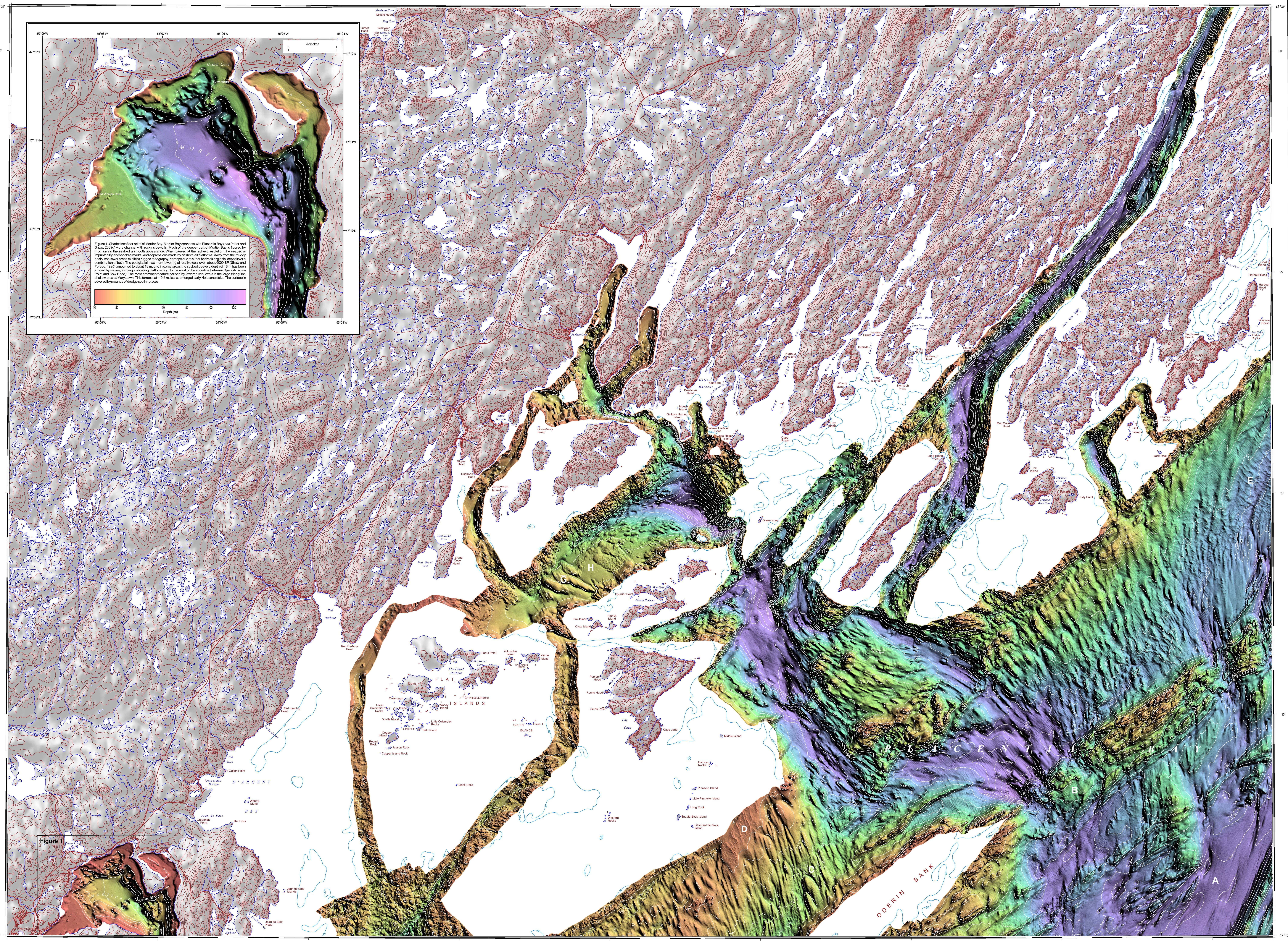

Figure 1. Shaded seafloor relief of Mortier Bay. Mortier Bay connects with Placentia Bay (*see* Potter and Shaw, 2009d) via a channel with rocky sidewalls. Much of the deeper part of Mortier Bay is floored by mud, giving the seabed a smooth appearance. When viewed at the highest resolution, the seabed is imprinted by anchor-drag marks, and depressions made by offshore oil platforms. Away from the muddy basin, shallower areas exhibit a rugged topography, perhaps due to either bedrock or glacial deposits or a combination of both. The postglacial maximum lowering of relative sea level, about 9000 BP (Shaw and Forbes, 1995) amounted to about 18 m, and in some areas the seabed above a depth of 18 m has been eroded by waves, forming a shoaling platform (e.g. to the west of the shoreline between Spanish Room Point and Cow Head). The most prominent feature caused by lowered sea levels is the large triangular, shallow area at Marystown. This terrace, at -19.5 m, is a submerged early Holocene delta. The surface is covered by mounds of dredge spoil in places.

Depth (m): 10, 20, 40, 60, 80, 100, 120

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 west-central part of the bay, adjacent to the Burin Peninsula. The bathymetry of this region is extremely complex. The deepest water within the map area is in the southeast about (220 m). Large areas of seabed are rugged, due to the presence of northeast-trending bedrock ridges, rugged jointed bedrock in coastal areas, and particularly due to the presence of glacial landforms, mostly drumlins. Because of technical limitations (and financial and time constraints), large areas around the numerous islands and shoals were not surveyed.

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 sonar system. The transducer was mounted in the starboard pontoon. The CCGS *Matthew* was equipped with a Kongsberg-Simrad EM710 multibeam sonar system. The hydrographic launch *Plover* deployed a hull-mounted Kongsberg-Simrad EM3000 multibeam sonar system in the 1997 survey. A Differential Global Positioning System was used for navigation, providing positional accuracy of about 1 m. Survey speeds averaged 10 knots for all vessels. Data were adjusted for tidal variations using output from a tide gauge installed at Burin (*see* Potter and Shaw 2009d). 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
1997	Survey by the hydrographic launch *Plover* in Mortier Bay using a Kongsberg-Simrad EM3000 system.
2005	Surveys by the CCGS *Federick G. Creed* using a Kongsberg-Simrad EM1002 system.
