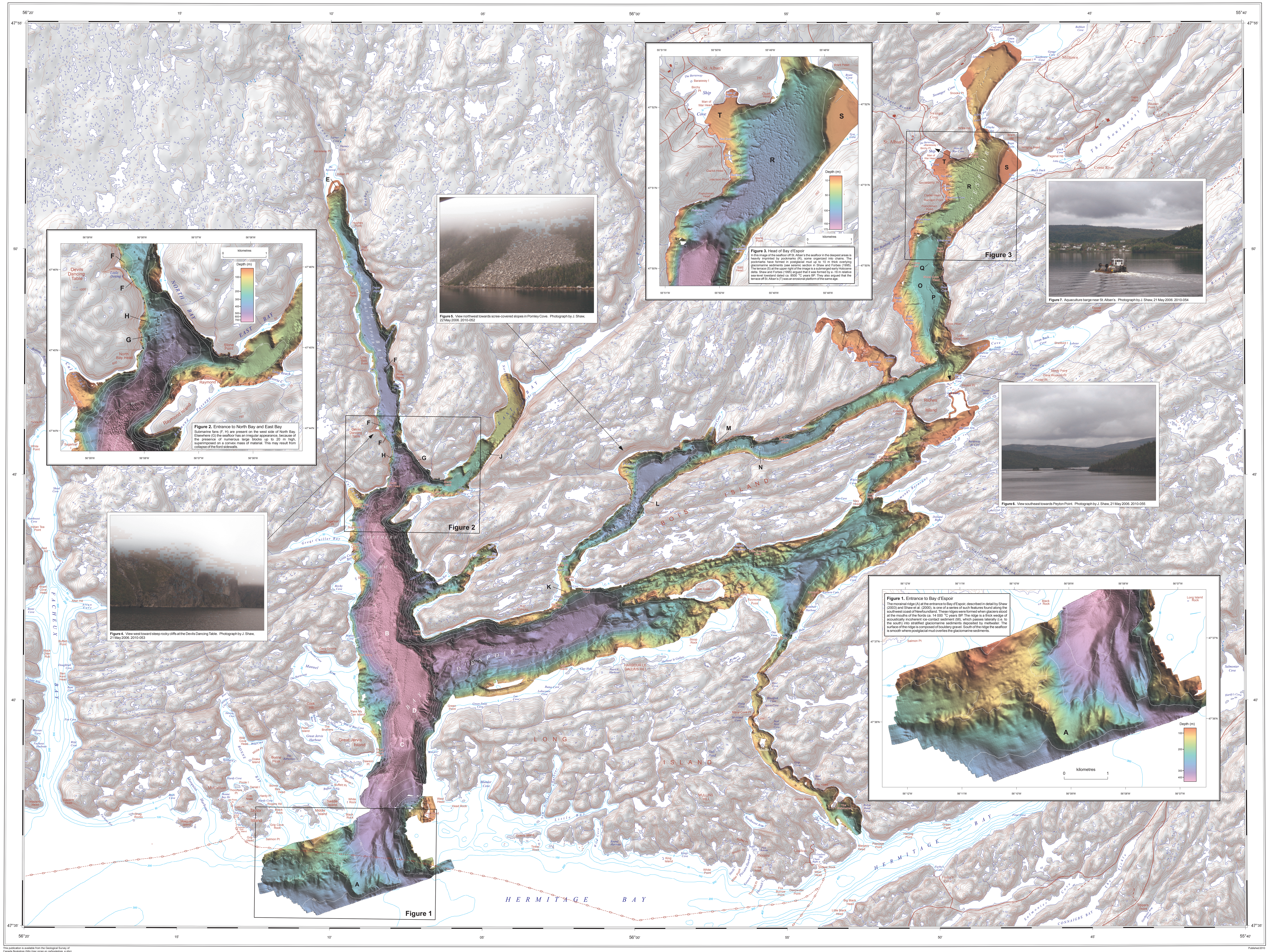

DESCRIPTIVE NOTES

INTRODUCTION

This map sheet depicts the bathymetry of Bay d'Espoir, a major fjord on the south coast of the island of Newfoundland, notable for having the deepest water on the continental shelf of Atlantic Canada (790 m). Depicted on Canadian Hydrographic Service Chart 4644, the bay includes a shallow shoal at the entrance (Fig. 1) and a deep north-trending trench just inside. Immediately north of the entrance the bay bifurcates into East Bay and North Bay (Fig. 2). The main bay extends northeastward as a wide channel. A narrow winding arm, Lampidoes Passage, separates from the main bay and rejoins farther northeast. The inner bay terminates in an arm extending northward to the St. Alban's area (Fig. 3). The narrow channel of Little Passage connects the bay with Hermitage Bay, separating Long Island from the mainland. The bay has imposing sidewalls, vertical to overhanging in places, which are nicely seen in the aerial video record made by Shaw and Frobel (1992).

