Atlantic Geology

On the Morphology of the Northeast Gulf of St. Lawrence

David Monahan

Volume 7, Number 2, September 1971

URI: https://id.erudit.org/iderudit/ageo07_2rep04

See table of contents

Publisher(s)

Maritime Sediments Editorial Board

ISSN

0843-5561 (print)
1718-7885 (digital)

Explore this journal

Cite this article

Monahan, D. (1971). On the Morphology of the Northeast Gulf of St. Lawrence. *Atlantic Geology*, *7*(2), 73–74.

Maritime Sediments, Vol. 7, No. 2, September 1971, pp. 73-75.

On the Morphology of the Northeast Gulf of St. Lawrence*

DAVID MONAHAN
Canadian Hydrographic Service, Department of the Environment, Ottawa, Ont.

The first bathymetric chart of the entire Gulf of St. Lawrence produced by the Canadian Hydrographic Service, Chart 801, presented an interpretation of depth data available to the end of 1968. In some regions information was relatively scarce, particularly in the area under discussion which is that bounded by Ile d'Anticosti, Quebec, and the Island of Newfoundland. At the time of preparation of Chart 801 there were considerably less than five soundings per ten square kilometres in this area (Monahan, 1971, Fig. 1), and many were of doubtful accuracy. Nota and Loring (1964) pointed out that there were insufficient soundings to draw meaningful contours. The deficiency has now been largely rectified through the results of a survey with sounding lines spaced about two kilometres apart, carried out during 1969 as part of a continuing program to improve our knowledge of the area. The new information has been used to prepare Natural Resource Charts 15088, 15098, 15180 and 15190 (in press). The nine-fold increase in sounding density reveals new features and gives better resolution of formerly very generalized features. The new interpretation updates Chart 801 and is shown as Figure 1. Several of the features are interesting and relate to other studies carried out in the area.

Most writers conclude that the present Laurentian Channel and northeast Gulf of St. Lawrence originated as a major river valley system that became enlarged and greatly modified by glacier tongues (Loring & Nota, 1969; Bostock, 1970). Clearly, the major flow of ice was southeasterly through the Laurentian Channel, with additions from two major tributaries; one flowing southerly along Esquiman Channel and the other flowing easterly north of Ile d'Anticosti (Nota & Loring, 1964). Chart 801 lent only token support to this hypothesis but the new interpretation (Fig. 1) shows several features of probable glacial origin, and some features which have probably been glacially modified.

South of Banc Beaugé where Chenal d'Anticosti and Esquiman Channel join, there is a long, low ridge extending southerly (A, Fig. 1). Loring (1971) has sampled the surface of this ridge and believes it is the remnant of a medial or interlobate moraine produced by the confluence of the two major tributary glaciers. Shearer (1971) has a shallow seismic record of a traverse across the eastern flank of Banc Beaugé which reveals the bank to be bedrock with little till cover. Hence, it is likely that the ridge in question is largely a glacially sculptured bedrock spur that has also, because of its interlobate position, been the locus of ice-marginal deposition.

A low ridge across the floor of the Laurentian Channel, south of the eastern tip of Ile d'Anticosti, could be the remnant of a recessional moraine (B, Fig. 1). Two smaller features also seem related to glacial action. Around the fiords of Bay of Islands and Bonne Bay there are arcuate topographic highs (C, D, Fig. 1) that may be offshore analogues to the end moraines of western Newfoundland attributed by Grant (1969) to the action of piedmont glaciers. Shearer (1971, Fig. 9) described the topographic highs as retreat moraines.

Eastward from Ile d'Anticosti there is a linear feature parallel to the strike of the Silurian and Ordivician rocks of the island (E). From shallow seismic records Shearer (Geological Survey of Canada, personal communication, 1971) identified this feature as a bedrock ridge. He also obtained seismic records of a traverse across a linear feature in Esquiman Channel (F) that begins as an escarpment near Port au Choix and becomes a ridge near the channel axis. Again the cause is shown to be a resistant bedrock formation; in this case it occurs approximately parallel to the strike of the contact he described that is found between the Mingan and Trenton-Black River formations (all Middle Ordivician), and lying within the younger Trenton-Black River sequence (Shearer, 1971, Fig. 4). The trends of both these features agree with the regional structure he described.

