Basic Information

This section contains basic information about the dataset, suitable for a minimal metadata entry.

Title: Sponge Reef Areas

Dataset ID: sponge-reefs

Status: Ongoing

Quality Control: Completed

Federal Geospatial Platform Record: https://gcgeo.gc.ca/geonetwork/metadata/eng/8ba7bced-b63f-462a-a8a1-7c7c8a7bcfa4

Open Maps Record: https://open.canada.ca/data/en/dataset/8ba7bced-b63f-462a-a8a1-7c7c8a7bcfa4

Summary: Sponge reefs are constructed by hexactinellid (glass) sponges of the Order Hexactinosida. The sponges trap fine sediments, and over centuries of sponge growth and sediment trapping, form large bioherms or reef mounds. Glass sponge reefs are unique habitats found along the Pacific coast of Canada and the United States and they have significant historic, ecological, and economic value. They link benthic and pelagic environments by playing important roles in filtration and carbon and nitrogen processing, and acting as silica sinks. They also form habitat for diverse communities of invertebrates and fish, including those of economic importance. Thus, accurate and up-to-date information on the location and spatial extent of sponge reefs is important to the management and conservation of many of Canada's Pacific marine species. We generated a map of known sponge reefs, derived from two source shape files: 1) Sponge_Reef_West_Coast, mapped by Natural Resources Canada (NRCan), 2) Howesound_Nine_reef_polygons and 3) HoweSound_Five_reef_polygons, which were mapped by DFO and NRCan. The resultant polygon shapefile is published on the GIS hub as a file geodatabase feature class.

Note: Even though the spatial files are available on FGP and/or Open Maps, they are kept on the GIS Hub as well. The reason is that FGP does not support accessing previous versions of datasets. In order to retain file-level version control on the GIS Hub, the spatial data resource needs to remain on the platform. Please use the download links available from FGP or Open Maps or request access to a previous version from the GIS Hub if required.

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Cite this data as: Anya Dunham, 2018. Sponge Reef Areas. Published Jul 01 2018. Data distributor: Anya Dunham, Marine Spatial Ecology Section, Fisheries and Oceans Canada, Nanaimo, BC.

Start Date: 1998-01-01

End Date: 2022-06-01

Contact Information

This section contains contact information for the data creator and program manager.

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General

General metadata compatible with the Canada Open Data metadata standard.

Topic Category: Oceans

Date Completed: 2017-07-01

Date Published: 2022-06-01

Update Frequency: Biannually

Dataset Level: Dataset

Keywords (GoC Thesaurus): habitats, ocean floor, oceans, conservation, aquatic ecosystems, aquatic wildlife

Science

This section contains metadata specific to the Science branch at DFO.

Science Keywords: aphrocallistes vastus, biogenic habitat, farrea occa, heterochone calyx, sensitive benthic areas, marine geology, benthos, queen charlotte sound, queen charlotte basin, hecate strait, british columbia, bc, georgia basin, strait of georgia, howe sound, holocene, ecologically and biologically significant areas, sponge reefs, reefs, ebsa

Theme: Protected Areas

Methods:
Data Source 1: West Coast Sponge Reefs (Natural Resources Canada) : Sponge reefs were mapped using multibeam imagery collected using a Simrad EM1002 multibeam swath bathymetry system mounted on the CCGS Vector between 2000 and 2002. The GIS coverage was created using ArcInfo software at the Pacific Geoscience Centre in March, 2005. The presence of sponge reefs was confirmed in most cases by use of remote operated vehicles (ROV) and/or sampling (Conway et al 2005, Dunham et al 2018) on several scientific surveys between 2002 and 2017. Several of these reefs have been extensively damaged by bottom trawling or other anthropogenic activity. References: Conway, K.W., Barrie, J.V. and Krautter, M. (2005) Geomorphology of unique reefs on the western Canadian shelf: sponge reefs mapped by multibeam bathymetry. - Geo-Marine Letters, 25/4: 205-213; Berlin.; Dunham, A., Mossman, J., Archer, S., Pegg, J., and

E. Archer. 2018. Glass Sponge Reefs in the Strait of Georgia and Howe Sound: Status assessment and ecological monitoring advice. DFO Can. Sci. Advis. Sec. Res. Doc. 2018/010.

