A Winter Scientific Reconnaissance of the North Water

Since 1966 the Institute's Baffin Bay — North Water Project has been investigating the causes and effects of the large semi-permanent polynya in northern Baffin Bay and Smith Sound. Summaries of existing data have been made by Project personnel[1,2] and detailed studies have been conducted during the summer season [3,4,5]. Winter data in all disciplines relating to the North Water have been conspicuously lacking, so the Project proposed a ship-borne winter scientific reconnaissance of the area.

The Canadian Coast Guard Ship *Louis S. St. Laurent* sailed from Halifax, Nova Scotia, on 1 February 1972, destined for the North Water. A 5-week period was allocated for the cruise. Aboard were: a team of physical oceanographers from the Defence Research Establishment Ottawa; teams representing three of the North Water Project's programs: oceanography, marine biology and meteorology; two ice observers from the Atmospheric Environment Service; and two representatives of the National Film Board. The objectives of the cruise were to collect data relating to the several disciplines represented and gain experience in the operating conditions in anticipation of increased year-round commerce in the eastern Arctic.

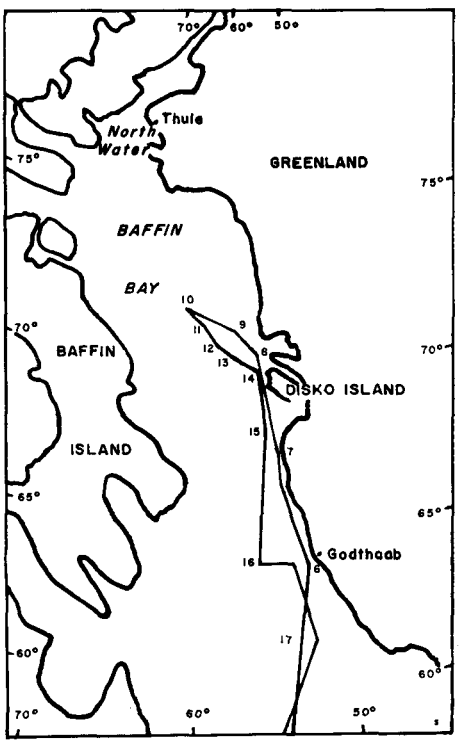

FIG. 1. Route of CCGS. *Louis S. St. Laurent* February 1972. Numbers indicate date and position of ship at local noon.

The southern edge of the pack ice was encountered on the afternoon of the 2nd, south of the latitude of Sidney, Nova Scotia. The ice in the Gulf of St. Lawrence was about 1-foot (0.3 m.) thick with a concentration of 8/10ths, and the ship proceeded at its optimum cruising speed of 13 knots. In the Strait of Belle Isle the floes were 2 feet (0.6 m.) thick and the concentration 10/10ths; so full power was required for ramming. The transit of the Labrador Sea was within the ice edge and the Arctic Circle was crossed late on the 6th (Fig. 1). Storm force winds rose on the 5th from the south, shifting to north by the 7th and dropping the temperature from the +30's to 0°F. (0°C. to −18°C.).

The Atmospheric Environment Service's DC-4 ice observation aircraft transmitted facsimile maps of ice conditions to the ship from the 4th to the 16th. The Bell helicopter aboard the ship was used from the 3rd until the 16th for local reconnoitering.

By the afternoon of the 7th, in the latitude of Disko Island, progress had slowed considerably. There was no evidence of a West Greenland lead, the ice was 4 to 5 feet (1.2 to 1.5 m.) thick and the concentration 10/10ths. The temperature fell into the −20's F. and stayed there for the next week. Winds were generally light but occasionally reached 20 knots. It was no longer possible to operate in a cruise mode for more than an hour at a time; and thereafter many hours were spent ramming the ice. By the morning of the 10th the ship had consumed one-third of its fuel and cruised over 2,000 miles (3,200 km.). The aircraft reported that the close pack, under moderate pressure, with ridges up to 9 feet (2.7 m.), extended for another 200 miles (320 km.) to the north and west. The field party leaders met with the Captain and discussed the need to turn south at that point. Although there was open water in Smith Sound and easier sailing between 75°N. and 78°N., the energy required to reach the North Water would have meant that the ship might have had insufficient fuel for the return trip. The ship had not been stopped, but its speed had been slowed to an average of 2.5 knots. This constraint coupled with the absolute necessity of its being available in early March to assist shipping in the Gulf of St. Lawrence led those concerned to the reluctant conclu-

sion that further northing was impractical; and at 10/1500Z the *St. Laurent* turned south from 72°06'N., 63°55'W.

The open water in Smith Sound was observed by the DC-4 which flew over southern Nares Strait on the afternoon of the 10th. Their flight track did not allow delineation of the entire North Water area, but concentrations as low as 4/10ths young ice and gray ice were noted. In addition to an ice map, photographic and IR scanner imagery were obtained.

Following the decision to turn south, the scientific party decided that the optimum program would consist of 5 oceanographic stations at 100-mile (160 km.) intervals down the centre of Baffin Bay, and 4 stations along the latitude of Godthaab (64°), profiling the West Greenland current. The first station was begun at 10/1900Z at 71°57'N., 62°07'W. in 2,000 m. of water. Oceanographic samples were taken at 10-metre intervals down to 300 m. and at standard depths to the bottom. Biological samples were taken throughout the water column and micrometeorological measurements made.

Progress during the next 3 days was so slow that the second station was begun at 13/2400Z at 70°37'N., 56°52'W. in 395 m. of water. All 3 programs collected data. It had been impractical to remain in the centre of the Bay because of the ice conditions and additional stations over the West Greenland shelf were not warranted. Consequently, the ship proceeded south, in progressively slackening conditions, and took 4 stations along the 64th parallel on the 16th. The ship arrived in Halifax on the morning of the 21st, having logged 4200 miles (6750 km.) and consumed 80 per cent of its fuel.

The scientific party did not reach the North Water, but did obtain the first winter data from central Baffin Bay. Evaluation of the scientific returns of the trip is now under-way; however, the biologists found what appear to be some unusual specimens at the northern station, while the STD revealed a 6°C. thermocline between 100 and 125 m. in the West Greenland current. It was also shown that it is possible to collect oceanographic specimens at −30°F. (−34°C.) with a 20-knot wind (windchill equivalent of no wind and below −70°F., i.e. −57°C.) although it was extremely uncomfortable for those who had to work in exposed areas.

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Observations of Well-Developed Podzols on Tundra and of Patterned Ground Within Forested Boreal Regions

In most, if not all, papers and monographs dealing with patterned ground there appears to be an implicit assumption that polygonal and patterned ground phenomena are exclusively characteristic of tundra regions. In rather extensive vegetational sampling in the forest, forest/tundra ecotone, and tundra of central northern Canada[1,2,3,4] it has been my observation that patterning is a relatively frequent characteristic of soils in at least the northern portion of the boreal forest in that region. This has escaped wider notice simply because the phenomenon is obscured by the thick layer of moss peat and living mosses and lichens, as well as herbaceous species, usually found under a boreal forest canopy. J. C. F. Tedrow (personal communication, September 1971) indicates that he also has observed patterning under forest in northern Canada and northern Scandinavia although the literature