Leading into Chenal d'Anticosti from the north are a series of valleys cut into the Palaeozoic bedrock (G). These may represent tributaries to the ancient river system formed during a lower stand of sea level, that were locally enlarged, deranged and scoured by Pleistocene glaciation.

The profile of Chenal d'Anticosti north of Ile d'Anticosti is a subdued, symmetrical 'U' shape, but in the area southwest of Banc Beaugé where it begins to curve southwards it becomes strongly asymmetrical with much steeper walls and greater depths occurring on the outside of the curve. Esquiman Channel is similarly distorted. This is a common characteristic of curves in channels cut by streams of ice as well as water, and might be considered further evidence for glacial modification. However, Laurentian Channel is locally asymmetrical in the opposite direction; the asymmetry in these places may be structurally controlled. Other areas that need further explanation are identified on Figure 1 by the letters H and J.

The process of re-surveying areas with relatively inadequate soundings and extending the

*Manuscript received November 19, 1971.

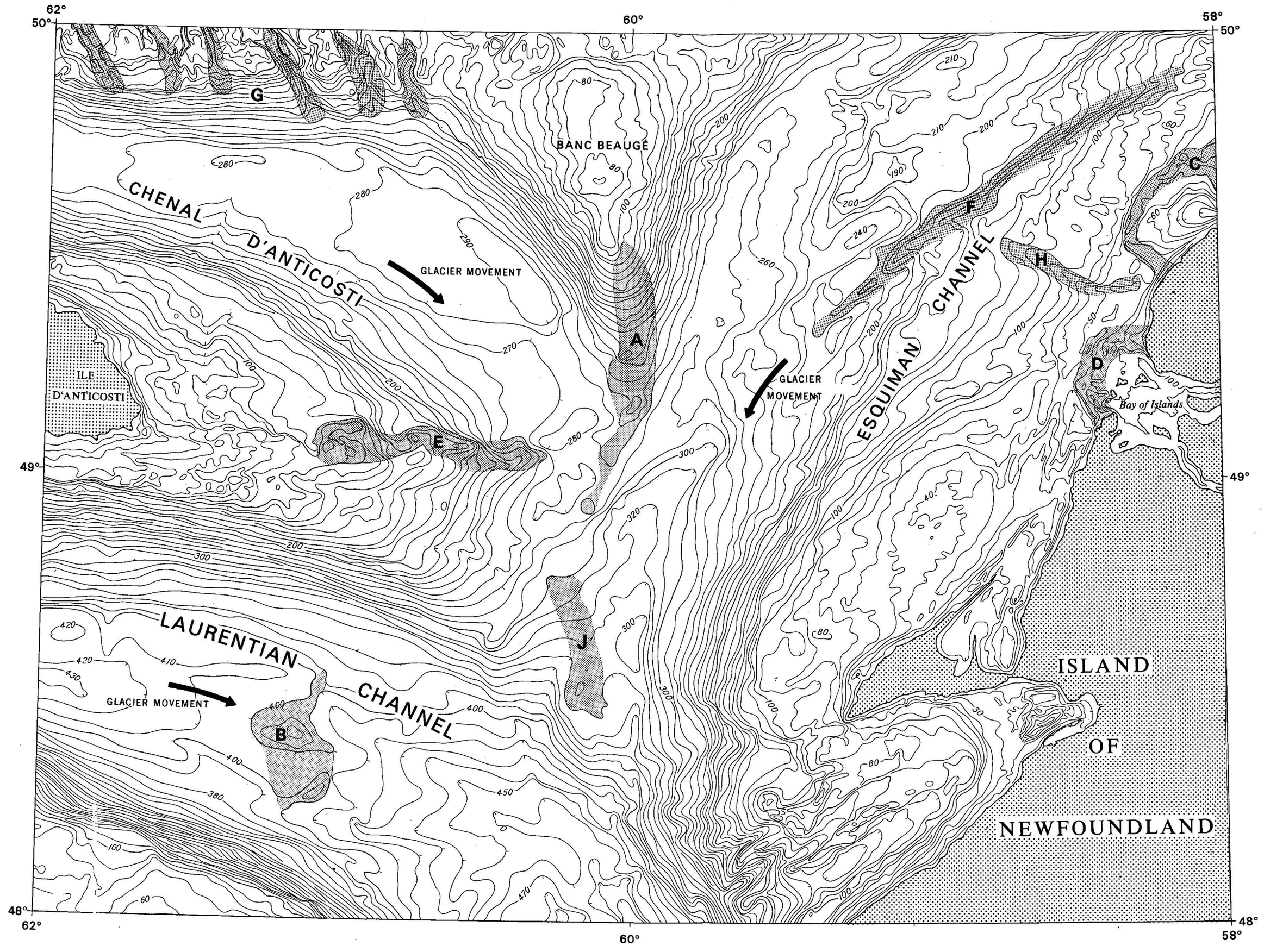

Figure 1 - Bathymetric chart of the North-East Gulf of St. Lawrence; scale 1:1,000,000; Lambert Conformal Conic Projection; contour interval ten metres. Letters and stipled areas are referred to in the text.

regions of survey coverage is a continuing one. As new information is acquired it is incorporated into the Natural Resource Chart series which will eventually be used to update all other bathymetric charts.

