１９８３年夏季の北西太平洋における海況概要

Outline of oceanographic conditions of the Northwest Pacific during the summer of 1983

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1. は じ め に

1983年夏季における北西太平洋の海況について例年と同様、100 m層水温、表面水温より検討を行なった。ここに使用された資料は、さけ・ます調査船9隻、さけ・ます母船4隻によって得られたものである。観測点数は、5月126点、6月221点、7月251点であった。

表面水温については、気象庁発行「全国海況旬報」(The Ten－Day Marine Report)、漁業情報サービスセンター発行「北太平洋漁海況速報」そして、Oceanographic Monthly Summary、NOAAをも参考とした。

北西太平洋におけるさけ・ますの分布、回遊は、Western Subarctic Water、Alaskan Streamさらに表面水温などによって影響をうけることが知られていることから、これらの性状に注目して検討を行なった。

2. Western Subarctic Water

Western Subartic Waterは、冬季の表層対流混合に起因する冷却水で、カムチャッカ半島、千島列島の東方水域を中心にして北西太平洋に広く分布している。ここでは例年と同様に100 m層の3 °C以下の冷水をこの水系として取り扱った。

5月(Fig. 1):3 °C以下の冷水は、カムチャッカ半島南東水域にみられ、50 °N以南では、167 °E付近より西方域においてのみ連続的に存在する。167 °Eより東方では、例年と同様にコマンドルスキー冷水舌がみられ、この冷水舌の中とWestern Subarctic Waterの東方張り出しの中に3℃以下の冷水が分離分布している。4 °C等温線分布にみられるように170 °E付近のコマンドルスキー冷水舌は明確な南方張り出しの分布パターンを示しているが、3 °C以下の冷水域は小さく、例年に比べてこの冷水舌の水温は相対的に高い。

また、Western Subarctic Waterの東方張り出しは、47 °N～49 °Nの水域に3.5 °C以下の冷水帯として示されている。この冷水帯の中に3 °C以下の分離冷水域が178 °E付近までみられるが、西方

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から連続した冷水がみられる例年に比べると、この時期のWestern Subarctic Water の 東方張り出しはそれほど強くないと考えられる。

6月（Fig. 2）：165°Eから170°E付近にかけての観測が少ないため、この時期のコマンドルスキー冷水舌の性状については明らかでない。一方Western Subarctic Water の東方張り出しは、46°N～50°N付近の3.5°C以下の冷水帯としてとらえることができるが、この冷水帯の中に5月と同様、3°C以下の冷水域が分離分布している。6月におけるこの水系の東方張り出しは、5月よりも分布域を拡げ、その勢力を強めているものとみられる。

7月（Fig. 3）：170°E付近を中心にコマンドルスキー冷水舌の南下分布がみられ、3°C 等温線の南端部は、43°N付近に達している。この南端部位置を過去のそれらと比較するとFig. 4に示すとおりである。Western Subarctic Water は、冬季から夏季にかけて表層から次表層へカムチャッカ南東域よりその東方、南方域へと拡がる傾向がある。従って6月より7月にコマンドルスキー冷水舌はより南下する傾向があるが、概してその間の南下変動は小さい。本年6月のコマンドルスキー冷水舌南端部を7月の結果より推察すると、ほぼ近年6年間の平均的位置にあり、1968年から1976年の水準に比べるとこの冷水舌の南偏傾向は著しいと考えられる。

コマンドルスキー冷水舌の西側域（165°E付近）と東側域（175°E付近）には、相対的高温水の北方張り出し分布がみられ、特に東側域では、コマンドルスキー冷水舌との間に明確な水温前線を形成している。

Western Subarctic Water の東方張り出しは、5月、6月に比べるとより顕著になっているが、175°E付近の相対的高温水の北方張り出し分布のため、174°E付近より東方では、連続性を持たない。従って3°C等温線の東端部の位置は、例年に比べるとやや西偏しており、この水系の東方張り出しがやや弱かったことを示唆している。

3. Alaskan Stream

既往の報告によりアラスカ湾より連続するAlaskan Stream系水は、アリューシャン列島南方沿いを西行する相対的高温水としてとらえることができる。Alaskan Streamの勢力を把握する一方法として、アリューシャン列島南方沿いにみられる4°C以上の相対的高温水に注目し、Alaskan Streamの西端部位置やWestern Subarctic Waterとの混合状態について検討した。

5月（Fig. 1）：アリューシャン列島南方沿いの資料が少ないため、東方からの連続性は明らかでないが、51°N、177°～178°Eに4°C以上の暖水域がみられる。この付近をAlaskan Streamの西端部位置とすると例年同期に比べAlaskan Streamの西方張り出しは強いものと考えられる。

6月（Fig. 2）：アリューシャン列島南方沿いに、Alaskan Stream水系とみられる4°C以上の相対的高温水帯がみられる。この水帯の西端部は170°E付近に達し、さらに3.5°C等温線分布からこの水系の一部は北方へ、他の一部は東方へ、それぞれ拡がると考えられる。本年6月のAlaskan Stream

西端部の位置は、過去20年間のそれらと比べて西方への偏よりが大きく、Alaskan Streamの勢力が強かったことを示唆している（Fig. 5）。

7月（Fig. 3）：連続した4°C以上の相対的高温水の西端部は172°E付近にみられ、6月よりやや後退している。また3°C以上の相対的高温水の拡がりも狭いことから、6月に比べて Alaskan Streamの勢力は幾分弱くなったものと考えられる。しかし、例年同期に比べるとこの水系の西方への張り出しは引き続き強いとみられる。

