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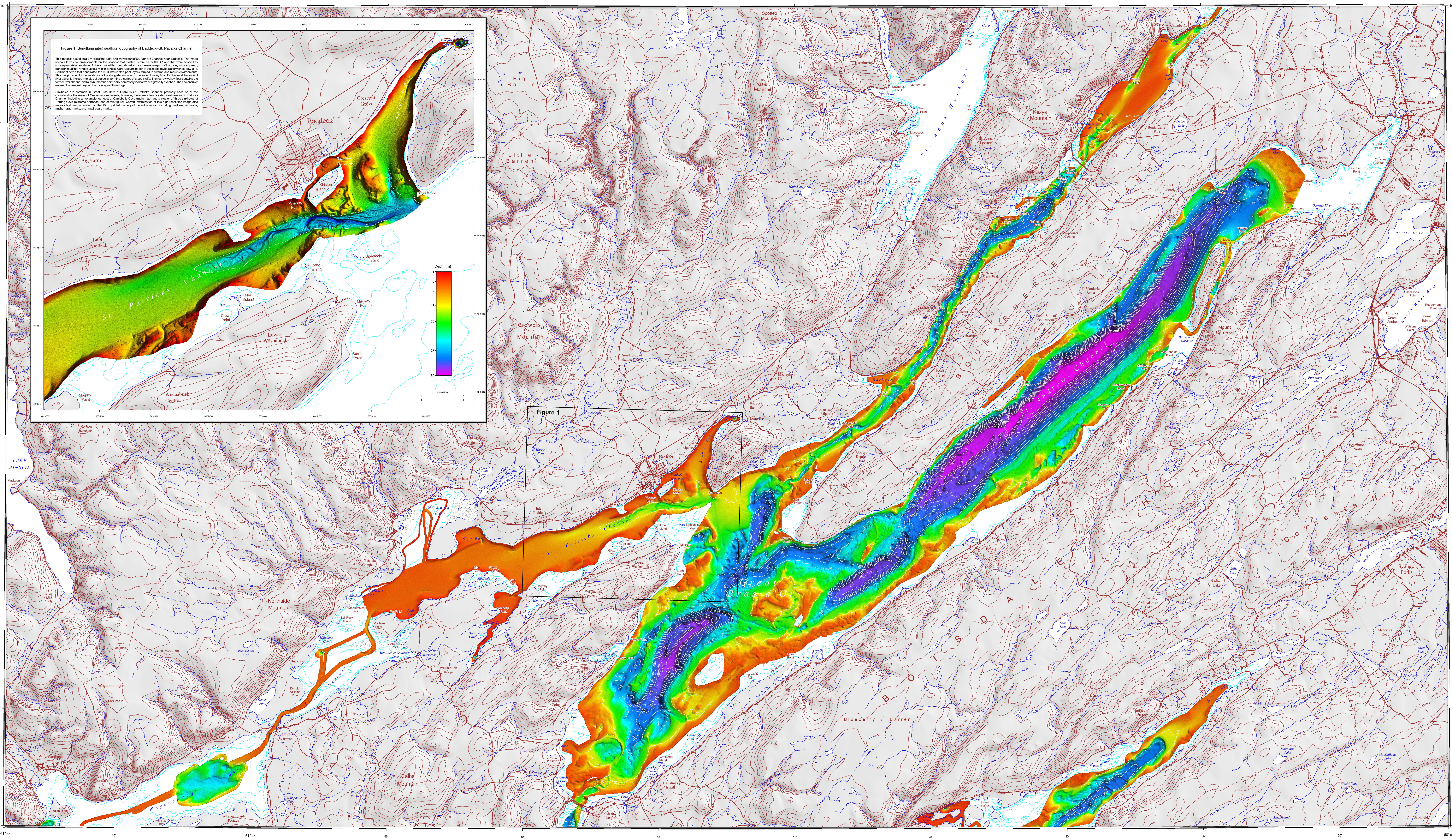
GEOLOGICAL SURVEY OF CANADA | COMMISSION GÉOLOGIQUE DU CANADA