2005	Surveys by the CCGS *Matthew* in extreme southeast of map area, using a Kongsberg-Simrad EM710 system.
2006	Small survey by the CCGS *Matthew* using a Kongsberg-Simrad EM710 system.

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

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 because of the seabed exposure of bedrock structures and of numerous glacial landforms. For purposes of description it can be divided into several areas. Sites on the map labelled as A to H are referenced in the text.

Deepwater areas

The deepest water in the region is found in the southeast, just west of Merasheen Bank (*see* Potter and Shaw, 2009a), where the maximum depth is about 220 m (site A). The seabed is smooth due to a cover of Quaternary sediments.

Southeastern areas

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.

Bedrock ridges

In the southeast of the map area a series of bedrock ridges (site B) extends northeast from Oderin Bank (which was too shallow to be surveyed). These ridges appear to be the western limb of a broad anticline, the axis of which lies in the deep area noted above. The 'nose' of the anticline lies just out of the map area, on White Sail Bank (*see* Potter and Shaw, 2009a), and the eastern limb forms Merasheen Bank (*see* Potter and Shaw, 2009a); the eastern limb appears in the extreme southeast corner of the area.

Glacial landforms

The dominant feature of this map area is the presence of hundreds of streamlined glacial landforms (e.g. site C) 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 = l/w where l = length and w = width). 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. The seabed texture may be muddy fine gravel, because the drumlins are covered by glaciomarine mud. According to Benn and Evans (1998) drumlins have elongation ratios up to 7:1. According to Stokes and Clark (1995), fast flow of ice (i.e. streaming) is indicated where E> 10:1. The drumlins in this map area become more elongated in the adjacent area to the south, and achieve elongation ratios of more than 10:1, and also display a convergent pattern, suggesting acceleration and streaming of ice down Placentia Bay. In one small area (site D), the drumlins have been planated during the postglacial lowering of relative sea level (Shaw and Forbes, 1995).

In some areas the drumlins are overlain by De Geer moraines, which are narrow (<50 m) ridges of till, commonly several hundreds of metres long, and composed of till. These formed at the margin of retreating grounded ice, and occur in swarms aligned parallel to the isobaths. The best examples occur in the channel extending to the northeast, on the east side of the map area (site E).