4. 表 面 海 況

5月から7月までの漁場における3定点（St。A、St．B、St．C）の表面水温変化をFig.6に示した（原資料：北太平洋漁海況速報）。アリューシャン南方のSt．A（48°N、172°E）、ベーリング海のSt．B（54°N、172°E）とも5月から7月にかけて昇温を示すが、いずれの点においても周期的に大きな降温がみられ例年に比べると昇温が小さい。特に6月中旬、7月初旬の降温は、1.5°C〜2.5°Cと大きく夏季を通じての昇温を小さくしている。この様な表面水温の低下は低気圧通過などに伴う海面攪乱、天空からの受熱の低下などによると考えられる。ベーリング海北部のSt．C（58°N、179°E）は資料不足のため明らかでない。

本年夏季の水温を昨年同期のそれと比較するとFig．7のようになる。St．A、St．Bとも負の偏差が多く、昨年より低温に経過したことを示している。特に太平洋側のSt．Aでは、ほぼ全期間を通じて昨年より低温を示している。

Fig．8に本年5月、6月、7月における表面水温の30年平均からの偏差を示している。5月には30年平均よりも高温な水域が50°N付近を中心にみられるが、7月にはベーリング海を除くさけ・ます漁場全域で平均よりも低温となっている。即ち、本年は5月から7月にかけて平均からの負のずれがだんだん大きくなっている。特に7月には平均よりも1°C〜4°Cも低温な水域が、35°N〜50°Nに広く分布している。NOAA資料（Oceanographic Monthly Summary）によるとこの異常とも言える低温域は中部太平洋水域を中心としており、北西太平洋のさけ・ます漁場は、この低温域の北西縁辺部にあたる。ベーリング海など高緯度域は、低温域の外にあり、平均に近いかやや高温を示している。

以上に述べた1983年夏季の北西太平洋の海況概要は、次のように要約される。

1. Western Subarctic Water の東方への張り出しは夏季を通じてやや弱かったが、コマンドルスキー冷水舌などとしてのこの水系の南方張り出しは例年よりやや強かった。
2. Alaskan Streamの西方への張り出し勢力は、夏季を通じて例年より強かった。
3. 表面水温は、ベーリング海などの高緯度域を除いて全域的に平年より低温であった。特に6月から7月にかけての昇温が小さく、平年に対して低温を示す水域が拡大した。

