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MARINE GEOLOGY OF BAIE DES CHALEURS

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INTRODUCTION

Baie des Chaleurs (Sheet 1, Figure 1) is the fourth largest estuary in eastern Canada, extending 180 km in length and up to 38 km in width, covering a total area of 5670 km^2. The estuary drains a hinterland basin of 25,800 km^2, and receives an annual freshwater discharge of 26 km^3. The depositional history of sediments was investigated by Schafer (1977) using grabs and cores (Sheet 1, Figure 2), and a zonation of the total benthonic foraminifera population is given in Schafer and Cole (1978). An environmental assessment of water, sediment and biota in the estuary was presented recently by Hildebrand (1984).

This open file presents bottom and subbottom information interpreted from two sets of acoustic data available in Baie des Chaleurs: closely-spaced high frequency depth sounder transects, and widely-spaced air gun seismic reflection and sidescan sonar lines (Sheet 1, Figure 3). The study was undertaken for two principle reasons: (1) to investigate the Quaternary history of the area, which is both highly complex (Rampton et al., 1984) and largely unknown offshore (Loring and Nota, 1973), and (2) to examine possible offshore placer deposit settings that are suggested by shallow water drainage channels (Sheets 3 and 4).

METHODS

Echograms were collected by the Canadian Hydrographic Service in 1964-66 from the C.S.S. Kapuskasing and its launches using Kelvin-Hughes 14.25 kHz MS26B depth sounders. Approximately 9500 km of hydrographic lines were run, at average spacings of 450 m in the outer and central bay and 300 m in the inner bay (Sheet 1, Figure 3). The lines were positioned using radar triangulation from shore stations. The echograms provide information on seafloor morphology, and on the thickness and distribution of acoustically penetrable sediment (mud) (Sheet 1, Figure 4). Three detailed maps are presented: seafloor bathymetry (Sheet 2), thickness of Holocene(?) mud (Sheet 3), and depth to pre-Holocene(?) sediment surface (Sheet 4).

655 cm^3 air gun single channel seismic reflection profiles (~100-3500 Hz) were collected from C.S.S. Dawson in 1986, along with 12 kHz echograms and some Klein 100 kHz side-scan sonograms (see Praeg et al., 1987 for technical details). 836 km of line were run (Sheet 1, Figure 3), positioned by radar ranges and bearings from the adjacent shores. The air gun records provide information on the character, thickness, and distribution of unconsolidated (Quaternary) sediments and underlying deformed sedimentary strata (Sheet 1, Figure 5). Four maps are presented (Sheet 5): Quaternary geologic features (Figure 1), thickness of sediment overlying bedrock (Figure 2), depth to bedrock surface (Figure 3), and bedrock geology (Figure 4).

HIGHLIGHTS

(1) irregular isobaths above ~30m in the inner bay (Sheet 2), which suggest paleo-shorelines related to lowered relative sea levels;

(2) a subparallel series of channels in the inner bay, most presently infilled by mud (cf. Sheets 2 and 4), which suggest fluvio-deltaic activity during a lowered relative sea level stand;

(3) a Quaternary stratigraphic sequence up to 45m thick, consisting of Holocene(?) mud overlying undifferentiated Pleistocene(?) sediment on air gun profiles (Sheet 5, Figure 1; Sheet 1, Figure 5); the Holocene(?) mud correlates with the acoustically transparent sediment observed on MS26B records (Sheet 3), although see (4) below;

(4) subsurface masking by semi-opaque gas reflectors on air gun profiles, often associated with surface gas escape marks which are linear on sidescan sonograms (Sheet 5, Figure 1); the gas reflector constitutes acoustic basement on MS26B records (Sheets 2-4) where it occurs within mud;

(5) an irregular ridge running along the north shore of the outer bay (Sheet 2), which air gun profiles indicate is a constructional accumulation of Pleistocene(?) sediments (Sheet 5, Figure 1); other constructional accumulations are also observed, including a barrier-like feature in the central bay;

(6) widespread erosion of Pleistocene(?) sediments in two forms: (a) thinning and surface smoothing above 50-70 m, often in coincidence with terraces along the margins of the outer bay (Sheet 5, Figure 1), and (b) below (a) to depths of 80-100 m (below sea level) in the central and outer bay features with relief of 1-3 m height and 50-100m spacing, which side-scan sonograms indicate are subparallel lineations oriented generally along the bay axis (cf. Sheet 5, Figures 1 and 3);

(7) an eroded bedrock surface containing prominent subparallel ridges and troughs oriented generally along the bay axis, including a ~30 m deep channel that runs from Dalhousie to a 100 m deep basin in the central bay (Sheet 5, Figure 3);

(8) gently deformed bedrock sedimentary strata which dip less than 3° along fold axes oriented subparallel to the bay axis (Sheet 5, Figure 4); structural styles and orientations suggest that these strata correlate with Carboniferous conglomerates, sandstones and shales found locally around the margins of the bay.

