PLACENTIA BAY NORTH

OFFSHORE NEWFOUNDLAND AND LABRADOR

Scale 1:50 000/Échelle 1/50 000

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Universal Transverse Mercator Projection

North American Datum 1983

Projection transverse universelle de Mercator

Système de référence géodésique nord-américain, 1983

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

Digital bathymetric contours in metres supplied by Canadian Hydrographic Service and GSC (Atlantic)

Magnetic declination 2009, 20°04'W, decreasing 12.3' annually

Elevations in feet above mean sea level

Depth in metres below mean sea level

DESCRIPTIVE NOTES

INTRODUCTION

Placentia Bay is a major embayment on the south coast of the island of Newfoundland. This map sheet is one of five maps of the Placentia Bay area (see also Potter and Shaw, 2009a, b, c, d); this sheet depicts the bathymetry of the northern part of the bay. This region is dominated by the three deep channels of Placentia Bay, namely Western Channel, Central Channel, and Eastern Channel. The very long and narrow Paradise Sound appears in the west of the map area. This map area is notable for the extensive industrial activity in the Come-by-Chance—Arnold's Cove area. The oil refinery and storage areas result in very heavy tanker traffic up Eastern Channel.

MULTIBEAM BATHYMETRIC DATA COLLECTION

Most data were collected in joint Geological Survey of Canada (GSC)–Canadian Hydrographic Service (CHS) surveys using Canadian Coast Guard vessels. The Frederick G. Creed is a SWATH (Small Waterplane Area Twin Hull) vessel which was initially equipped with a Kongsberg-Simrad EM1000 multibeam sonar system, with the transducer mounted in the starboard pontoon. This was replaced by a Kongsberg-Simrad EM1002 system in 2005. The CCGS *Matthew* was equipped with a Kongsberg-Simrad EM1002 multibeam sonar system during the 2004 surveys; this was replaced by a Kongsberg-Simrad EM710 system in 2005. Shallow areas were surveyed using the hydrographic launch *Plover*, which deployed a hull-mounted Kongsberg-Simrad EM3000 multibeam sonar system. A Differential Global Positioning System was used for navigation, providing positional accuracy of about 1m. Survey speeds for most vessels averaged 10 knots. Data were adjusted for tidal variations using output from a tide gauge installed at Argentia (see Potter and Shaw, 2009a). Data were cleaned and gridded in 5 m (horizontal) bins using the CARIS Hydrographic Information Processing System, exported and subsequently imported into GRASS, a GIS developed by the U.S. Army Corps of Engineers.

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

SURVEY REMARKS

1997 Survey by the launch *Plover* using a Kongsberg-Simrad EM3000 system.

2000 Survey by the launch *Plover* using a Kongsberg-Simrad EM3000 system.

2004 Survey by the CCGS *Frederick G. Creed* using a Kongsberg-Simrad EM1000 system. 2004 Survey by the CCGS Matthew using a Kongsberg-Simrad EM1002 system. 2005 Survey by the CCGS Frederick G. Creed using a Kongsberg-Simrad EM1002 system. 2006 Survey by the CCGS *Matthew* using a Kongsberg-Simrad EM710 system.

DATA DISPLAY

Artificial sun illumination from 045° azimuth and 45° inclination was applied in the GRASS GIS. Vertical exaggeration is x10. A colour palette was applied to the bathymetric data; warm colours (e.g. reds) represent shallow water and cool colours (e.g. blues) represent deep water. Bathymetric divisions between colours were assigned such that equal areas are covered by each colour in the palette.

Bathymetric contours in blue were generated from gridded data obtained from the Canadian

Hydrographic Service collected prior to the multibeam surveys in this study.

MORPHOLOGY This region is topographically complex, and shows evidence of strong bedrock structural control, together with the effects of glaciation and modern oceanographic processes. Soft, muddy seafloor in deep water grades to muddy sand in shallow coastal embayments. Much of the seafloor is reflective, due to a veneer of glaciomarine mud over bedrock. For purposes of description, the region is divided into four areas. Sites on the map labelled as A to M are referenced in the text.