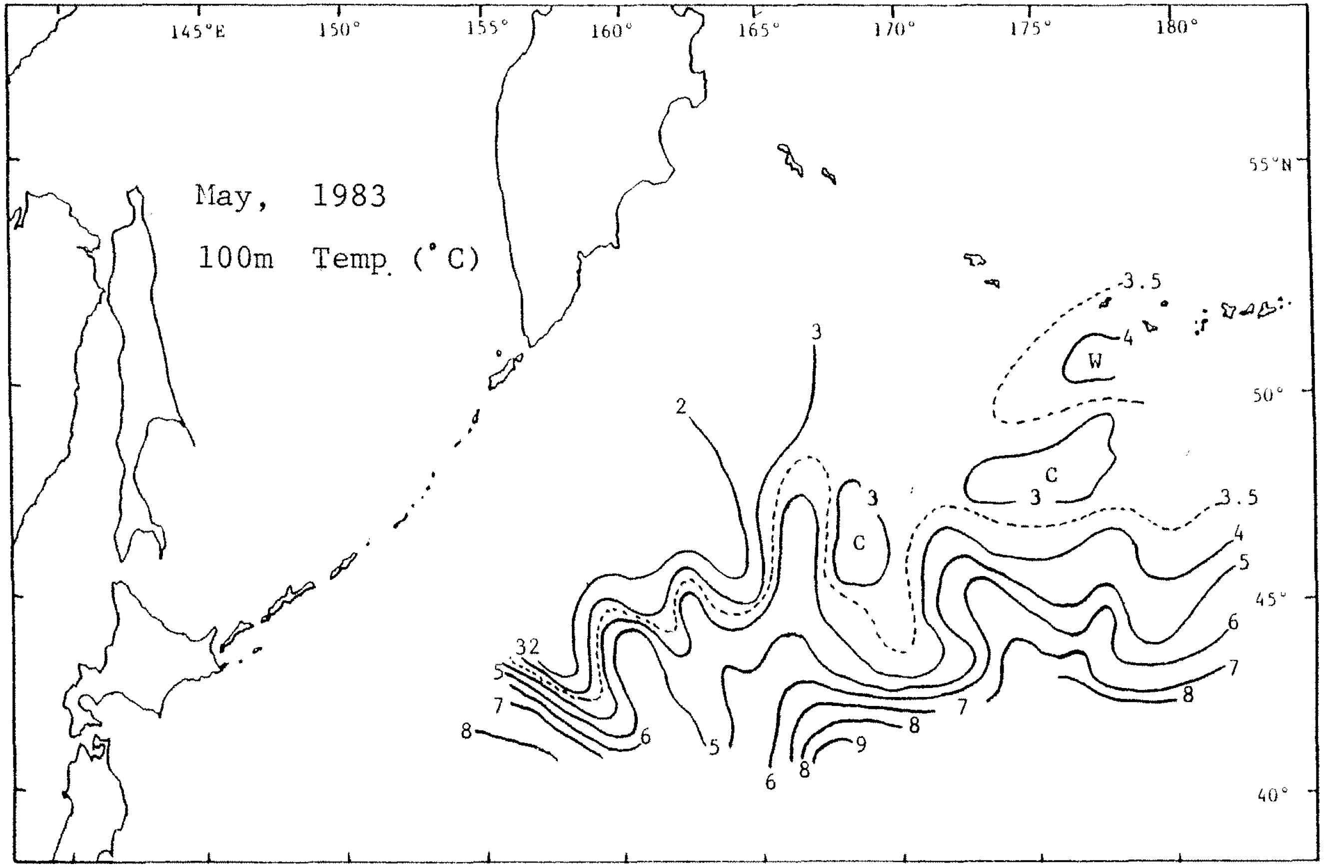

Fig. 1 Temperature distribution at 100m layer in May, 1983

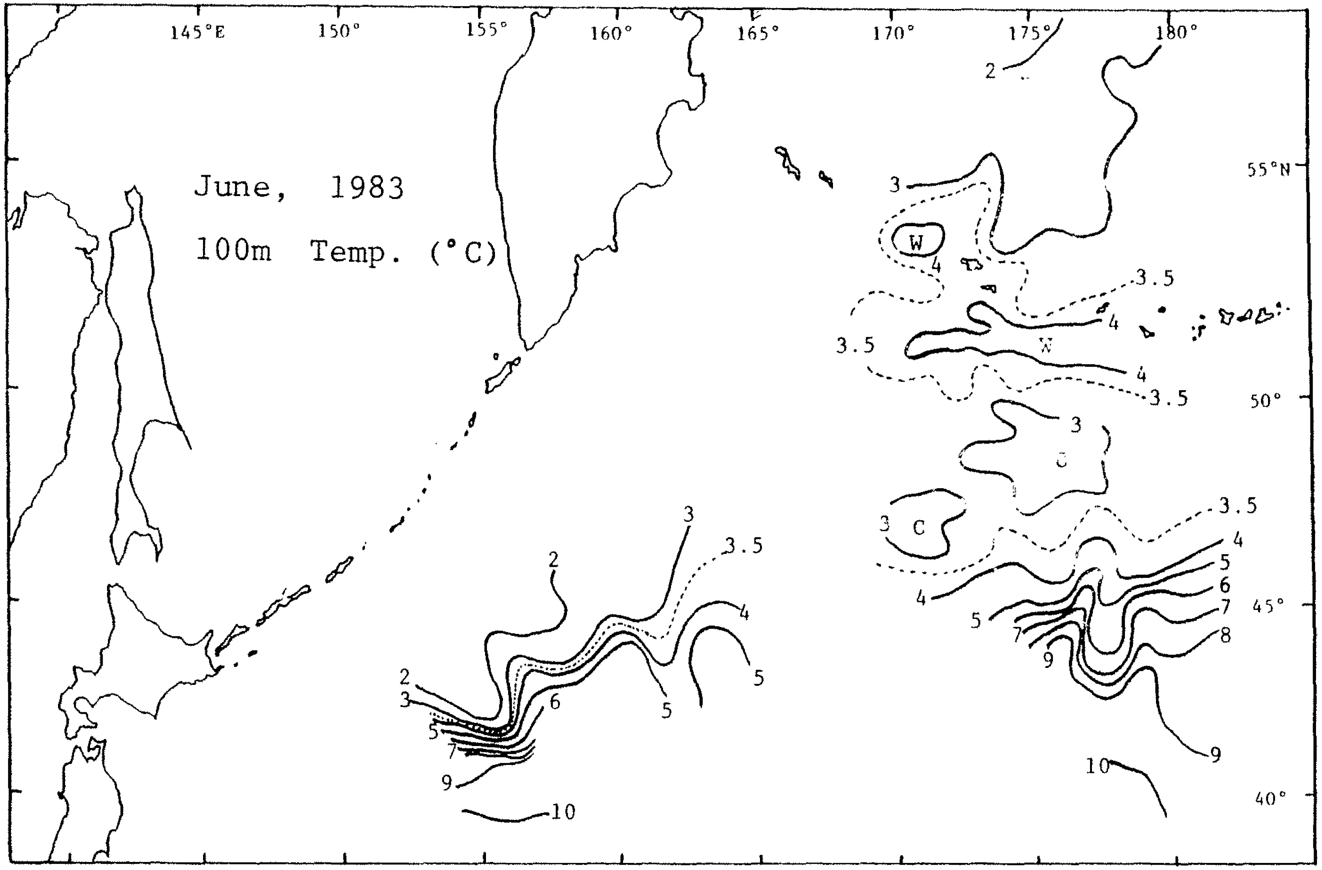

Fig. 2 Temperature distribution at 100m layer in June, 1983

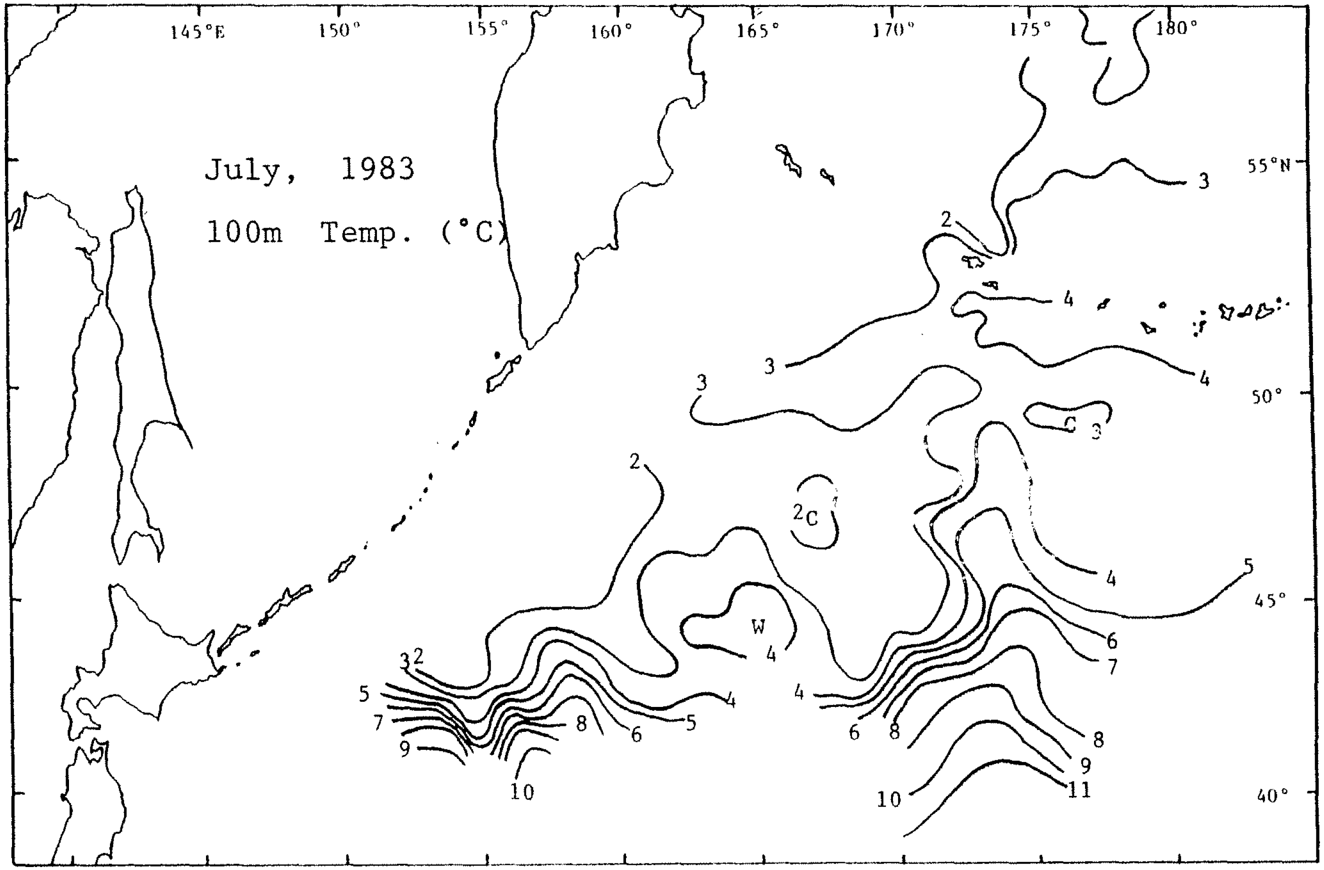

