Basic Information

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

Title: Nearshore Bottom Patches for Pacific Canada. Version 1.0

Dataset ID: n/a

Status: Completed

Quality Control: Completed

Summary:
The shallow, coastal regions of the world's oceans are highly productive ecosystems providing important habitat for commercial, forage, endangered, and iconic species. Given the diversity of ecosystem services produced or supported by this ecosystem, a better understanding of its structure and function is central to developing an ecosystem-based approach to management. However this region termed the 'white strip' by marine geologists because of the general lack of high-resolution bathymetric data - is dynamic, highly variable, and difficult to access making data collection challenging and expensive. Since substrate is a key indicator of habitat in this important ecosystem, we created a continuous substrate map of Bottom Patches (BoPs) from the best available bottom type data using an approach that is simple, quantitative, and transparent making it amenable to iterative improvement as data quality and availability improve. To provide subsequent analyses (such as habitat models) with some confidence in the defined bottom type values, we developed a corresponding confidence surface based on the agreement of, and distance between observations. Such data are critical to assessments of species distributions and anthropogenic risk.

Bottom patches (BoPs) have been created to represent bottom type for the entire Pacific Canadian coast from the high high water line to a depth of 50 metres (m). As a polygon representation, the BoPs describe patches of similar substrate prescribed by depth classes and the available field observations. In the areas where no observations are available, predicted bottom type values are used. The approach is described in Gregr et al. (2013), as a spatial framework for representing nearshore ecosystems.

Accuracy of the bottom type depends on a multitude of factors but primarily the reliability and density of the bottom type observations. The horizontal accuracy of these data likely ranges from metres to 10s of metres because of the source data or data processing required. Areas with a higher data density, where the data show strong coherence, are understood to have higher accuracy. The BoPs use depth ribbons (polygons describing bathymetric ecozones) as an input. Depth ribbons for Pacific Canada were created from a high resolution (20 x 20 m2) bathymetry. Given the resolution of these data, processing was facilitated by dividing the Pacific Coast into 5 regions.

The West Coast of Vancouver Island, extending from Cape Sutil in the North past Port San Juan to the South, includes a total of 110,313 BoP polygons. Bottom Patches for Queen Charlotte Strait and Strait of Georgia regions were combined for a total of 235,754 BoP polygons. The North Central Coast region, extending from the Alaskan border in the North to Cape Caution in the South, includes a total of 431,639 BoP polygons. The Haida Gwaii region includes a total of 86,825 BoP polygons.

These data are intended for scientific research only. The developers (Fisheries and Oceans Canada, SciTech Environmental Consulting) are not responsible for damages resulting from any omissions or errors that may be contained in this dataset and expressly disclaims any warranty of fitness for any particular purpose. Developers shall not be liable for any losses, financial or otherwise, due to the use of these data. The user assumes the entire risk as to the suitability, results and performance of the dataset for their proposed use.

Please credit SciTech and Fisheries and Oceans Canada as the source of the data in any maps, reports, or articles that are printed or published on paper or the Internet.

Maintainer Email: ed@scitechconsulting.com

Start Date: 1991-01-01

End Date: 2016-01-01

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: 2022-11-9

Date Published: 2022-11-9

Update Frequency: As needed

Dataset Level: Series

Keywords (GoC Thesaurus): ocean floor, coasts, sediments, coastal waters, aquatic ecosystems

Science

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

Science Keywords: coastal zone, sediment, substrate, bottom type, sea floor, sea bed, British Columbia, Pacific

