

as dancing associates, *mumiqatik*, a major kind of extra-kinship partnership which along with seal sharing and spouse exchange extends the network of social interaction and economic cooperation. But although such socioeconomic aspects may be seen, the drum dance should be first considered in its essence as the prime aesthetic manifestation of Eskimo life.

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## Airborne Temperature Survey of Harrison Bay

## INTRODUCTION

During 10 August 1973 while conducting an oceanographic program in deep waters off the North Slope of Alaska, an opportunity arose to make an airborne radiation thermometer (ART) flight to map the surface water temperature of Harrison Bay (Fig. 1). Little is known about the oceanography of the Bay.

Yet this zone may well come under considerable, if not great, environmental stresses stemming from present localization of resource development and exploitation. This paper presents a summary of the results of the low-altitude ART flight.

## MEASUREMENT TECHNIQUE

A Barnes Engineering Company PRT-5, 9.5-11.5  $\mu$  Infrared Radiometer with a field of view of 2 degrees was used to make the 3-hour flight over Harrison Bay. The temperature survey was carried out using 2 helicopters from the icebreaker USCGC *Glacier*, flying a grid pattern and measuring the surface temperature along the flight track. The flight was conducted at a nominal altitude of 46 metres, with a flight speed of 150 km./hr. Navigation was done by visual contact with the coast and by radar tracking from the *Glacier*. Clear, cloud-free conditions existed in the entire study area during the survey. Continuous winds ( $> 3.0$  m./sec.) mixed the surface waters so that the radiometer measurements are representative of bulk temperature rather than the skin temperature of the water.

The ART equipment was calibrated before, during, and after the flight. A temperature-controlled water bath and a mercury thermometer were used for calibration. At the beginning and end of the flight, calibration temperatures were obtained from sea surface measurements (expendable bathythermograph, bucket thermometer) made from the ship while the helicopter was overhead. The ART measurements are considered to be within  $\pm 0.6^\circ\text{C}$ . of the true surface temperature.

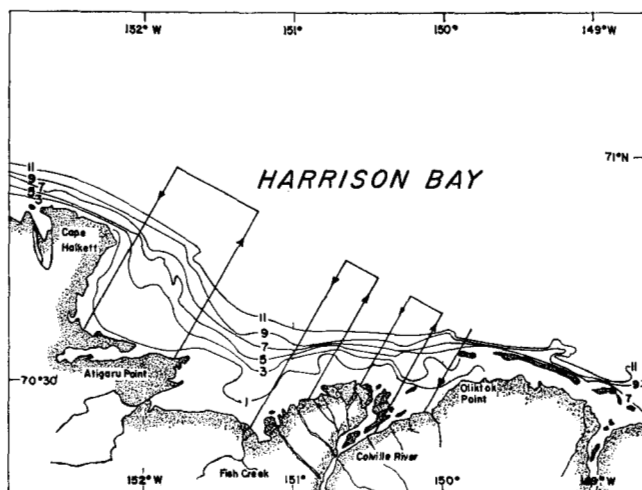


FIG. 1. Location of ART flight pattern over Harrison Bay, 10 August 1973. Included is the bathymetry (in metres) of the Bay.

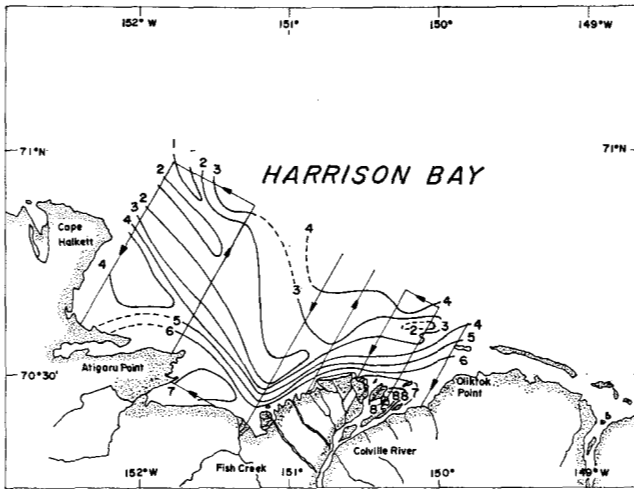


FIG. 2. Sea surface temperature distribution of Harrison Bay, 10 August 1973. The contour interval is 1 degree Celsius.

One-minute averages of the corrected ART temperatures were obtained from the ART analog record and the average values were plotted along the aircraft flight track. The 1-minute average ART temperature corresponds to the average temperature of a 2.5 km. resolution element measured along the flight path.

#### RESULTS AND DISCUSSION

Contours of the surface-water temperature distribution of Harrison Bay are presented in Fig. 2. Two major features are exhibited: the lack of large river effluent plumes; and the penetration of relatively cold water from the west into Harrison Bay. The weak packing of isotherms ( $4^{\circ}$  to  $8^{\circ}\text{C}$ .) near the Colville River delta indicates that river runoff was very low in early August and freshwater influence was restricted to near the shore. This was expected. Arnborg *et al.*<sup>1</sup> have found that the Colville River has a total annual discharge of  $16 \times 10^9 \text{ m}^3$  of which 80 per cent occurs the first twenty days of June. During the rest of the summer, river flow is very low.

In the second feature (Fig. 2) the  $3^{\circ}\text{C}$ . isotherm represented the boundary of the cold water and was accompanied by a sharp colour separation: offshore of the isotherm the water was green whereas inshore the water was brown. It is also interesting to note that the  $3^{\circ}\text{C}$ . isotherm paralleled the 5.5 metre isobath in Harrison Bay.

Along the North Slope coast, surface currents depend largely on local winds, are highly variable (0 to 60 cm./sec.), and may even reverse direction (Hufford *et al.*<sup>2</sup>). The wind is generally from the east during the

summer and rarely exceeds 10 m./sec. However, from 6 to 11 August 1973, the wind direction was from the west-southwest at an average of 4 m./sec. This was sufficient to cause the nearshore waters to flow easterly, pushing the colder coastal waters into Harrison Bay. Assuming steady state conditions the magnitude of the wind-driven cold-water current was 12 cm./sec. The pocket of  $< 4^{\circ}\text{C}$ . water near Cape Halkett (Fig. 2) may represent an eddy.

The surface water temperature distribution of Harrison Bay observed 10 August 1973 is probably unique in that the winds were blowing from the west causing the presence of a tongue of cold water to occur which covered a great part of the bay. However, the data should add to our sparse understanding of the area and point out the need for continued study.

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