Fig. 3 Temperature distribution at 100m layer in July, 1983

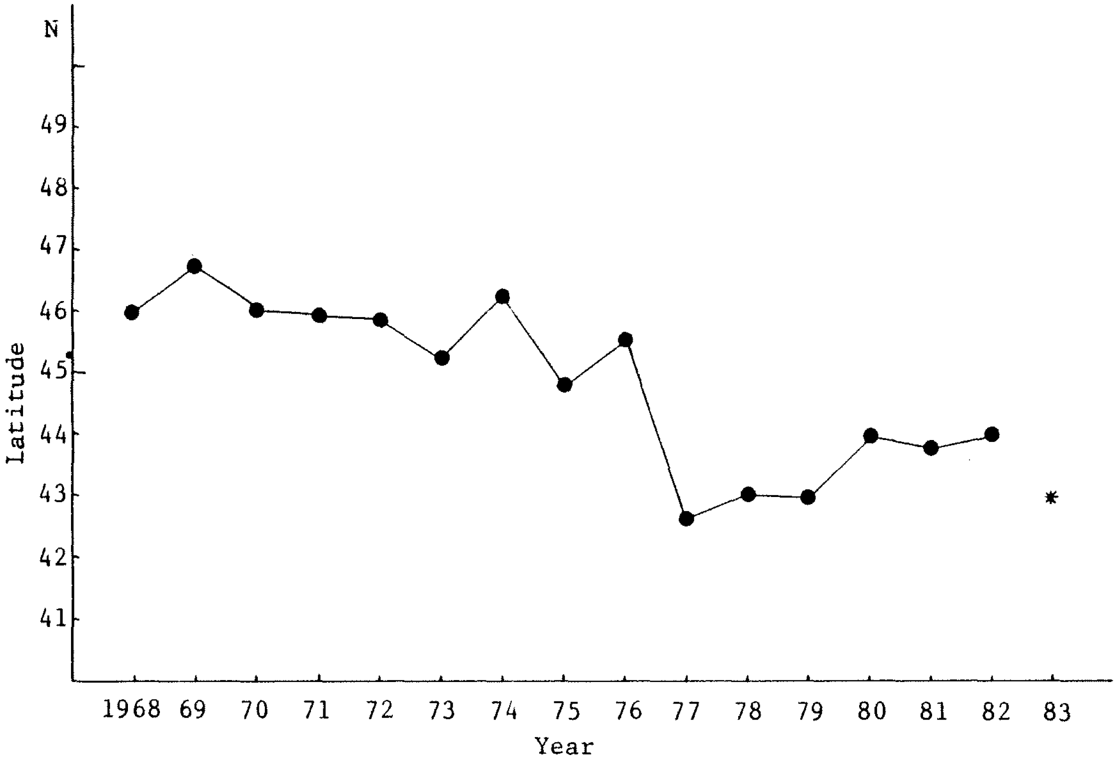

Fig. 4 Annual fluctation of southward extension of Komandrskie togue-shaped cold water in June indicated 3°C isothermal at 100m depth.

