GEOLOGICAL SURVEY OF CANADA COMMISSION GÉOLOGIQUE DU CANADA

Hydrographic Service and GSC (Atlantic)

Magnetic declination 2009, 19°50'W, decreasing 11.8' 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 southwest portion of the bay, adjacent to the southern extremity of the Burin Peninsula. The bathymetry of this region can be divided into two parts. In the north and west the seabed is rugged, and relatively shallow, with numerous shoals. The deepest water is in the south and east, where the smooth seabed is typically 180–230 m below sea level. The western side of this map area appears on the surficial geology map by Fader et al. (1982).

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 equipped with a Kongsberg-Simrad EM1002 multibeam bathymetric survey system, with the transducer mounted in the starboard pontoon. The CCGS *Matthew* was equipped with the Kongsberg-Simrad EM710 multibeam sonar system. The hydrographic launch *Plover* deployed a hull-mounted Kongsberg-Simrad EM3002 multibeam sonar system. A Differential Global Positioning System was used for navigation providing positional accuracy of about 1 m. Survey speeds Positioning System was used for navigation, providing positional accuracy of about 1 m. Survey speeds averaged 10 knots. Data were adjusted for tidal variations using output from a tide gauge installed at Burin. 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.

	SURVEY	REMARKS
	2004	Survey by the hydrographic launch <i>Plover</i> using a Kongsberg-Simrad EM3000 system in the approaches to Mortier Bay.
	2005	Extensive survey by the CCGS Federick G. Creed, using a Kongsberg-Simrad EM1002 system.
	2005	Survey by the CCGS <i>Matthew</i> in the extreme southeast of the map area, using a Kongsberg-Simrad EM710 system.

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

(Neoproterozoic) by King et al. (1986).

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.

The area of the map can be divided into two distinctive regions based on mean depth and seabed morphological character. Sites on the map labelled as Ato Hare referenced in the text. The region is relatively shallow, and indeed several offshore banks (e.g. Mortier Bank) were too shallow to be surveyed. The complexity of the terrain is due to two factors. The first is a series of prominent bedrock ridges (e.g. site A) and isolated knolls that extend from the northeast to the southwest. The rock outcrops are folded, and may form the western limb of a large syncline the axis of which runs from northeast to southwest. The bedrock forms acoustic basement, and was designated as being Hadryian (Neopretorezgic) by King et al. (1986)

(Neoproterozoic) by King et al. (1986).

The second factor, and the dominant aspect in the northwest of this map area, is the presence of hundreds of streamlined glacial landforms (e.g. site B) with snub noses pointing toward the northwest and narrow tails pointing southeast. These formed under an ice sheet that flowed from northwest to southeast. The landforms are classified as drumlins, on the basis of their elongation ratio E (E = I/w where I = length and w = width). According to Benn and Evans (1998), drumlins have elongation ratios up to 7:1. The drumlins display some morphological variation and changes of direction in the map area. Subbottom profiles show they are composed of till up to 20 m thick, although the seabed texture may be fine muddy gravel, because the drumlins are covered by glaciomarine mud. In the extreme southwest (site C) the drumlins have been modified by a late advance of ice from the southwest, up the bay. They are lower and flatter, and have been grooved by the ice. flatter, and have been grooved by the ice. In some areas (e.g. site D) the drumlins are overlain by De Geer moraines, which are narrow (<50 m) ridges commonly several hundreds of metres long, composed of till. These formed at the margin of retreating grounded ice, and occur in swarms, aligned along the isobaths. In one area (site E) more substantial retreat moraines have formed, with orientations similar to the De Geer moraines.

In contrast to the northwest, this region is relatively deep and the seabed is comparatively smooth. The Carboniferous bedrock (King et al., 1986) is buried beneath Quaternary deposits, but can be seen on acoustic profiler images as gently dipping, folded strata. The drumlins in this area are more elongated than those to the northwest. According to Stokes and Clark (1999), fast flow of ice (i.e. streaming) is indicated when the elongation ratio E> 10:1. The drumlins in this part of the map area achieve elongation ratios > 10:1, and also have a pronounced curvature (site F), suggesting acceleration and streaming of ice down Placentia Bay. The drumlins vanish beneath a cover of glaciomarine mud that thickens toward the southeast. The seabed is marked by numerous ancient iceberg furrows (site G), some up to 200 m across. Farther southeast the seabed is completely smooth where the glaciomarine sediments are covered by an eastward-thickening bank of postglacial mud, the surface of which is marked by pockmarks (gas-escape structures). Careful inspection of the image reveals a cluster of five fishing vessels (site H) that were scuttled in the late 1990s.

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*. Cartographic support was provided by P.A. Melbourne and G. Grant. The authors relied heavily on contributions by GIS specialists S. Hayward and S. Hynes. The map was reviewed by R. Parrott and R.C. Courtney. The work was part of GSC project X-38 (J. Shaw, leader) in the Geoscience for Ocean Management Program.

REFERENCES

Benn, D.I. and Evans, D.J.A. 1998: Glaciers and Glaciation; Arnold, London, United Kingdom, 734 p.

King, L.H., Fader, G.B.J., Jenkins, W.A.M., and King, E.L.