The author is indebted to Dr. D.R. Grant and Mr. J.M. Shearer, Geological Survey of Canada, Ottawa, and to Dr. D.H. Loring, Fisheries Research Board, Dartmouth, Nova Scotia, for helpful discussions during the interpretation stage, for allowing access to as yet unpublished material, and for their critical readings of this report.

References cited

BOSTOCK, H.S., 1970, Physiographic subdivisions of Canada; in R.J.W. Douglas (editor) Geology and economic minerals of Canada, Report No. 1, Geol. Surv. Can., pp. 10-30.

CANADIAN HYDROGRAPHIC SERVICE, 1969, Bay of Fundy to Gulf of St. Lawrence. Chart 801, First Edition. Department of Energy, Mines and Resources, Ottawa.

_____, 1972. Natural Resource Charts 15088, 15098, 15180, 15190. First Edition. Department of the Environment, Ottawa, (in press).

GRANT, D.R., 1969, Late Pleistocene re-advance of piedmont glaciers in western Newfoundland. Maritime Sediments, vol. 5, no. 3, pp. 126-128.

LORING, D.H., 1971, Marine geology of the Gulf of St. Lawrence 1. Bedrock geology. 2. Glacial and post-glacial history. Earth Sci. Symp. Offshore Eastern Canada, Geol. Surv. Can., Paper, (in press).

_____, and NOTA, D.J.G., 1969, Mineral dispersion patterns in the Gulf of St. Lawrence. Rev. Georgr. Montr., vol. XXIII, no. 3, pp. 289-305.

MONAHAN, D., 1971, Three-dimensional representation of submarine relief: continental margin of eastern North America. Marine Sciences Paper 9, Information Canada, Ottawa.

NOTA, D.J.G., and LORING, D.H., 1964, Recent depositional conditions in the St. Lawrence River and Gulf - a reconnaissance survey. Marine Geol. vol. 2, no. 3, pp. 198-235.

SHEARER, J., 1971, Bedrock and surficial geology of the northern Gulf of St. Lawrence as interpreted from continuous seismic reflection profiles. Earth Sci. Symp. Offshore Eastern Canada, Geol. Surv. Can., Paper, (in press).