Western Channel Western Channel is a glacially overdeepened trough. In the deeper parts of the channel (site A) the seabed is smooth and has low backscatter due to a cover of postglacial mud overlying glaciomarine silt. In shallower water, however, the seafloor is both very reflective and highly irregular, indicating the presence of bedrock with a veneer of glaciomarine mud. At the north end of Western Channel (site B) the seabed is dominated by closely spaced convex hills, with relief of 20–40 m, with De Geer moraines superimposed in relatively deep areas. The hills have high backscatter and possibly consist of bedrock.

Central Channel Central Channel is narrow and shallow in comparison with the channels to either side of it. The thalweg of the channel is occupied by thin postglacial mud, with sedimentary furrows in places overlying glaciomarine mud; the sides of the channel are composed of bedrock, with veneers of glaciomarine mud

Eastern Channel

The glacial trough of Eastern Channel is more than 330 m deep in places. As elsewhere, the deepest areas have a smooth seabed, due to the presence of postglacial mud overlying thick glaciomarine silt (site C). Current action at the seabed has banked the postglacial mud to either side of the main channel, so that in some areas glaciomarine mud capped by a highly reflective lag of muddy, sandy gravel is exposed near the seafloor, and the postglacial mud is off to one side of the main thalweg. Sedimentary furrows are imprinted into the postglacial mud in several places (site D). In shallower water (e.g. site E) the highly reflective, rugged seafloor is mostly bedrock with veneers of glaciomarine mud in deeper areas. Streamline glacial landforms (drumlins) are observed at site F and moraines at site G. The The head of the bay

This area lies north of the tip of Grassy Point, near Arnold's Cove. This region was intensively surveyed using geophysical systems in 1989, at a time when there were plans to assemble the Hibernia Platform in this vicinity (see Shaw et al., 1990). The seafloor is very complex. The deepestarea, at the northern end this vicinity (see Shaw et al., 1990). The seafloor is very complex. The deepestarea, at the northern end of Eastern Channel, has a smooth seabed due to the presence of postglacial mud (site J). Extensive areas of smooth muddy seafloor occur elsewhere (site K). Veneers of glaciomarine mud capped by surficial lags of muddy gravel overlie bedrock throughout this region. A series of bedrock-cored drumlins at site L is indicative of convergent flow of glacial ice from northwest to southeast. In the Come by Chance area (site M) the seafloor is marked by moraines. The early Holocene submerged delta west of Garden Cove described by Shaw and Forbes (1995, referenced in error therein as 'Piper's Hole') lies just outside the coverage of the multibeam surveys, in the extreme northwest of the map area.

ACKNOWLEDGMENTS

Most surveys were carried out with the collaboration of the Canadian Hydrographic Service. In particular the authors acknowledge the role played by A. Roy and C. Stirling, St. John's, Newfoundland. The authors also acknowledge the masters and crews of the CCGS Frederick G. Creed and CCGS Matthew, and the coxswains of the hydrographic launch Plover. D. Beaver of the GSC operated the multibeam system on some launch surveys. Cartographic support was provided by P. A. Melbourne and G. Grant. The map was reviewed by R.O. Miller and P. Moir. The work was part of GSC project X-38 (J. Shaw, leader) in the Geoscience for Ocean Management Program. leader) in the Geoscience for Ocean Management Program.

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2009c: Shaded seafloor relief, Placentia Bay southwest, offshore Newfoundland and Labrador; Geological Survey of Canada, Map 2146A, scale 1:50 000. 2009d: Shaded seafloor relief, Placentia Bay west, offshore Newfoundland and Labrador, Geological Survey of Canada, Map 2144A, scale 1:50 000.

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This map was produced by Natural Resources Canada in co-operation with Fisheries and Oceans Canada

Multibeam bathymetric data collected by Canadian Hydrographic Service and Natural Resources Canada, 1997, 2000, 2004–2006

Multibeam bathymetric data compiled by D.P. Potter, 2007 and 2008

Digital cartography by P.A. Melbourne, Data Dissemination Division (DDD)

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