MULTIBEAM BATHYMETRIC DATA COLLECTION

The earliest data collection was in 1995, when CCGS *Matthew* surveyed the entrance to Bay d'Espoir using the hull-mounted Simrad EM100 system. In 1998 surveys were conducted using the *Frederick G. Creed*, a SWATH (Small Waterplane Area Twin Hull) vessel equipped with a Simrad EM1000 multibeam sonar system, with the transducer mounted in the starboard pontoon. The surveys were conducted by the Geological Survey of Canada (GSC), and covered most of the bay, although data quality in the deep trench was poor. In the fall of the same year the Canadian Hydrographic Service (CHS) conducted training operations in Roti Bay, near St. Alban's, and collected data in that area using a launch-mounted Simrad EM3000 system.

The Canadian Hydrographic Service collected data in the deep trench in 1995 using the CCGS *Matthew*, equipped with a hull-mounted Simrad EM1002 multibeam sonar system. These data were not used in compiling the present map because the same area was resurveyed in 2006 by CCGS *Matthew* using an EM710 system (Shaw et al., 2006). At that time, North Bay and East Bay were also surveyed, and Lampidoes Passage was resurveyed. During these operations the hydrographic launch *Plover* equipped with the Simrad EM3002 system surveyed some areas around Riches Island, i.e. where Lampidoes Passage rejoins the main bay.

The Differential Global Positioning System was used for navigation, providing positional accuracy of about 3 m. Survey speeds for most vessels averaged 10 knots. Data were adjusted for tidal variations using output from tide gauges installed at St. Alban's. 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 US Army Corps of Engineers. Contours, tif images, and colour bars were exported from GRASS to the ARC GIS system.

YEAR	REMARKS
1995	Survey of the entrance shoal by CCGS *Matthew*, Simrad EM100 system
1998	Survey of much of the bay by CCGS *Frederick G. Creed*, Simrad EM1000 system
1998	Surveys of Roti Bay and adjacent areas by CHS, Simrad EM3000 system
2005	Survey of the deep trench by the CCGS *Matthew*, Simrad EM1002 system
2006	Survey of the deep trench and other areas by the CCGS *Matthew*, Simrad EM710 system
2006	Survey in parts of the inner bay by the hydrographic launch *Plover*, Simrad EM3002 system.

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

DATA DISPLAY

Artificial sun illumination from 060° azimuth and 35° 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. Histogram equalization was applied to the colour palette, i.e. bathymetric divisions between colours were assigned such that equal areas are covered by each colour in the palette.

MORPHOLOGY

This region is topographically complex, and shows evidence of strong bedrock structural control, overdeepening by glaciation, and the effects of lowered sea levels in the early Holocene (Shaw and Forbes, 1995). The deep trench has flat, muddy floors and steep sidewalls; however, other parts of the bay have quite irregular seafloors, with thinner covers of unconsolidated sediments. Shallow terraces at the heads of several arms of the bay have been identified as submerged deltas (Shaw and Forbes, 1995). The shoal at the entrance is a large arcuate submarine moraine (Shaw et al., 2000; Shaw, 2003). For purposes of description the bay is divided into several areas.

Mouth of Bay d'Espoir

The shoal (A) at the entrance to the bay (*see also* Fig. 1) is an arcuate submarine ridge 60 m high and comprised of seaward-projecting lobate ramps. The ramps are ornamented with grooves expressive of basal sliding by glacier ice. The ridge is a 75 m thick wedge of acoustically incoherent ice-contact sediment (till). It formed when glacier ice stood at the mouths of the fiords of south Newfoundland ca. 14 000 ^{14}C years BP (Shaw et al., 2000; Shaw, 2003).