ACKNOWLEDGMENTS

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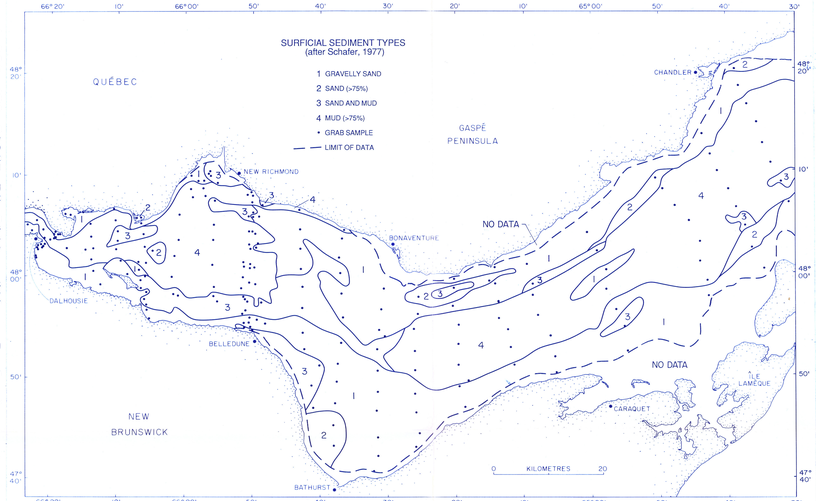
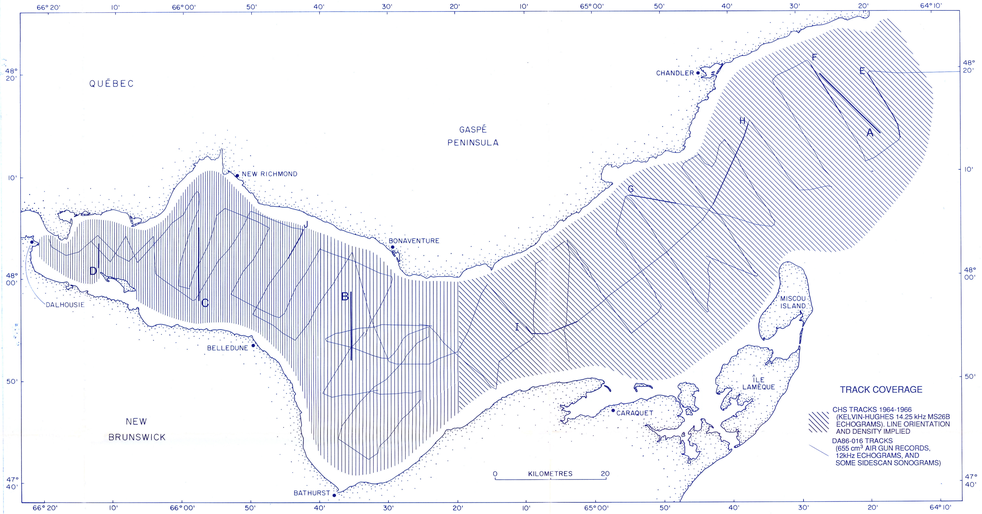