DESCRIPTIVE NOTES

INTRODUCTION

Bras d' Or Lake and Great Bras d' Or, Nova Scotia, constitute Canada's largest inland sea. This map sheet depicts the bathymetry of the northern part of the lakes, including St. Patricks Channel, St. Andrews Channel, and Great Bras d' Or, the principal connection to the ocean. The southern area is shown on the Bras d'Or Lake map sheet (Shaw and Potter, 2006). The bathymetry of this region has the greatest range within Bras d'Or Lake–Great Bras d'Or area, ranging from the very shallow St. Patricks Channel (depth mostly less than 20 m) to the very deep St. Andrews Channel (maximum depth 256 m). The surficial geology around the lakes is mostly related to the history of glaciation, and has been mapped by Grant (1994). The detailed morphology of the lake floor has, until now, been poorly known.

MULTIBEAM BATHYMETRIC DATA COLLECTION

Data were collected using Canadian Coast Guard vessels. The majority of surveys were performed by the Canadian Hydrographic Service (CHS), but some were conducted by the Geological Survey of Canada (GSC). Table 1 lists the surveys. The *Frederick G. Creed* is a SWATH (Small Waterplane Area Twin Hull) vessel equipped with a Simrad EM1000 multibeam survey system, with the transducer mounted in the starboard pontoon. The hydrographic launch *Plover* deployed a hull-mounted Simrad EM3000 multibeam sonar system. A Differential Global Positioning System was used for navigation, providing positional accuracy of about 3 m. Survey speeds averaged 10 knots. Data were adjusted for tidal variation using output from a tide gauge installed at Barra Strait. (The tidal range of the lake is only about 0.1 m, but atmospheric conditions cause water-level variations of up to 0.5 m.) Data were cleaned using the CARIS® Hydrographic Information Processing System, and were analyzed using an in-house version of the US Army Corps of Engineer GRASS GIS system.

SURVEY	REMARKS
2000	CHS surveys in Great Bras d'Or, St. Andrews Chan., Whycocomagh Bay; CCGS *Creed*
2002066	GSC surveys in Baddeck area; *Plover*, deployed from CCGS *Matthew*
2003015	GSC surveys in St. Patricks Channel; *Plover*, deployed from CCGS *Matthew*
2003099	GSC survey in Bras d'Or Lake; some work in Great Bras d'Or Channel; CCGS *Creed*

Table 1. Remarks on surveys carried out in study area.

DATA DISPLAY

Multibeam bathymetric data were gridded in 10 m (horizontal) bins to produce the Digital Elevation Model (DEM) shown here. Artificial sun illumination is from 045° azimuth and 45° inclination. Vertical exaggeration is x10. A colour palette has been applied to the bathymetric data; warm colours (e.g. reds) represent shallow water and cool colours (e.g. blues) represent deep water. The palette has been given hypsometric normalization. The data shown here contained various artifacts, mostly due to uncorrected refraction. The resultant ridging is minimized when illumination is along the survey lines, as is the case for most of the image, but is readily apparent where turns remain in the data or where illumination is across lines.

MORPHOLOGY

The area of the map can be divided into several distinctive regions based on mean depth and seabed morphological character.

Great Bras d' Or

In the northeast Great Bras d'Or is narrow. At its seaward end, between MacPhees Cove and Kellys Point, the seafloor is shallow. The morphology is that of a flood-tidal delta–an area of smooth, sandy seabed formed by the deceleration of the tidal currents that are predominantly into the lakes at the sea-floor. Immediately landward of the narrows are large ripples. The channel in the narrows and just seaward is artificially deepened by dredging. To the southwest the remainder of the narrow channel is deeper, with remains of an ancient (fluvial) channel in places, partly obscured by deposits of mud. The widest part of Great Bras d'Or extends from near Baddeck to the narrows at Barra Strait. The morphology is extremely complex, and includes a deep area (229 m) incised in bedrock. Highly folded bedrock structures appear on the shallow platform immediately west of this deep area. In the north, the seafloor is pocked by sinkholes–pits created by solution of carbonate rocks. Some sinkholes contain shallow gas that masks seismic records, and several contain small pock marks.