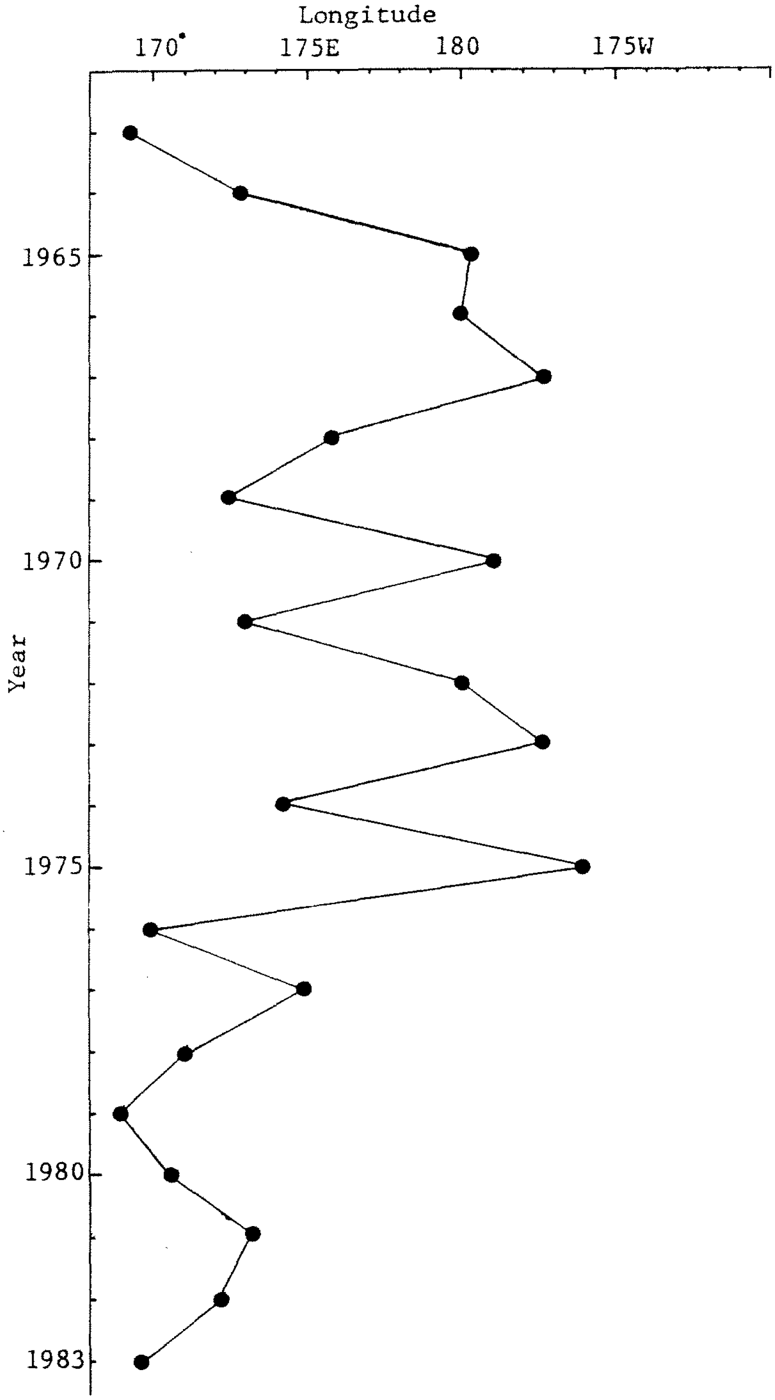

Fig. 5 Annual fluctuation of the extension of Alaskan stream in June indicated by 4 °C isotherm at 100m depth.

