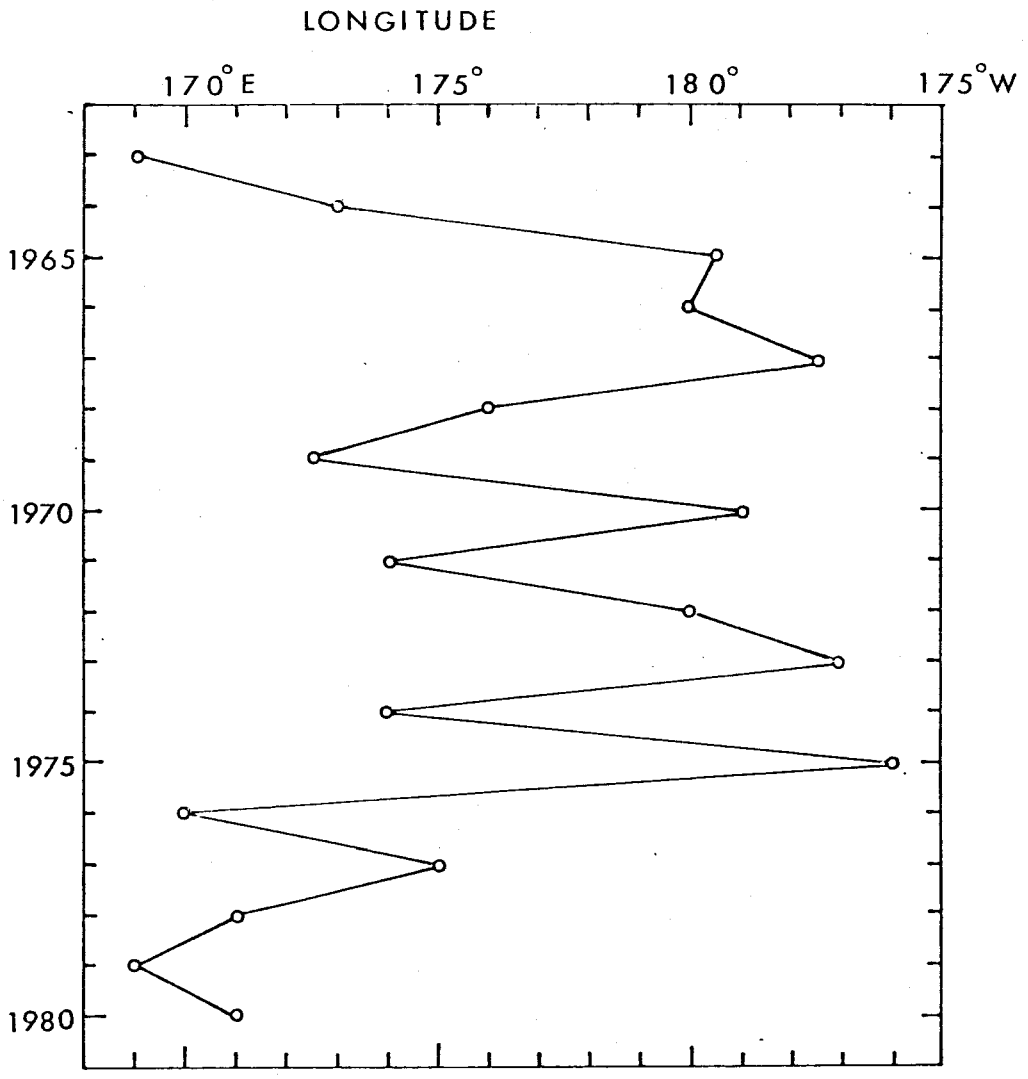

Fig. 7 Annual fluctuation of the extension of the Alaskan Stream in June indicated by 4.0°C at 100 m in the year of 1963 to 1980.