Theme: Base mapping

Methods:
We created a continuous substrate map of Bottom Patches (BoPs) from the best available bottom type data using an approach that is simple, quantitative, and transparent making it amenable to iterative improvement as data quality and availability improve. To provide subsequent analyses (such as habitat models) with some confidence in the defined bottom type values, we developed a corresponding confidence surface based on the agreement of, and distance between observations. Bottom patches (BoPs) have been created to represent bottom type for the entire Pacific Canadian coast from the high water line to a depth of 50 m. As a polygon representation, the BoPs describe patches of similar substrate prescribed by depth classes and the available field observations. In the areas where no observations are available, predicted bottom type values are used. The approach is described in Gregr et al. (2013), as a spatial framework for representing nearshore ecosystems.
The BoPs require depth ribbons (polygons describing bathymetric ecozones) to be defined for the area of interest. Depth ribbons for Pacific Canada were created from high resolution (20 m raster or better) bathymetry. The resolution and complexity of the bathymetry required the Pacific Coast to be divided into regions to make the depth ribbon processing time tractable.
The BoPs are created semi-automatically using a series of Python scripts divided into two phases. There are also several supporting scripts to spatialize transect data. The use of Python scripts ensures consistency of application across different processing regions, speeds up and standardises the various data transformation processes, and helps identify data errors and exceptions, greatly improving the consistency and repeatability of the work.
The data standardization phase reviews projections, validates field names and cross-walks each source of bottom type data to the appropriate BoP bottom type (BType) code. Outputs from this phase are used as inputs to Shellfish and Herring spatialization, and to the second processing phase, which creates and manipulates the Thiessen polygons after all the data are prepared and validated. Methods are more fully described in Gregr et al. 2013, and the project documentation.

Data Sources:
Canadian Hydrographic Service, Fisheries and Oceans Canada (DFO)
Bottom type data from shellfish surveys (https://www.gis-hub.ca/dataset/substrate-obs)
Bottom type data from herring surveys (https://www.gis-hub.ca/dataset/substrate-obs)
Bottom type data from ShoreZone dataset
Bottom type data from underwater remote vehicle survey, collected around Calvert Island.
Bottom type data from underwater remote vehicle survey, collected throughout NCC focused on rockfish

Scripts or Software Routines:
Custom Python scripts developed by Scitech Environmental Consulting. Scripts are described in the following reports, and are available on request.
Bottom Patches for coastal waters in Pacific Canada - Technical Report. Gregr. 2017.
Python scripts for creating Bottom Patches in coastal waters - User manual. Gregr and Peterman. 2017.

Spatial Data Quality:
The quality of the BoP data is a function of the source data accuracy and density. At higher point densities, the spatial variability is more likely to be well represented. The accuracy with which the data are originally recorded will influence the correspondence between any particular source point and its real world value. The

accuracy of the generalization of any single point to a BoP also then depends on the natural variability of the region

Positional Accuracy:
Horizontal accuracy is based on 20 x 20 m2 raster which was in turn based on a variable resolution collection of field data. The BoP polygons themselves have the positional accuracy of the source data. Grab data probably at the scale of metres, and Obs data accuracy at the scale of 10s of m because many were estimated from transects

Attribute Accuracy:
Accuracy of the bottom type depends on a multitude of factors including the size and distance of the source polygons, and the quality of the source data themselves. Higher density data, with more coherence is understood to have higher accuracy. See project documentation for additional details

Logical Consistency:
The data fields in this database are modelled, and are thus consistent with the logic and consistency of the model process.

Completeness:
The BoPs form a complete tessellation of the study area. All fields are complete as required. Note that those fields relating to the source data are sparse (i.e., not completely filled), because not every BoP draws information from every data source.

Absence Data:
Absence can be directly inferred from the size of the BoPs, which reflect the spatial sampling density

Uncertainties:
Empirical data are extrapolated and supplemented with modelling work rather than relying only on the model results for two reasons. First, a raster analysis does not provide the best available spatial representation of the coast. Second, the models, while statistically robust, produce considerable variability in the spatial pattern depending on the parameterization, meaning local agreement with observations will also be variable

Use Restrictions:
Intended for scientific research only. Not to be used to personal, navigational, or commercial purposes

Temporal Coverage
1991-2016

References:
Gregr, E. J., J. Lessard, and J. Harper. 2013. A spatial framework for representing nearshore ecosystems. Progress In Oceanography 115:189-201

Collaboration:
Co-creators are collaborators

Confidentiality: Not Protected