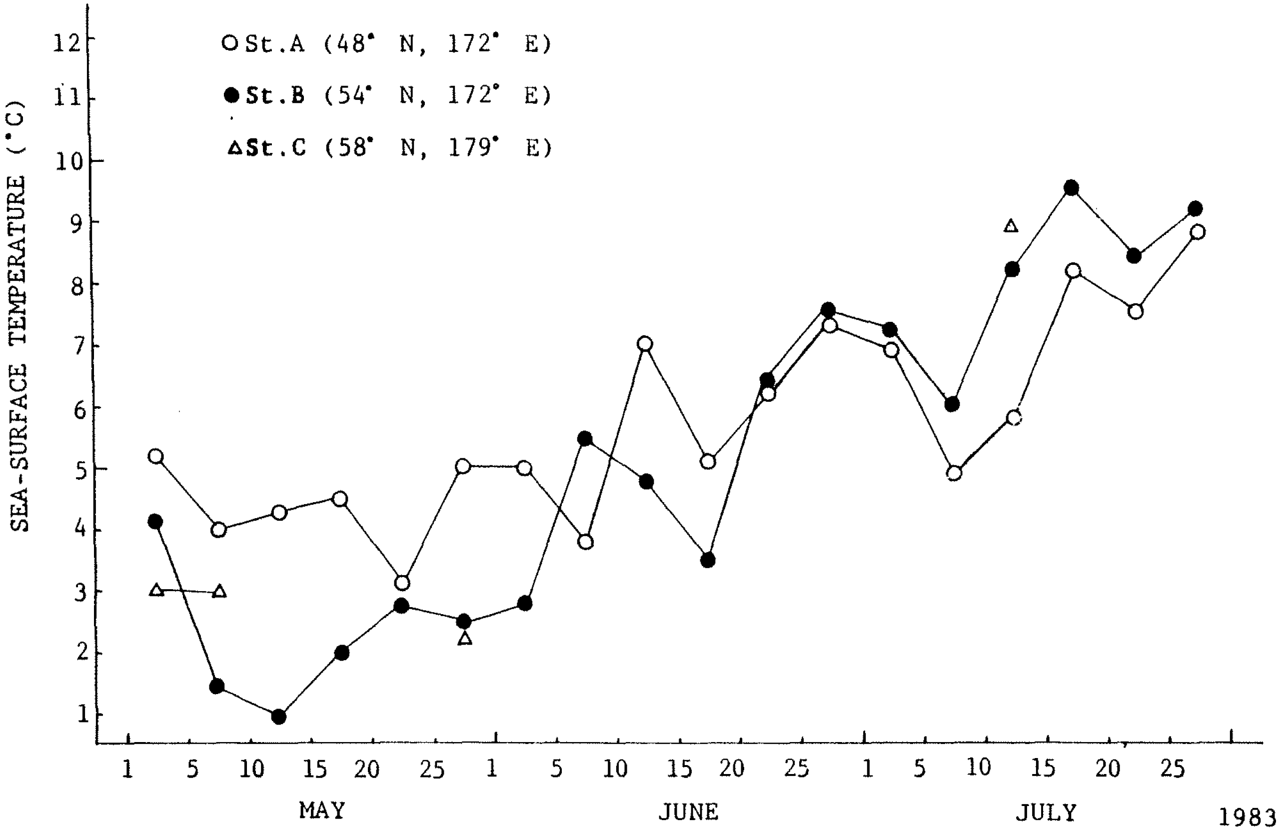

Fig. 6 Time series of SST (Sea-Surface Temperature) from May to July, 1983

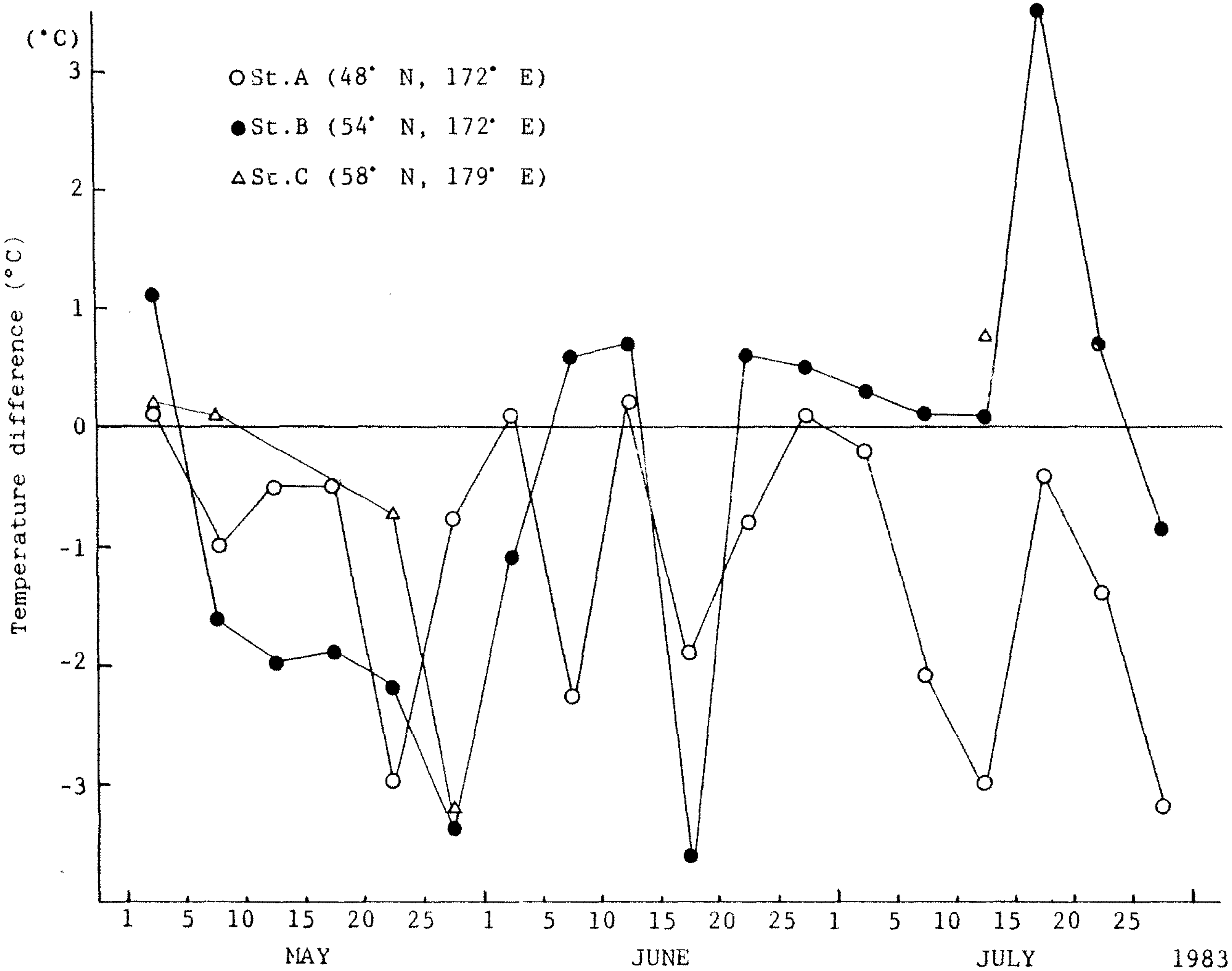

Fig. 7 Difference between SST in this summer and last summer. Negative value shows that this summer's SST is lower than last summer's SST.