Figure 2



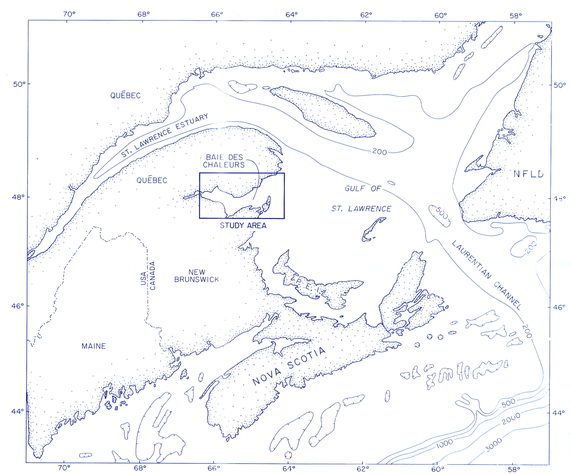


Figure 1

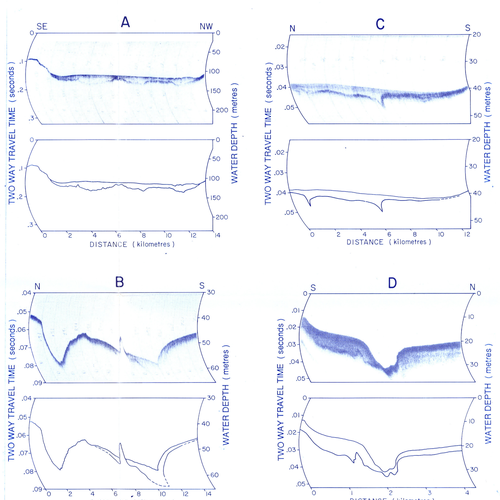


FIGURE 4. Kelvin-Hughes 14.25 kHz MS26B echograms and interpretations, showing seafloor morphology and variable thickness of acoustically penetrable (muddy) sediments. For locations see Sheet 1, Figure 3, or see Sheets 2 to 4.

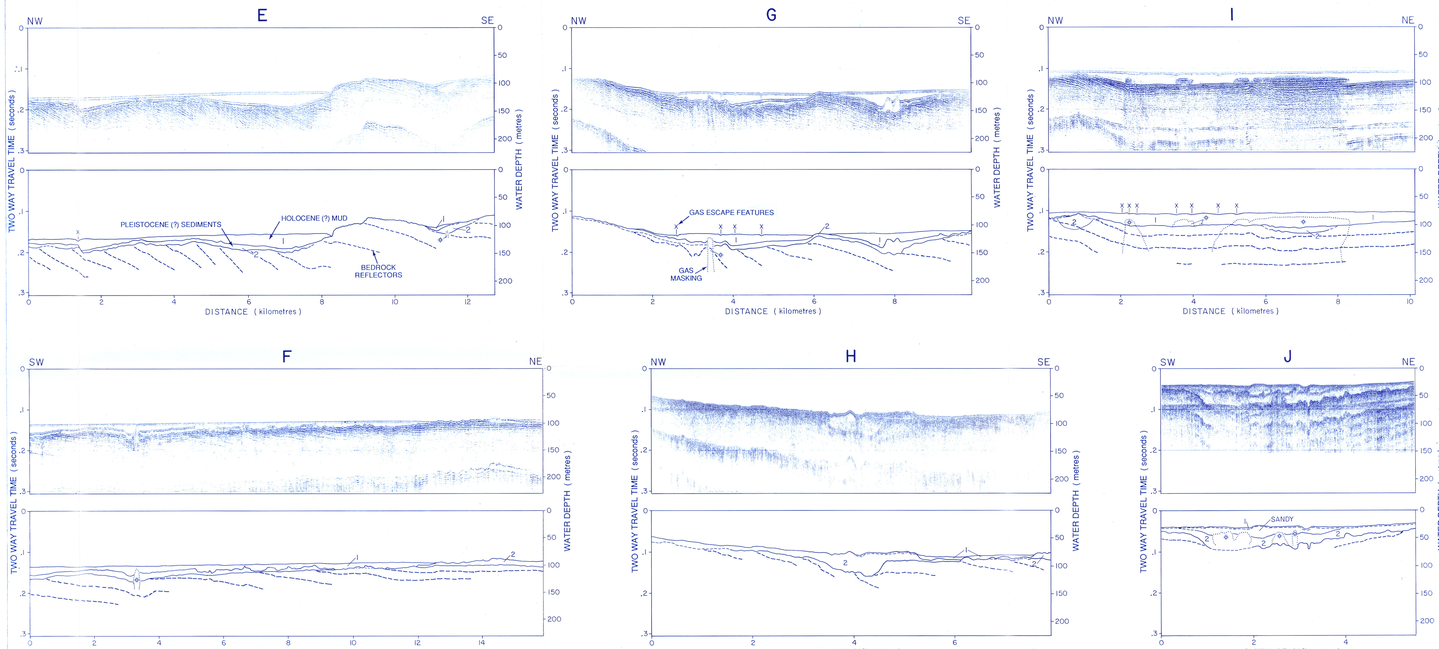


FIGURE 5. 655 cm^3 air gun seismic reflection records and interpretations, showing Quaternary sediment units of varying character and thickness, unconformably overlying gently deformed sedimentary strata (heavy dashed lines). For legend see Sheet 5, Figure 1. For locations see Sheet 1, Figure 3, or see Sheet 5.