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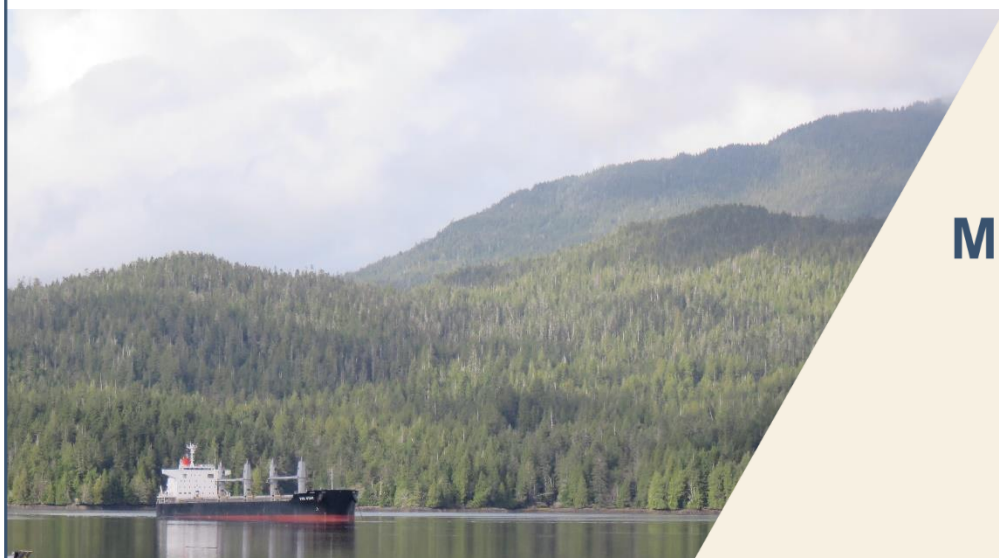
CANADIAN GEOSCIENCE MAP 437

MARINE GEOLOGY

GEOMORPHOLOGY OF CHATHAM SOUND

British Columbia

parts of NTS 103-G, H, I, and J



**Map Information
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ABSTRACT

This map depicts the geomorphology of the Chatham Sound area, British Columbia, and is based on bathymetry and backscatter data from multibeam sonar surveys, complemented by 3.5 kHz subbottom profiler data, grab samples, cores, and bottom photographs. The map encompasses three physiographic areas: 1) the easternmost portion of Dogfish Banks; 2) the north-south oriented Hecate trough; and 3) the maze of channels and inlets east of Hecate trough. The morphological and textural complexity reflects the underlying bedrock, glacial history, a complex pattern of postglacial relative sea-level change, and modern oceanographic processes. Hexactinellid sponge reefs are a significant component of the seafloor mosaic. The criteria for reef identification were positive relief, low backscatter strength, and acoustic transparency.

RÉSUMÉ

Cette carte figure la géomorphologie de la région du détroit de Chatham, en Colombie-Britannique. Elle est fondée sur des données de bathymétrie et de rétrodiffusion provenant de levés sonar multifaisceaux, complétées par des données de sondeurs de sédiments 3,5 kHz, des échantillons ponctuels, des carottes et des photos du fond marin. La carte englobe trois zones physiographiques : 1) la partie la plus orientale des bancs Dogfish; 2) la cuvette Hecate (appellation informelle) d'orientation nord-sud; et 3) le dédale de chenaux et de bras de mer à l'est de la cuvette Hecate. La complexité morphologique et texturale est un reflet du substratum rocheux, de l'histoire glaciaire, d'une séquence complexe de changements postglaciaires du niveau relatif de la mer et des processus océanographiques modernes. Des récifs d'éponges hexactinellides sont une composante importante de la mosaïque du fond marin. Les critères d'identification des récifs sont un relief positif, une faible intensité de rétrodiffusion et une transparence acoustique.

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SHEET 1 OF 1, MARINE GEOLOGY

GENERAL INFORMATION

Authors: J. Shaw and D.G. Lintern

Geological compilation by J. Shaw

Cartography by S. Hayward

Scientific editing by L. Ewert

Map projection Universal Transverse Mercator, zone 9

North American Datum 1983

Base map at the scale of 1:250 000 from Natural Resources Canada, with modifications

Shaded-relief image derived from the digital elevation model supplied by GSC Atlantic

Illumination: azimuth 315°, altitude 45°, vertical factor 10x

Mean magnetic declination 2023, 17°42'E, decreasing 7.9' annually

Readings vary from 17°33'E in the SE corner to 17°49'E in the NW corner of the map.

This map is not to be used for navigational purposes.

Title photograph: Prince Rupert, British Columbia. Photograph by B. Pickrill. NRCan photo 2020-422

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Data may include additional observations not portrayed on this map. See map info document accompanying the downloaded data for more information about this publication.

This publication is available for free download through GEOSCAN (<https://geoscan.nrcan.gc.ca/>).

MAP VIEWING FILES

The published map is distributed as a Portable Document File (PDF), and may contain a subset of the overall geological data for legibility reasons at the publication scale.