Data Source 2: Howe Sound Sponge Reefs (DFO and NRCan): To provide a comprehensive review of all available evidence on glass sponge aggregations throughout Howe Sound that are thought to be sponge reefs, the following three datasets were combined: 1. MLSS glass sponge aggregation map (ecological dataset #1). All reef-building sponge locations from the drop camera transects and SCUBA-based observations were mapped in Google Earth; the polygons were then drawn to encompass all sponge points (sparse to dense) or, in cases of single or clustered observations, markers were placed near the centre points by the MLSS. Visual survey methods, as well as the approaches and software used for placing markers and outlining polygons are described in McAuley (2017) and Clayton and Dennison (2017).; 2. DFO Science ROV survey results (ecological dataset #2). To further ground-truth sponge aggregation locations provided by the MLSS, a survey of nine reef aggregations was conducted by DFO Science in September 2016 (cruise Pac2016-063) using the Phantom ROV HD2+2 (Deep Ocean Engineering) aboard the CCGV Neocaligus. Video and still imagery were collected along predetermined line transects; transect placement was informed by the MLSS ecological dataset and the NRCan geological dataset. Data processing and analyses followed methods described in Dunham et al. 2018.; 3. NRCan geological footprint maps (geological dataset). All remote sensing (multibeam swath bathymetry and backscatter) imagery previously collected within the entire Howe Sound area by the Geological Survey of Canada and the Canadian Hydrographic Service were reviewed for geological reef footprint evidence as described in Conway et al. (2005). The multibeam swath bathymetry provided a 5 m resolution map of the seabed. Backscatter layer for areas of interest was reprocessed, using original survey data, to 0.5-1 meter resolution in FM Geocoder (Fledermaus suite of data visualization products). Geological reef polygons were created by draping the backscatter layer over multibeam bathymetry layer and were identified as areas simultaneously exhibiting positive relief, low backscatter strength, and acoustic transparency (Conway et al. 2005). In addition, raised seafloor areas displaying a “snowcapped morphology” while being non-reflective have been identified as indicative of sponge reefs. This method was not yet available during an earlier review of multibeam and backscatter imagery in the Georgia Basin, and thus not all sponge reefs were identified in Howe Sound at the time. The methods used in this paper can reliably identify a contiguous glass sponge reef patch of ≥20 m in diameter.

Data Source 3: Howe Sound Sponge Reefs (DFO and NRCan): Additional areas in Howe Sound were identified as possible sponge reefs based on SCUBA-based observations, drop camera footage, or geological records. The following three datasets were combined and used to assign sponge reef status and condition: 1. MLSS glass sponge aggregation map (ecological dataset #1). All reef-building sponge locations from the drop camera transects and SCUBA-based observations were mapped in Google Earth; the polygons were then drawn to encompass all sponge points (sparse to dense) or, in cases of single or clustered observations, markers were placed near the centre points by the MLSS. Visual survey methods, as well as the approaches and software used for placing markers and outlining polygons are described in McAuley (2017) and Clayton and Dennison (2017); 2. DFO Science ROV survey results (ecological dataset #2). To further ground-truth sponge aggregation locations provided by the MLSS, a survey of seven reef aggregations was conducted by DFO Science in May 2019 (cruise Pac2019-015) using the Phantom ROV HD2+2 (Deep Ocean Engineering) aboard the CCGV Vector. Video and still imagery were collected along predetermined line transects; transect placement was informed by the MLSS ecological dataset and the NRCan geological dataset. Data processing and analyses followed methods described in Dunham et al. 2018; 3. NRCan geological footprint maps (geological dataset). All remote sensing (multibeam swath bathymetry and backscatter) imagery previously collected within the entire Howe Sound area by the Geological Survey of Canada and the Canadian Hydrographic Service were reviewed for geological reef footprint evidence as described in Conway et al. (2005). The multibeam swath bathymetry provided a 5 m resolution map of the seabed. Backscatter layer for areas of interest was reprocessed, using original survey data, to 0.5-1 meter resolution in FM Geocoder (Fledermaus suite of data visualization products). Geological reef polygons were created by draping the

backscatter layer over multibeam bathymetry layer and were identified as areas simultaneously exhibiting positive relief, low backscatter strength, and acoustic transparency (Conway et al. 2005).

Data Sources:

Source: Data source 1 was part of the Geological Survey of Canada's mapping program on the continental shelf.

Source: Source 2 data were mapped after the presence of sponge reefs was brought to DFO's attention by recreational divers or NRCan seafloor geomorphology analysis. Locations were subsequently ground-truthed by DFO Science using ROV surveys and reef extents were mapped by combining these ROV data with seafloor geomorphology analysis carried out by NRCan.

Source: Data Source 3 data were mapped after the presence of sponge reefs was brought to DFO's attention by recreational divers or NRCan seafloor geomorphology analysis. Locations were subsequently ground-truthed by DFO Science using ROV surveys and reef extents were mapped by combining these ROV data with seafloor geomorphology analysis carried out by NRCan.

Scripts or Software Routines: None available.

Spatial Data Quality: Given the data are contemporary and collected with latest available technology, the data quality is considered high.

Positional Accuracy: No quantitative estimates available. However, position will depend on the quality of the ROV GPS signal, and is thus likely accurate to better than 10 m horizontal. Vertical accuracy will be sub-metre where multibeam data were used.