Northern Arm

The deep trough (B) has a flat floor mostly at depths of 760–780 m, and has a maximum depth of 790 m. The trench was used to scuttle unwanted vessels, but these are not observed, as they are below the resolution of the data. The sidewalls (C) are steep and rocky, with a submarine fan (D) on the east side. The flat floor is underlain by nearly 300 m of postglacial and glaciomarine mud, so that the bedrock base of the trough is approximately 1000 m below sea level (Shaw et al., 1992).

North Bay and East Bay

North Bay (*see also* Fig. 2) is flat-bottomed with depths averaging 300 m, and has steep sides, producing a 'U'-shaped cross-profile. At the head of the bay the seafloor shallows up toward a submerged delta (E). In the southern part of North Bay the seafloor in the centre of the bay is flat, whereas near the coast (Fig. 4) large submarine fans (F) occur off Doting Cove, Little Doting Cove, and immediately north of The White Horse. South of Doting Cove the bay narrows and shallows, probably because of a moraine on the seafloor. Immediately south of the narrows, the seafloor has a highly jumbled appearance, with blocks up to 20 m high on the seafloor (G). This is suggestive of a massive collapse of the fiord sidewalls. Submarine fans up to 40 m high (H), originating from the west coast of the bay, are superimposed on the failed material, suggesting that the failure is not recent. East Bay contains a submerged delta and also further evidence of mass failure in the form of a jumble of large blocks on the seafloor (J).

Lampidoes Passage

A moraine (K) is located at the entrance to Lampidoes Passage. The irregular seafloor (L) in the narrows, just southwest of Pomley Cove (Fig. 5), was caused by massive rock falls from vertical and overhanging fiord sidewalls. A series of submarine fans originating from the north shore are superimposed on the blocky slump debris, suggesting that sidewall failure was not recent. The underwater ridge (M) off Northwest Cove may be a moraine, and another rock fall (N) may be present on the seafloor just east of the moraine. Immediately north of Peyton Point (Fig. 6) pockmarks occur in a banked mud deposit.

Northeastern Bay d'Espoir

Roti Bay is a shallow area extensively used for aquaculture (Fig. 7). North of Little Crow Head the basin floor (O) is flat whereas the valley walls have a channellized appearance. Several lobate submarine slide deposits (P) probably result from failure of glaciomarine sediments on the fiord sidewalls. A sunken vessel about 25 m long (Q) reaches 2–3 m above the mud bottom. Near St. Alban's (*see* Fig. 3) the seafloor is heavily marked by pockmarks (R). The terrace off Conne River (S) is a submerged early Holocene delta (Shaw and Forbes, 1995), whereas the terrace off St. Alban's (T) is more like an erosional platform of the same age (Shaw and Forbes, 1995).

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0 | 100 | 200 | 300 | 400 | 700

Depth (m)

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Published 2010

LOCATION MAP

MAP 2156A

SHADED SEAFLOOR RELIEF

BAY D'ESPOIR

NEWFOUNDLAND AND LABRADOR

Scale 1:50 000/Échelle 1/50 000

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

Authors: J. Shaw and S. Hayward

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

Multibeam bathymetric data collected and compiled by J. Shaw and S. Hayward, 2008

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

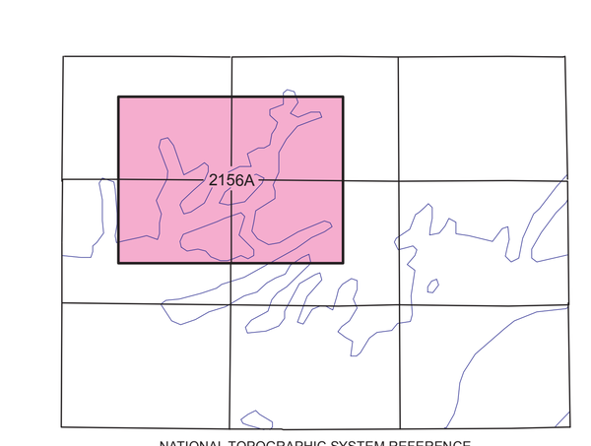
Digital base map (land area) from data compiled by Geomatics Canada, modified by GSC (Atlantic)

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

Magnetic declination 2010, 20°00'W, decreasing 11.6' annually

Elevations in feet above mean sea level

Depth in metres below sea level



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE

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