# GEOLOGICAL RECONNAISSANCE OF SOUTHERN AND WESTERN APPROACHES TO BROUGHTON ISLAND, NORTHWEST TERRITORIES

by

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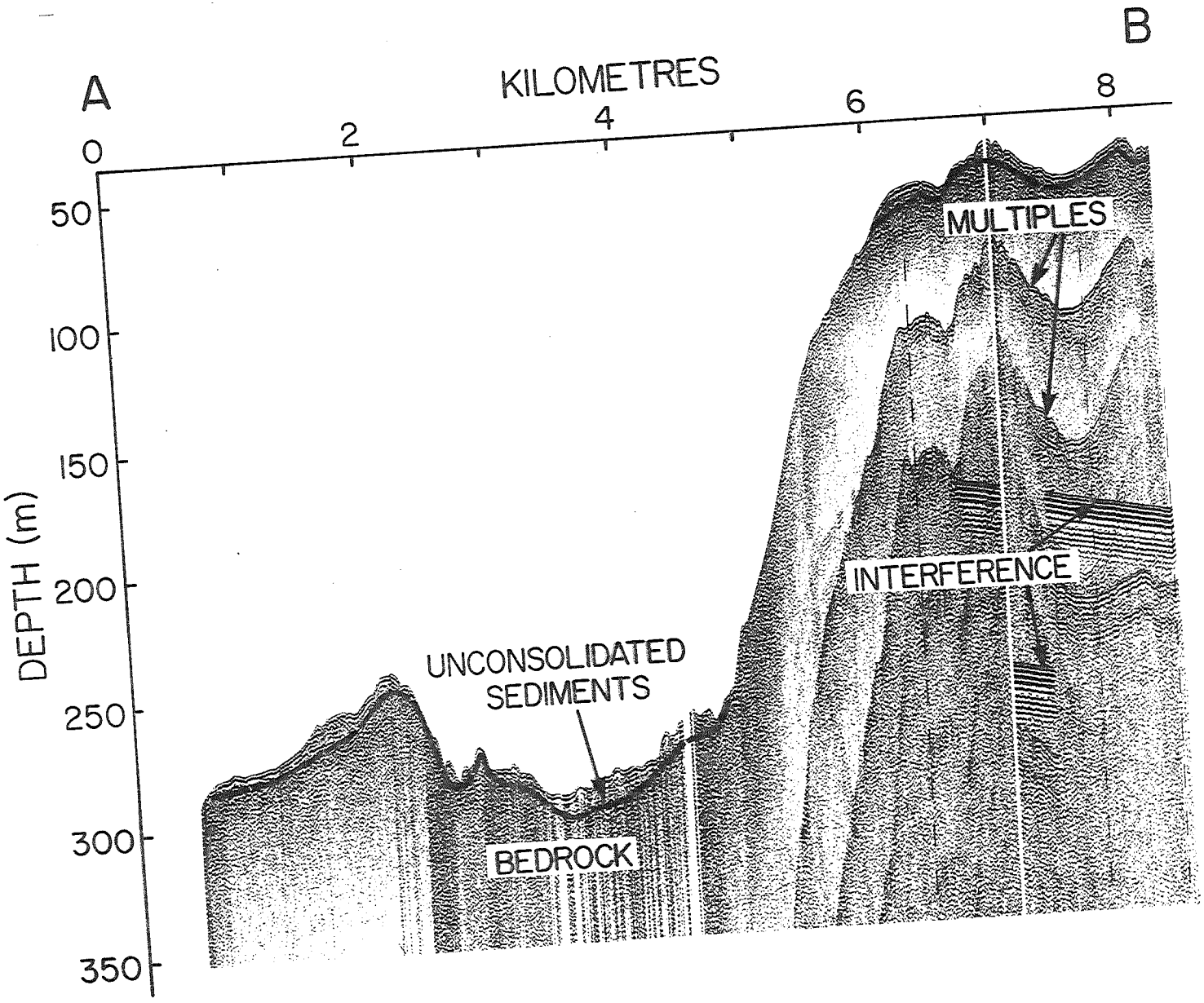
A
B
KILOMETRES
0
2
4
6
8
DEPTH (m)
50
100
150
200
250
300
350
MULTIPLES
INTERFERENCE
UNCONSOLIDATED
SEDIMENTS
BEDROCK