Attribute Accuracy: As a description of the presence of sponge reefs, the attribute is accurate.

Logical Consistency: The methods are consistent between the two data sources, but with one important distinction. Polygons for the reefs that were originally mapped by NRCan ("Sponge_Reefs_West_Coast" shape file) were drawn based on geological signature only; this means that all reef structure sufficient to produce a remote sensing signature was encompassed, whether it represented live reef, dead reef, or dead-and-buried-by-the-sediment reef. In contrast, Howe Sound reef polygons mapped by DFO Science in collaboration with NRCan were drawn to encompass both ecological and geological reef evidence.

Completeness: The study area covers the entire Pacific Canadian shelf.

Absence Data: Most of the coast has been surveyed for large glass sponge reefs using remote sensing methods, with the exception of shallow areas (Conway et al. 2013). The resulting datasets have been thoroughly reviewed for geological evidence of sponge reef presence. Thus, it is unlikely that other large glass sponge reefs will be discovered along the BC coast in the future. However, the geological evidence method can reliably identify a contiguous glass sponge reef patch of 20 or more meters in diameter. Thus, while the layer provides strong indication of absence, smaller and/or patchy reefs, as well as sponge gardens may be discovered in the future.

Uncertainties: Biases: ROV vs. multibeam backscatter classification may provide different information. Multibeam backscatter is unable to determine whether the reef is dead and buried, dead and visible, or alive, in the NRCan geological dataset.

Use Restrictions: None

Change History:

Date of Change	Description of Change
2018-07-01	Initial creation of dataset record.
2020-09-29	Pointing to FGP Record.
2020-09-29	Pointing to FGP Record.
2020-11-10	Re-uploaded data. FGP record did not include spatial downloads.
2022-05-17	Updated data available and uploaded here to push to FGP/Open Data.

Species Data:

Code and Name	Age Data	Obs Type

References:

Reference: Conway KW. (1999). Hexactinellid sponge reefs on the British Columbia continental shelf: geological and biological structure with a perspective on their role in the shelf ecosystem. Canadian Stock Assessment Secretariat Research Document. 99/192.

Reference: Conway KW, Barrie JV, Krautter M. (2004). Modern siliceous sponge reefs in a turbid silicclastic setting: Fraser River delta, British Columbia, Canada. Neues Jahrbuch fuer Geologie und Palaeontologie. 6(6):335-350.

Reference: Conway KW, Krautter M, Barrie JV, Neuweiler M. (2001). Hexactinellid sponge reefs on the Canadian continental shelf: a unique “living fossil.” Geoscience Canada. 28(2).

Reference: Conway KM, Barrie JV, Austin WC, Luternauer JL. (1991). Holocene sponge bioherms on the western Canadian continental shelf. Continental Shelf Research. 11: 771-790.

Reference: Krautter M, Conway KW, Barrie JV, Neuweiler M. (2001). Discovery of a “living dinosaur”: globally unique modern hexactinellid sponge reefs off British Columbia, Canada. Facies. 44(1): 265-282.

Reference: Whitney F, Conway KW, Thomson RE, Barrie JV, Krautter M, Mungrov G. (2005). Oceanographic habitat of sponge reefs on the western Canadian continental shelf. Continental Shelf Research. 25(2): 211-226.

Reference: Fisheries and Oceans Canada (2018). Glass sponge aggregations in Howe Sound: locations, reef status, and ecological significance assessment. DFO Can. Sci. Advis. Sec. Sci. Resp. 2018/032.

Reference: Dunham A, Archer SK, Davies S, Burke L, Mossman J, Pegg J. (2018). Assessing condition and ecological role of deep-water biogenic habitats: Glass sponge reefs in the Salish Sea. Marine Environmental Research 141: 88-99. Open Access: https://www.sciencedirect.com/science/article/pii/S0141113618303544

Reference: Dunham A, Mossman J, Archer S, Pegg J, Davies S, Archer E. (2018). Glass sponge reefs in the Strait of Georgia and Howe Sound: status assessment and ecological monitoring advice. DFO Can. Sci. Advis. Sec. Res. Doc. 2018/010. http://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2018/2018_010-eng.html

Reference: DFO. 2018. Glass sponge aggregations in Howe Sound: locations, reef status, and ecological significance assessment. DFO Can. Sci. Advis. Sec. Sci. Resp. 2018/032. https://waves-vagues.dfo-mpo.gc.ca/Library/40714767.pdf.

Reference: DFO. 2020. Ground-truthing the latest set of suspected glass sponge reefs in Howe Sound: Reef delineation and status assessment. DFO Can. Sci. Advis. Sec. Sci. Resp. 2020/026. https://waves-vagues.dfo-mpo.gc.ca/Library/40923812.pdf.

Collaboration: Collaboration with Natural Resources Canada and Marine Life Sanctuaries Society

Confidentiality: Not Protected