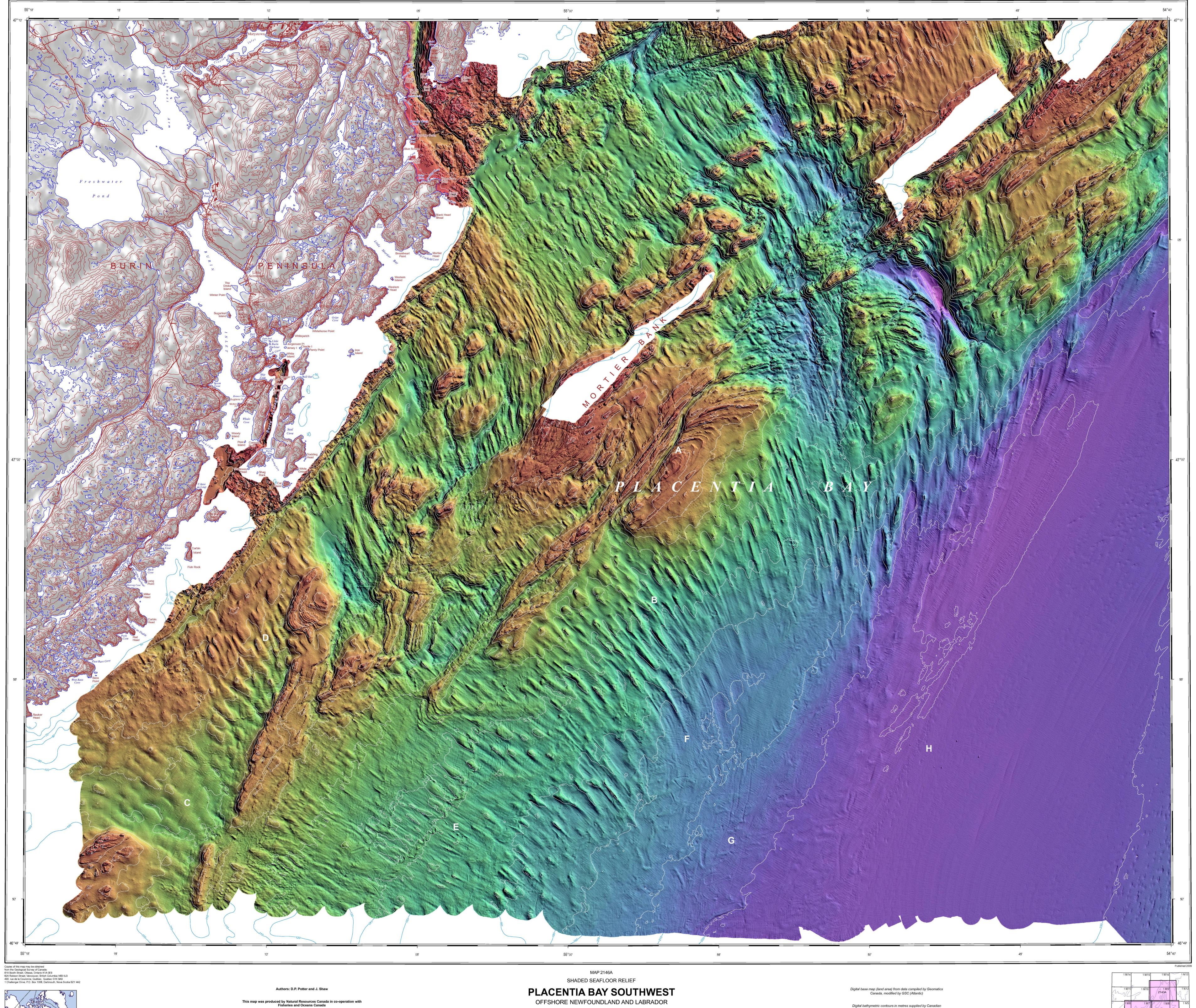
Fader, G.B., King, L.H., and Josenhans, H.W. Surficial geology of the Laurentian Channel and the western Grand Banks of Newfoundland; Geological Survey of Canada, Paper 81-22, Department of Energy, Mines and Resources, Marine Geoscience 21, Ottawa, 37 p. and map, scale 1:350 000.

1986: Occurrence and regional geological setting of Paleozoic rocks on the Grand Banks of Newfoundland; Canadian Journal of Earth Sciences, v. 23, p. 504–526.

2009a: Shaded seafloor relief, Placentia Bay east, offshore Newfoundland and Labrador; Geological Survey of Canada, Map 2145A, scale 1:50 000. 2009b: Shaded seafloor relief, Placentia Bay north, offshore Newfoundland and Labrador; Geological Survey of Canada, Map 2143A, scale 1:50 000. 2009c: Shaded seafloor relief, Placentia Bay southeast, offshore Newfoundland and Labrador, Geological Survey of Canada, Map 2147A, 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. Stokes, C.R. and Clark, C.D. 1999: Criteria for the recognition of palaeo-ice streams; Annals of Glaciology, v. 28, p. 67–74.

0 20 40 60 80 100 120 140 160 180 200 210 220 240 260 Depth (m)



Scale 1:50 000/Échelle 1/50 000

© Her Majesty the Queen in Right of Canada 2009 © Sa Majesté la Reine du chef du Canada 2009 This map is not to be used for navigational purposes Cette carte ne doit pas être utilisée aux fins de navigation

Projection transverse universelle de Mercator

Système de référence géodésique nord-américain, 1983

Universal Transverse Mercator Projection

North American Datum 1983

Multibeam bathymetric data collected by Canadian Hydrographic Service and Natural Resources Canada, 2004–2005

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