## INTRODUCTION

Reconnaissance acoustic profiles and sediment samples were obtained in the southern and western approaches to Broughton Island, N.W.T. (Figure 1) during CSS HUDSON Cruise 85-027 (September - October, 1985). These, in part, were in response to the possible establishment of a scrap metal disposal site offshore. The community of Broughton Island is situated on the west side of the island, and a D.E.W. station is located atop the eastern part of the island.

Water depths along the ship track typically range from 320-365 m in the channel south of Broughton Island, shallow rapidly at the entrance to the channel west of the island, and lie mainly in the 50-55 m range in the southern part of the western channel. A sill, with minimum depths of 12-17 m west of the settlement, restricts the western channel farther north.

## METHODS

Acoustic profiles were obtained with single-channel, shallow seismic reflection (655 $cm^3$ airgun), Huntec high-resolution seismic, sidescan sonar, and echosounder systems along a single track approximately in the middle of the southern and western approach channels (Figure 1).

Grab samples of the seafloor sediments were obtained with Van Veen samplers at one station west of the island, and at two stations south of the island (Table 1). Bottom photographs were also obtained at one station in the latter area.

## RESULTS

In the channel south of Broughton Island, seafloor morphology is irregular, and shallow, seismic-reflection data (Figure 2) indicate that unconsolidated sediments locally attain thicknesses up to about 18 m. Resolution of these sediments by the Huntec high-resolution system was generally poor, but the available data suggest that the uppermost sediments locally include 1-2 m of moderately-transparent, acoustically-unstratified material (e.g. clayey and/or silty sediment). They are successively underlain by stratified and unstratified sediments, which may include glacial debris.

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Grab samples of the seafloor sediments consisted of muddy, fine-to-medium sand at both stations (19 and 21) south of Broughton Island. At Station 19 (Figure 1), sediments sampled included a thin, upper, greenish, non-cohesive sediment (not present at Station 21) overlying grey to black sediments. Rounded and angular pebbles, thought to represent drop-stones, were present in the sediments at Station 21. Bottom photographs indicate that seabed sediments in the vicinity of Station 20 are variable, and include gravel-sized components in the pebble-to-boulder range, as well as finer-grained material.

In the channel west of Broughton Island, the seafloor morphology is hummocky or irregular in profile, and the seabed is primarily acoustically opaque. Seismic reflection data suggest the presence, locally, of 9 to 15 m of surficial sediments that resemble glacial till, both acoustically and morphologically. No indication of soft (fine-grained) sediments was seen on the acoustic profiles from the west channel.

Sidescan sonar-imagery is degraded by apparent thermocline interference, but features are observable at the base of the western channel walls that presumably are related to bedrock outcrops or lobes of Quaternary sediments.

The grab samples from Station 18 consisted mainly of fine-to-medium sand, with pebbles and shells, and a lower mud content than the stations in the southern channel. This texture is consistent with the hard acoustic character of the sediments in the western channel, and appears to reflect higher tidal or current energy here, compared to the southern channel.

The data acquired on Cruise 85-027 provide reconnaissance information on seabed conditions in the southern and western approaches to Broughton Island. Any additional samples and acoustic data needed to further define seabed geological and geotechnical conditions, e.g. stability of the sediments, would require use of a small, maneuverable, shallow-draft craft suitable for more extensive operations in these confined waterways.

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28/08/86

TABLE 1

| Station No. | Latitude | Longitude | Water Depth (M) | Station Type |
|---|---|---|---|---|
| 18 | 67°30.64'N | 64°03.20'W | 68 | grab |
| 19 | 67°28.80'N | 63°57.10'W | 357 | grab |
| 20 | 67°28.55'N | 63°57.20'W | 317 | camera |
| 21 | 67°28.70'N | 63°51.45'W | 360 | grab |