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DESCRIPTIVE NOTES

INTRODUCTION

The Bras d' Or Lakes, Nova Scotia, constitute Canada's largest inland sea. This map sheet depicts the bathymetry of the southern part of the lakes: Bras d'Or Lake, East Bay, West Bay, and Denys Basin. The southern part of the lakes is generally shallower than the northern part. The greatest depth in the centre of Bras d'Or Lake is 289 m. The shape of the bedrock floor of the lakes is complex and, in part, is closely related to the history of glaciation, and has been mapped by Grant (1994). The detailed morphology of the lake floor, however, has remained a mystery. The southern parts of the lakes, depicted in this map, differ from the northern parts in that seabed morphology is principally related to the presence of extensive and thick glacial deposits, mainly drumlins, but also moraines, and coastal features that formed when the lakes were composed of fresh water (in the early to middle Holocene).

MULTIBEAM BATHYMETRIC DATA COLLECTION

Data were collected using Canadian Coast Guard vessels. The majority of surveys were performed by the CCGS *Frederick G. Creed*, which is based in Sydney, Nova Scotia, and operated by the Canadian Coast Guard (CCG). Table 1 lists the surveys. The *Frederick G. Creed* is a SWATH (Small Waterplane Area Twin Hull) vessel equipped with a Simrad EM1000 multibeam bathymetric survey system, with the transducer mounted in the starboard pontoon. The hydrographic launch *Plover* deployed a Reson SeaBat 8101 and Simrad EM3000 multibeam sonar system. The hydrographic launch *Penguin* deployed a Submetrix™ multibeam sonar system. Positioning was by differential GPS, using the Canadian Coast Guard system 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 lakes is only ~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 analysed using an in-house version of the US Army Corps of Engineers GRASS GIS system.

SURVEY	REMARKS
2001	CHS surveys near St. Peter's and Eskasoni; survey launch *Plover*
2002	GSC surveys in central Bras d' Or Lake; CCGS *Creed*
2001	GSC surveys in East Bay with St. Peter's transit lines; CCGS *Creed*
2003099	GSC survey in Bras d'Or Lake; CCGS *Creed*
2004099	GSC survey in West Bay; CCGS *Creed*
2004500	GSC survey in Denys Basin; launch *Penguin*

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 a non-linear distribution, so that the colour changes more rapidly in shallow water, to highlight subtle seabed refraction. The resultant lighting is minimized when illumination is along the survey lines, as is the case for most of the image, but is readily apparent where lume remain in the data or where illumination is across lines.

MORPHOLOGY

Bras d'Or Lake can be divided into several distinctive regions based on mean depth and seabed morphological character.

East Bay

At the west end of East Bay, south of Benacadie Point, a field of drumlins is oriented approximately north-south. The seabed extends across the bay as a coastal feature constructed during the early to mid-Holocene, when the lake was fresh and water level was about 24 m lower than today. A second series of drumlins is oriented east-west, and is located in the centre of East Bay. These drumlins are composed of deposits that formed at the level of the ancient freshwater lake. These drumlins and barriers consist of narrow, ridge-like forms that are analogous to their modern counterparts in the lakes. Northeast of MacGregors Point several basins are observed, the most northeasterly basin is better seen on the map sheet to the north (Map 2097A, Shaw and Potter, 2007). These basins must have been lakes, separated from the main lake during the freshwater phase.

Central Bras d'Or Lake

This is the deepest area of Bras d'Or Lake. The seabed shows evidence of glaciation, including fields of drumlins with a mainly north-south orientation. At the southeast, south, and west margins of the lake, fields of drumlins with varying orientation occur. Those on the southeast and south have been modified during the ~24 m lake phase: they are linked by submerged barrier beaches. Between MacLeods Point and Cod Shoals, a large drumlin is modified into a submerged island. Cod Shoals and the final represent the final phase of drowning when beach deposits are formed into a small barrier spit.

Channels on the seabed just north of the deepest area are interpreted as having formed under the glaciers that formerly occupied the basin. An arcuate ridge that extends northeast from Malagawatch Point, and includes Cod Shoals, is a moraine. North of here the flat area is an ancient delta. High-resolution versions of the multibeam imagery reveal a meandering river channel in this area, and a series of low ridges that are barrier beaches that formed at the delta's northeastern edge. The deep area just north of Cod Shoals represents a paleowetland that has developed in mud. At the other end of the basin, the narrow channel that winds down towards St. Peter's contains fields of drumlins with an orientation of about 330°.

Denys Basin

This is a very shallow part of the lake, with a smooth, muddy bottom for the most part; however, the multibeam imagery reveals meandering river channels (see Fig. 1 and accompanying text) that formed in the early Holocene, when a freshwater lake existed. The river channels coalesce and extend eastwards; it was this river system that formed the delta just north of Malagawatch Point.

West Bay

A field of drumlins extends southwest into West Bay. The drumlins are elongated at the entrance of West Bay, but towards the southwest they become more irregular in form and smaller. The drumlins have been modified during the freshwater lake phase. The ~24 m ancient lake level is marked in places by a horizontal erosional shore platform. Elsewhere, drumlin shoals are linked by narrow ridges that are drowned beaches and barriers.

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 CCG logistics and coordinations. Thanks to Jacques Locat, Université Laval, Québec, for encouragement. 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 K-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.

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Grant, D.R.
1994 Quaternary Geology, Cape Breton Island, Nova Scotia; Geological Survey of Canada, Bulletin 462, 109 p.

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.

Copies of this map may be obtained
Geological Survey of Canada (Atlantic)
901 Booth Street, Ottawa, Ontario K1A 0E8
3303-33rd Street, N.W., Calgary, Alberta T2L 2A7
101-605 Robson Street, Vancouver, B.C. V6B 5J3
490, rue de la Couronne, Québec, Québec G1K 9A9
1 Challenger Drive, P.O. Box 1006, Dartmouth, Nova Scotia B2Y 4A2

LOCATION MAP

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

MAP 2098A

SUN-ILLUMINATED SEAFLOOR TOPOGRAPHY

BRAS D'OR LAKE

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
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This map is not to be used for navigational purposes

Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1983
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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°40'W, decreasing 9.6' annually

Elevations in metres above mean sea level

Depth in metres below sea level

Published/2007

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