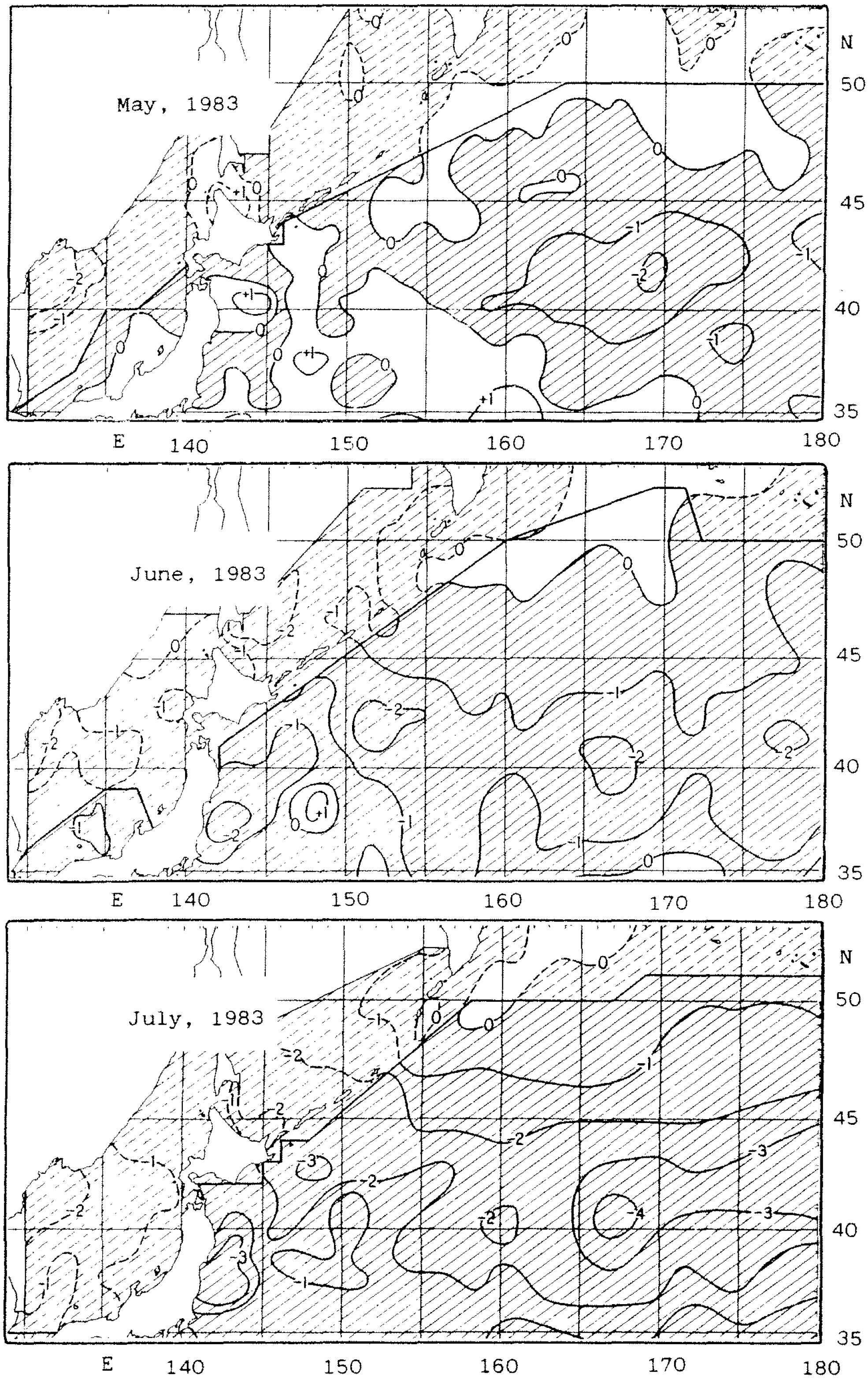

Fig. 8 Deviation of the sea-surface temperature from 30 years mean, 1951-1980 (From the Ten-Day Marine Report, Nos.1320,1323 and 1326).

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OUTLINE OF OCEANOGRAPHIC CONDITIONS IN THE NORTHWEST PACIFIC DURING THE SUMMER OF 1983

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Introduction

Oceanographic conditions in the northwestern Pacific Ocean during the summer of 1983 were examined using distributions of water temperature, i.e. temperatures at the surface and at 100 m depth, as in previous years. Data used were obtained from nine salmon research vessels and four salmon motherships. Observations were made at 126 stations in May, 221 stations in June, and 251 stations in July. For surface water temperatures, the "Prompt Report on Fisheries in the North Pacific Ocean" by the Fisheries Information Service Center, "The Ten-day Marine Report" of the Meteorological Agency of Japan, and the Oceanographic Monthly Summary, NOAA, were used. Much previous work has pointed out that distribution and migration of salmon in the northwestern Pacific Ocean are influenced by Western Subarctic Water, the Alaskan Stream, and surface water temperature. Therefore, we assessed the distribution and features of these water masses.

1. Western Subarctic Water

Western Subarctic Water is a cold water mass produced by surface cooling in winter that is widely distributed in the northwestern Pacific Ocean, centering off the eastern areas of the Kamchatka Peninsula and the Kuril Islands. Here we will deal with the cold water mass with temperature 3°C or less at 100 m depth as identifying this water mass as in previous years.

May (Fig. 1)

The water mass with temperature 3°C or less was observed in waters southeast of the Kamchatka Peninsula. In waters south of 50°N, the water mass existed in a continuous band only in areas adjacent to 167°E and further west. In areas east of 167°E, the Komandorskiye Cold Tongue was observed as in previous years and isolated cold water masses of 3°C or less were observed in this tongue and in the eastward extension of the Western Subarctic Water. As shown by the distribution of the 4°C isotherm, the Komandorskiye Cold Tongue near 170°E clearly showed a pattern of southward extension, areas with water temperature less than 3°C were small and the temperature of this cold tongue was somewhat higher than in previous years.

The eastward extension of the Western Subarctic Water was a cold water belt with temperature of 3.5°C or less in waters between 47°N and 49°N. In this cold water belt, an isolated cold water area with temperatures of 3°C or less was observed as far east as near 178°E. Compared to previous years, however, when continuous cold water from the west was observed, the eastward extension of the Western Subarctic Water in this season was not considered strong.