DESCRIPTIVE NOTES

STUDY AREA

This map encompasses four physiographic areas: (1) the easternmost portion of Dogfish Banks; (2) the northern extension of Hecate Strait, here informally named the Hecate trough; (3) the archipelago and inter-island channels extending from Banks Island in the south to Dundas Island in the north; and (4) the eastern zone that includes

basins, shoals, the very deep Dixon Entrance, and fiords that extend far inland. The morphological and textural complexity of the area also reflects multiple glaciations, a complex relative sea-level history, and modern oceanographic processes that vary spatially.

RECENT GEOLOGICAL HISTORY

About 15 000 years ago, the region was covered by glacial ice of the Cordilleran Ice Sheet (Barrie and Conway, 1999; Blaise et al., 1990, Clague, 1985; Clague and James, 2002; Ryder et al., 1991). Moraines that formed during halts in ice retreat include the large moraine along the east flank of Hecate trough. Meltwater plumes deposited a blanket of glaciomarine silt heavily furrowed by icebergs. With deglaciation, the map area experienced a complex pattern of relative sea-level change (Josenhans et al., 1995; 1997). At ca. 12.5 ka, areas to the west of Haida Gwaii experienced a lowstand of -150 m, concurrent with submergence of 50 m at Prince Rupert (Barrie and Conway, 2002), while relative sea levels up to +200 m were found at the heads of fiords ca. 10.5 ka (Clague, 1985). Paleogeography was considerably different from that of today (Hetherington and Barrie, 2004; Hetherington et al., 2004). In Hecate trough, a large lowstand delta graded to about 90 m below modern sea level is dated at 11.5¹⁴C yrs BP (Barrie and Conway, 2002). In postglacial time, glacial sediments, including glacial diamict and glaciomarine mud, were eroded, providing sediment for the postglacial sand and mud units. Narrow, overstepped gravel barrier beaches were stranded on drowned shoals. The postglacial mud and sandy mud were deposited in areas of low-current velocity in the east of the map area, and were augmented by some input of fluvial sediment from the Skeena River. The biogenic substrates mapped in this area are glass sponge reefs, as mapped elsewhere in the region (Conway et al., 2005; Leys et al., 2004; Shaw et al., 2018).

MODERN PROCESSES

The Skeena River is a source of modern sediments, and the delta front continues to prograde. About 70% of Skeena River water moves north, past the Tsimpsean Peninsula, and leaves the sound via Dundas entrance (Shaw et al., 2018). The low-salinity water exiting the region exhibits a strong gradient across Chatham Sound, with high-salinity water in the east, and high sediment concentrations associated with the plume during high discharge hug the east coast (ibid.). Strong bottom currents impact the seafloors in some areas, notably Hecate trough, where large sandy bedforms are up to 8 m high (Barrie et al., 2009).

MAPPING APPROACH

The area was surveyed by the Canadian Hydrographic Service using Kongsberg Maritime multibeam sonar systems that provide high-resolution bathymetry of the seafloor as well as backscatter strength, a derived attribute that correlates loosely with sediment type at the seafloor. Other information used for mapping was derived from subbottom profiles, grab samples, piston cores, and bottom photographs.

The approach is similar to that of “seascape mapping” (Shaw et al. 2011, 2012, 2013), in which it assumed that the seafloor can be mapped in terms of units, each unit having a distinct combination of morphology, texture, and biota. However, it was felt that there were insufficient bottom photographs to adopt the exact same approach in the map

region, so the map units described here are essentially geomorphology and texture (as for the fiord terrain just to the south mapped by Shaw and Lintern (2016)).

ACKNOWLEDGMENTS

This map was part of a project managed by Dr. Gwyn Lintern under the aegis of the Public Safety Geoscience Program. Robert Kung supplied multibeam and backscatter data. Scott Hayward processed GIS data and assembled the map, and Dr. Vaughn Barrie conducted a review.

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ADDITIONAL INFORMATION

The Additional Information folder of this product's digital download contains figures and tables that appear in the map surround as well as additional geological information not depicted on the map, nor this document, nor the geodatabase.
-PDF of each figure/table that appears in the CGM surround.

AUTHOR CONTACT

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COORDINATE SYSTEM

Projection: Universal Transverse Mercator
Units: metres
Zone: 9
Horizontal Datum: NAD83
Vertical Datum: mean sea level

BOUNDING COORDINATES

Western longitude: 131°25'00"W
Eastern longitude: 129°50'00"W
Northern latitude: 54°42'55"N
Southern latitude: 53°34'15"N

SOFTWARE VERSION

Data has been originally compiled and formatted for use with ArcGIS™ desktop version 10.8.2 developed by ESRI®.

DATA MODEL INFORMATION

No Model

This Canadian Geoscience Map does not conform to either the Bedrock or Surficial Mapping Geodatabase Data Models. The author may have included a complete description of the feature classes and attributes in the Data\Data Model Info folder.