Coastal areas

This region has numerous islands, ranging from relatively large (e.g. Jude Island) to rocks that barely protrude above water level. They are surrounded by rugged, well jointed bedrock. The narrow northeast-trending embayments have smooth seabeds, indicative of Quaternary sediment fills. The best example, Paradise Sound, has steep sidewalls and a smooth seabed marked by sedimentary furrows that indicate some current action (site F).

Mortier Bay

Mortier Bay is the largest embayment in the map area, and is the location of Marystown, a regional industrial centre. The entrance to the bay is a narrow, rugged channel with bedrock ridges exposed at the seabed. The bay has a relatively smooth seabed due to thick deposits of postglacial mud, gas charged in places. At the west side of the bay a large, flat terrace is a submerged early Holocene (ca. 9000–8000 BP) river delta that formed when sea level was about 18 m lower than present (Shaw and Forbes, 1995). The morphology of the bay is described in more detail in Figure 1. The seabed appears smooth, but sidescan sonar surveys and multibeam data gridded at high resolution show that it is covered by dredge spoils and marked by anchor drags and spud marks from oil rigs.

Other areas

One part of the map is somewhat enigmatic. The seabed between Cross (Grass) Island and Jude Island hosts four smooth ridges (site G) that have been grooved by ice flowing from the northwest. There is no ground-truthing here, so it is uncertain whether these ridges are composed of till or bedrock. Immediately northeast, the seabed (site H) may show evidence of a submarine slide.

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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 southwest, offshore Newfoundland and Labrador; Geological Survey of Canada, Map 2146A, scale 1:50 000.

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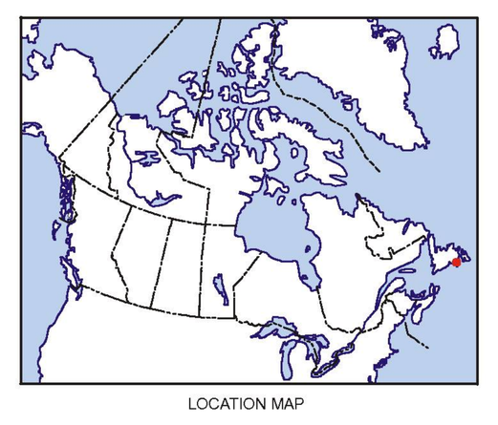
Depth (m): 0, 100, 200, 300, 400

Copies of this map may be obtained
from the Geological Survey of Canada:
615 Booth Street, Ottawa, Ontario K1A 0E9
625 Robson Street, Vancouver, British Columbia 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

Authors: D.P. Potter and J. Shaw

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, 2005–2006

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

MAP 2144A

SHADED SEAFLOOR RELIEF

PLACENTIA BAY WEST

OFFSHORE NEWFOUNDLAND AND LABRADOR

Scale 1:50 000/Échelle 1/50 000

kilometres 1 0 1 2 3 4 kilomètres

Universal Transverse Mercator Projection
North American Datum 1983

This map is not to be used for navigational purposes

Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1983

Cette carte ne doit pas être utilisée aux fins de navigation

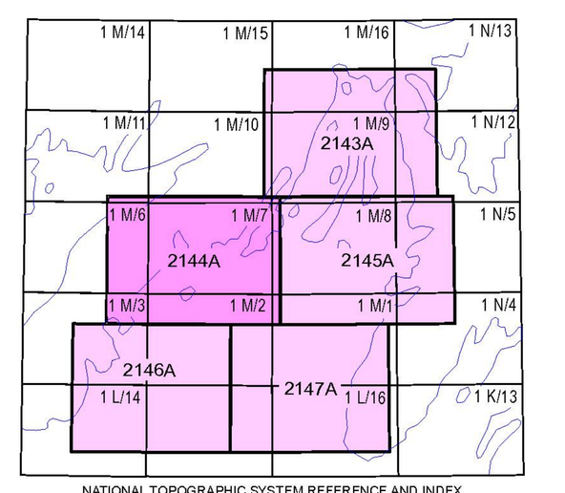
Digital base map (land area) from data compiled by Geomatics Canada, modified by GSC (Atlantic)

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

Magnetic declination 2009, 19°58'W, decreasing 12.0' annually

Elevations in feet above mean sea level

Depth in metres below mean sea level



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