Canadian Oceanographic Research in the Eastern Subarctic Pacific Region during 1971

by

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A. **Field Programs**

Field programs in 1971 contributing data essential to studies of the oceanography of the eastern Subarctic Pacific Region included:

(a) A survey of the continental shelf and the adjacent oceanic waters extending to about 50 miles off the British Columbia coast by personnel of the Pacific Environment Institute, West Vancouver, B.C. aboard CNAV ENDEAVOUR during the period March 5-21. Station positions are shown on Fig. 1;

(b) Physical and chemical observations at six-week intervals, at and enroute to Ocean Station P (lat. 50°N, long. 145°W), by personnel of the Marine Sciences Branch, Victoria, B.C. aboard CCGS QUADRA and VANCOUVER;

(c) Bathythermograph and surface salinity observations in the Gulf of Alaska during the period September 6 - October 3. Observations were made by personnel of the Defence Research Establishment Pacific, Victoria, B.C. aboard CNAV ENDEAVOUR;

(d) Daily observations of temperature and salinity (density) at 16 coastal lightstations along the British Columbia coast. The program is administered by Marine Sciences Branch personnel of the Pacific Environment Institute.

B. **Research**

(Some of the results presented in this report are included in the 1970 INPFC Annual Report, but were not presented and reviewed at the 1970 Annual Meeting.)

1. Continental shelf-oceanic waters off the British Columbia coast.


Surface-salinity distributions for the periods October 1-16, 1969, March 5-19, 1970 and March 5-21, 1971 are presented in Fig. 2, 3 and 4 respectively. Surface salinities of the oceanic waters off the coast of British Columbia were between 0.2 and 0.4 °/oo lower in October 1969 than in March 1970 and 1971, due primarily to offshore transport (divergence) of low-salinity water...
during the summer period and its conservation in a relatively shallow surface layer.

The surface-salinity distributions for March 1970 and 1971 (Fig. 3 and 4) show a relatively marked salinity decrease (~1.0 °/oo) paralleling the Vancouver Island coast, but becoming less pronounced in Queen Charlotte Sound—a typical March feature. It occurs as a result of the convergence (onshore movement) of water along the coast associated with southeast winds that predominate during this period. It appears that off the northern half of the Vancouver Island coast, the convergent mechanism (and the gradient) was more fully developed in March 1971 than in March 1970, resulting in greater salinity water near the coast during the former period.

The surface-salinity distributions for October 1969 (Fig. 2) and March 1970 (Fig. 3) reflect the typical seasonal variations—surface salinities of the waters overlying the continental shelf off Vancouver Island were lower in March 1970 than in October 1969, attributable to the large local runoff and its conservation along the coast. However, in Queen Charlotte Sound, surface salinities were greater in March 1970, than in October 1969.

In general, surface salinities of the continental shelf waters were greater in March 1971 than in March 1970 (cf Fig. 3 and 4).


Surface temperature distributions for the periods October 1-16, 1969, March 5-19, 1970 and March 5-21, 1971, are presented in Fig. 5, 6 and 7 respectively. Sea-surface temperatures in October 1969 (Fig. 5) were highest in the oceanic waters, 12°-16° C, increasing southward. Lowest temperatures were encountered in Queen Charlotte Sound, 11.5°-12.0° C, and on the continental shelf and slope off Vancouver Island, 12°-14° C; in both areas temperatures decreased shoreward.

In both March 1970 and March 1971 (Fig. 6 and 7) the north-south gradient in the offshore waters noted in October 1969 was absent. In general, surface temperatures increased shoreward to a maximum near the continental shelf and then decreased. Surface temperatures were significantly greater (by 1.5°-2.0° C) in March 1970 than in March 1971.

Charts of sea-surface temperature and anomalies issued by the National Marine Fisheries Service, La Jolla, California, and also the calculated monthly-mean temperatures at the coastal lightstations (Amphitrite Point, Kains Island, and Cape St. James, Fig. 1), show that temperatures in October 1969 were higher (by 1.0° C) than in October 1968, but were similar to the long-term mean. In March 1970, temperatures were higher
(by \(\sim 1.0^\circ C\)) than in March 1969 and were also greater (by \(\sim 1.0^\circ C\)) than the long-term mean. However, in March 1971, anomalously cold conditions prevailed—temperatures were about \(1.0^\circ C\) lower than the long-term mean. Below-normal conditions prevailed until August, when surface local heating and/or advection of warm water sufficient to raise surface temperatures to near-normal conditions.

(c) Vertical temperature distributions.

In Fig. 8-12 are shown the vertical temperature distributions for a section off Wickaninnish Bay, Vancouver Island (Fig. 1) for the periods March 8-9, 1969, April 18, 1969, October 2-3, 1969, March 7, 1970 and March 8, 1971, respectively. In the March-April periods, waters were warmest at intermediate depths, between generally 50 and 100 m. In this temperature-maximum layer, temperatures in March 1971, were about \(1.0^\circ C\) lower than those observed in March and April 1969 and March 1970.

From a depth of 200 m shoreward, the temperature ranges of the bottom or near-bottom waters for the periods shown were; March 1969, 7.5\(^\circ\)-8.5\(^\circ\)C; April 1969, 7.5\(^\circ\)-8.5\(^\circ\)C; October 1969, 6.8\(^\circ\)-9.8\(^\circ\)C; March 1970, 7.5\(^\circ\)-9.0\(^\circ\)C; March 1971, 6.5\(^\circ\)-7.5\(^\circ\)C. In these waters, lowest temperatures for the March-April periods occurred in 1971—about 1.0-1.5\(^\circ\)C lower than those observed in the other late-winter periods. Although the anomalies are less than those noted in the sea-surface temperature distributions and at the coastal stations, these data do reflect conditions generally occurring in the bottom waters during the late winter periods.

2. Gulf of Alaska

In the Gulf of Alaska, lower-than-normal sea-surface temperatures occurred during the months of May, June and July. Temperatures in May were approximately \(1.0^\circ C\) below the long-term mean, and, in June and July, about \(2.0^\circ C\) lower than the long-term mean.
Fig. 1  Station positions, March 5-21, 1971
Fig. 2  Surface salinity (‰), October 1-16, 1969
Fig. 3  Surface salinity (‰), March 5-19, 1970
Fig. 4  Surface salinity (‰), March 5-21, 1971
Fig. 5  Surface temperature (°C), October 1-16, 1969
Fig. 6 Surface temperature (°C), March 5-19, 1970
Surface Temperature (°C)
March 5-21, 1971

Fig. 7 Surface temperature (°C), March 5-21, 1971
Fig. 8  Vertical temperature distribution off the coast of Vancouver Island, March 8-9, 1969.
Fig. 9  Vertical temperature distribution off the coast of Vancouver Island, April 18, 1969.
Fig. 10  Vertical temperature distribution off the coast of Vancouver Island, October 2-3, 1969.
Fig. 11 Vertical temperature distribution off the coast of Vancouver Island, March 7, 1970.
Fig. 12 Vertical temperature distribution off the coast of Vancouver Island, March 8, 1971.