June (Fig. 2)

Because of the limited number of observations made in areas between 165°E and 170°E, the shape of the Komandorskiye Cold Tongue in this period was not clear. An eastward extension of the Western Subarctic Water was recognized as a cold water belt with temperatures of 3.5°C or less in areas between 46°N and 50°N, and isolated cold water masses with temperatures of 3.0°C or less were observed in this belt as was the case in May. This cold water belt was larger in area in June than in May and seemed to strengthen its eastward extension.

July (Fig. 3)

The southward extension of the Komandorskiye Cold Tongue was observed centered in an area adjacent to 170°E and a southern tip of the 3°C isotherm reached areas as far south as 43°N.

A comparison of the location of the southward extension in 1983 June with that in the same period in previous years is shown in Fig. 4. The Western Subarctic Water has a tendency to enlarge its extension from surface to subsurface layers and from southeast of Kamchatka towards the east and south during the period of winter to summer. Therefore, the Komandorskiye Cold Tongue tends to extend further south in July than in June but this change is usually small. Estimating the location of the southern tip of the Komandorskiye Cold Tongue in July from that in June in 1983, the location this year is about the mean location for the past six years, but a comparison of this year's location with those for 1968 to 1976 shows that the southward extension of this cold water mass in 1983 was remarkably strong.

Northward extensions of water with relatively high temperature were observed in an area west (near 165°E) and east (near 175°E) of the Komandorskiye Cold Tongue which formed clear water fronts adjacent to the Komandorskiye Cold Tongue, particularly on the east side.

The eastward extension of the Western Subarctic Water became more prominent in July than in May and June but discontinued in areas east of 174°E because of the strong northward extension of water with relatively high temperature in areas adjacent to 175°E. Therefore, the location of the eastern tip of the 3°C isotherm was relatively further west which suggests that the eastward extension of this cold water mass was somewhat weak.

3. Alaskan Stream

The Alaskan Stream, which flows from the Gulf of Alaska, is recognized as a relatively high temperature current which flows towards the west along the south side of the Aleutian Islands. We examined the location of water with relatively high temperature of 4°C and over south of the Aleutian Islands at 100 m depth in order to determine the western tip of the Alaskan Stream and conditions of its mixture with Western Subarctic Water.

May (Fig 1)

Because the amount of data obtained in waters along the south coast of the Aleutian Islands was small, the continuation from the east was not certain. However, warm water with temperature 4°C or over was observed in areas around 51°N and between 177°E and 178°E. Assuming these areas as the western tip of the Alaskan Stream, the westward extension was strong compared to that in the same period of previous years.

June (Fig. 2)

A belt-shaped distribution of water with relatively high temperature of 4°C or greater, which was regarded as the Alaskan Stream, was observed along the south coast of the Aleutian Islands. The western tip of this water belt reached areas adjacent to 170°E. Judging from distribution of the 3.5°C isotherm, some of this water was considered to extend towards the north and west. The western tip of the Alaskan Stream in June 1983 was located notably further west compared to that in the last 20 years which suggests that the Alaskan Stream was strong in this period (Fig. 5).

July (Fig. 3)

The western tip of continuous water with high temperature of 4°C or greater was observed in the area adjacent to 172°E, showing a slight shift towards the east, and the extension of water with temperature 3°C or greater was also weak which suggested that the strength of the Alaskan Stream became a bit weaker in July than in June. However, in comparison with the same period in previous years, the westward extension of this water was still considered to be strong.

4. Surface conditions

Changes of surface water temperature at three stations (Station A, Station B, Station C) during 1982 May to July are shown in Fig. 6 (Source: Prompt Report on Fisheries in the North Pacific Ocean). At Station A which is south of the Aleutian Islands (48°N, 172°E) and at Station B in the Bering Sea (54°N, 172°E), water temperatures rose from May to July. At both stations, water temperatures showed periodic notable drops and total temperature increment in 1983 was smaller than in previous years.

Drops in water temperature in mid-June and early July were as large as 1.5°C to 2.5°C which made the increment of water temperature in summer smaller. These drops in water temperature are considered to be due to mixing of the surface by a low pressure air mass and to a decrease in heat received from the atmosphere. Trends at Station C, which is north in the Bering Sea (58°N, 179°E), are not clear because of the limited data.

A comparison of surface water temperatures in 1983 with those in the same period in 1982 is shown in Fig. 7. Both at Station A and B, many deviations with negative values are shown which indicates that surface water temperature this summer was lower than in last summer. At Station A on the Pacific side, in particular, the temperature was lower almost throughout the season.

Figure 8 shows deviations in sea surface temperature in May, June, and July from the 30 year mean of 1951 to 1980. In May, areas where the temperatures were higher than the mean can be observed centering around 50°N but in July the temperatures were lower than the 30 year mean throughout the fishing ground for high seas salmon fisheries excluding the Bering Sea. In 1983, the negative deviation became larger during May through July, and in July areas where the differences in temperature were as great as -1° to -4° were widely distributed in waters between 35°N and 50°N. According to the Oceanographic Monthly Summary, NOAA, the unusual low temperature area was centered in the mid Pacific and the fishing grounds for salmon fisheries in the northwest Pacific were located at the northwest edge of the low temperature area. Areas of high latitude such as the Bering Sea were outside low temperature area and showed normal or somewhat higher temperature.

Oceanographic conditions in the northwestern Pacific during the summer of 1983 can be summarized as follows--

1. The eastward extension of Western Subarctic Water was somewhat weak throughout the summer, but the southward extension of the Komandorskiye Cold Tongue, etc., was a bit stronger than in previous years.

2. The westward extension of the Alaskan Stream was strong throughout the summer.

3. Sea surface temperatures were generally lower than in previous years except for high latitude areas such as the Bering Sea. In particular, temperature increases in June through July were small which resulted in an enlarged lower temperature area.

FIGS. 1 TO 8 ARE IN ENGLISH IN THE JAPANESE DOCUMENT