St. Patricks Channel

St. Patricks Channel is the valley of an early Holocene river that connected a series of lakes. The sea-floor is mostly smooth and shallow, with the ancient lakes appearing as basins, as at the head of Whycocomagh Bay. The morphology of the region is more complex around Baddeck, where the ancient river is incised into older deposits, and appears as an incised channel (*see* Fig. 1) leading to a former delta; the delta forms the flat platform near Red Head. Deep holes in the area are sinkholes; they occur at Herring Cove (head of Baddeck Bay), Campbells Cove, Whycocomagh Bay, and near Bucklaw.

St. Andrews Channel

St. Andrews Channel is oriented northeast-southwest, and attains a maximum depth of 256 m. The channel is remarkably linear, reflecting the fact that it is largely excavated in northeast-trending bedrock, possibly along the axis of a major fault. Removal of bedrock by solution may have played a role in formation of this channel.

ACKNOWLEDGMENTS

The Master and crew of the CCGS *Frederick G. Creed* were instrumental in the multibeam bathymetric surveys carried out by the GSC. The Canadian Hydrographic Service (CHS) organized most of the surveys and provided tidal stations. Cartographic support was provided by G. Grant, with assistance from Phil O'Regan, Scott Hayward, and Sheila Hynes, Natural Resources Canada. The map was reviewed by R.B. Taylor and R.C. Courtney. The work was part of GSC project X-29 (J. Shaw, leader) in the Geoscience for Ocean Management Program. It was partly supported by funding from the Climate Change Action Fund, Project A-581. The authors thank Ken Paul, formerly of CHS, for initiating the collaboration with that organization.

REFERENCES

Grant, D.R.
1994: Quaternary geology, Cape Breton Island, Nova Scotia; Geological Survey of Canada, Bulletin 482, 159 p.

Shaw, J. and Potter, D.P.
2007: Sun-illuminated seafloor topography, Bras d'Or Lake, Cape Breton Island, Nova Scotia; Geological Survey of Canada, Map 2098A, scale 1:50 000.

0 10 20 30 50 100 250
Depth (m)

Copies of this map may be obtained
from the Geological Survey of Canada:
601 Booth Street, Ottawa, Ontario K1A 0E8
3303-33rd Street, N.W., Calgary, Alberta T2L 2A7
625 Robson Street, Vancouver, B.C. V6B 5J3
490, rue de la Couronne, Québec, Quebec G1K 9A9
1 Challenger Drive, P.O. Box 1006, Dartmouth, Nova Scotia B2Y 4A2

LOCATION MAP

MAP 2097A

SUN-ILLUMINATED SEAFLOOR TOPOGRAPHY

GREAT BRAS D'OR

CAPE BRETON ISLAND, NOVA SCOTIA

Scale 1:50 000/Échelle 1/50 000

kilometres 1 0 1 2 3 4 kilomètres

Universal Transverse Mercator Projection
North American Datum 1983
© Her Majesty the Queen in Right of Canada, 2007
This map is not to be used for navigational purposes

Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1983
© Sa Majesté la Reine du chef du Canada, 2007
Cette carte ne doit pas être utilisée aux fins de navigation

Authors: J. Shaw and D.P. Potter

Multibeam bathymetric data collected by J. Shaw and D.P. Potter, 2004

Multibeam bathymetric data compiled by J. Shaw and D.P. Potter, 2005

Digital cartography by G. Grant and S. Hayward, GSC (Atlantic)

Any revisions or additional information known to the user would be welcomed by the Geological Survey of Canada

Digital base map (land area) from data compiled by Geomatics Canada, modified by GSC (Atlantic)

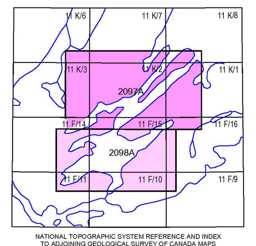
Some geographical names subject to revision

Magnetic declination 2007, 19°50'W, decreasing 9.8' annually

Elevations in metres above mean sea level

Depth in metres below sea level

Published 2007



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

Recommended citation:
Shaw, J. and Potter, D.P.
2007: Sun-illuminated seafloor topography, Great Bras d'Or, Cape Breton Island, Nova Scotia; Geological Survey of Canada, Map 2097A, scale 1:50 000.

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