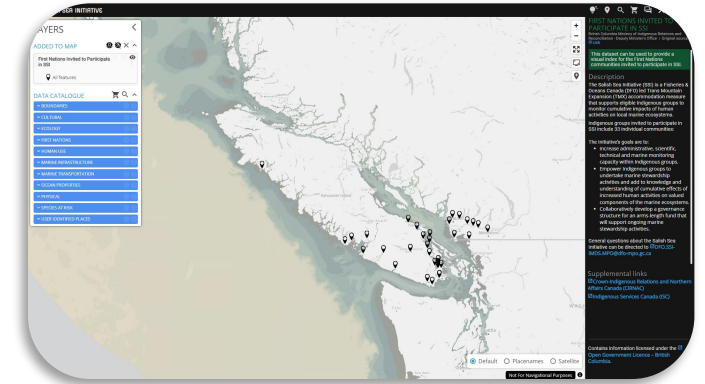




Salish Sea Initiative's Interactive Map

Nina Harvey

November 25, 2023



With humble acknowledgement that I work, live and play within the traditional territory of the Sḵw̓x̓wú7mesh Úxwumixw (Squamish Nation).



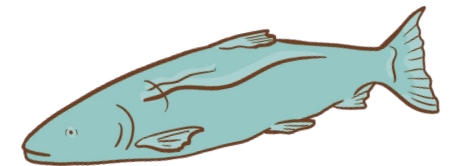
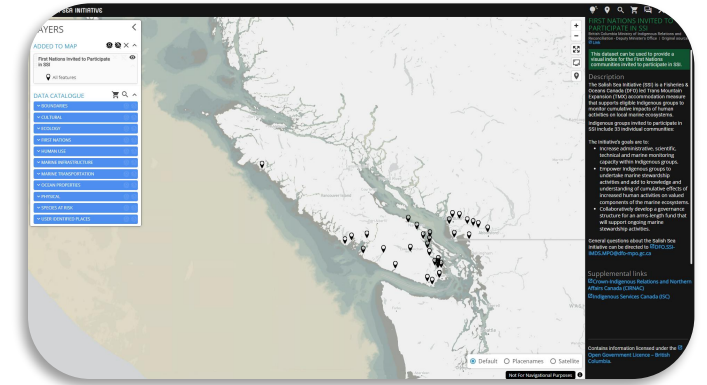
Salish Sea Initiative

The Salish Sea Initiative (SSI) is one of eight Accommodation Measures established in relation to the Trans Mountain Expansion (TMX) project.

It responds to concerns raised by First Nations regarding the cumulative effects of human activities in the marine environment.

The initiative is building capacity within First Nations communities to support:

- **Acquisition and reporting of baseline environmental data**
- **Tracking of environmental impacts and changes**
- **Assessment of cumulative environmental effects from human activities**
- **Determination of Valued Ecosystem Components within the Salish Sea**



Salish Sea Initiative Interactive Map

The Salish Sea Initiative Interactive Map (SSIM) is a deliverable of the SSI Science team. We were charged with building an interactive map for use of the 33 First Nations invited to participate in the initiative.



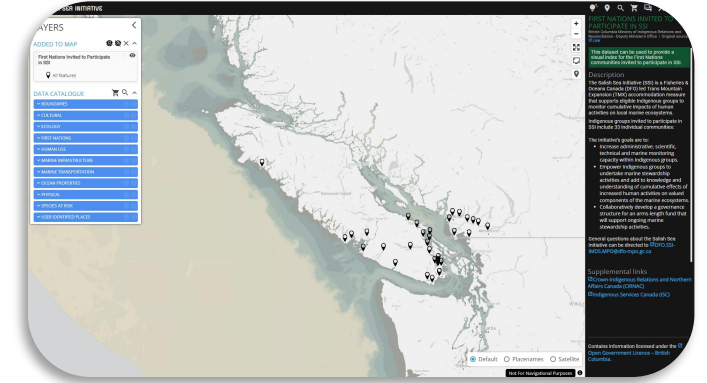
Co-developed Identified Scope & Key Features

- To include all ecosystem components data
 - and all other available relevant data
- Map needs to be easy to use
- OCAP compliant
- Tools to find, visualize, and understand the data
- Ways to share traditional knowledge and languages
- Data portal functionalities (upload & download)



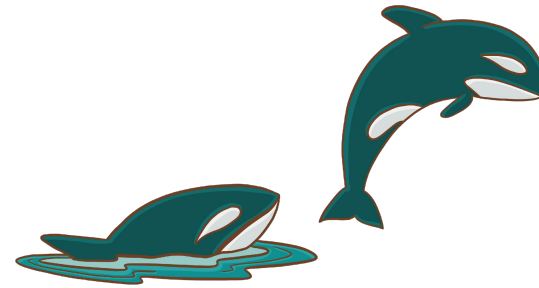
SSIM Design

- Uses Mapbox API
- Data stored on Amazon Web Services servers in Canada
- Login Accounts
 - general participants, DFO, individual community users
 - supports selective data sharing
- Maintained by **Trailmark**  Systems



Current Status

- 182 map layers
- 104 resources & tools
- Download portal (layer file, info panel documentation, metadata, processing notes)
- Layer filtering, feature attribute filtering, charting data



LAYERS

ADDED TO MAP

First Nations Invited to Participate in SSI

All features

DATA CATALOGUE

- BOUNDARIES
- CULTURAL
- ECOLOGY
- FIRST NATIONS
- HUMAN USE
- MARINE INFRASTRUCTURE
- MARINE TRANSPORTATION
- OCEAN PROPERTIES
- PHYSICAL
- SPECIES AT RISK
- USER IDENTIFIED PLACES



FIRST NATIONS INVITED TO PARTICIPATE IN SSI

British Columbia Ministry of Indigenous Relations and Reconciliation - Deputy Minister's Office | Original source: [Link](#)

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Supplemental links

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- [Indigenous Services Canada \(ISC\)](#)

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Default
 Placenames
 Satellite

Not For Navigational Purposes



LAYERS

ADDED TO MAP



First Nations Invited to Participate in SSI

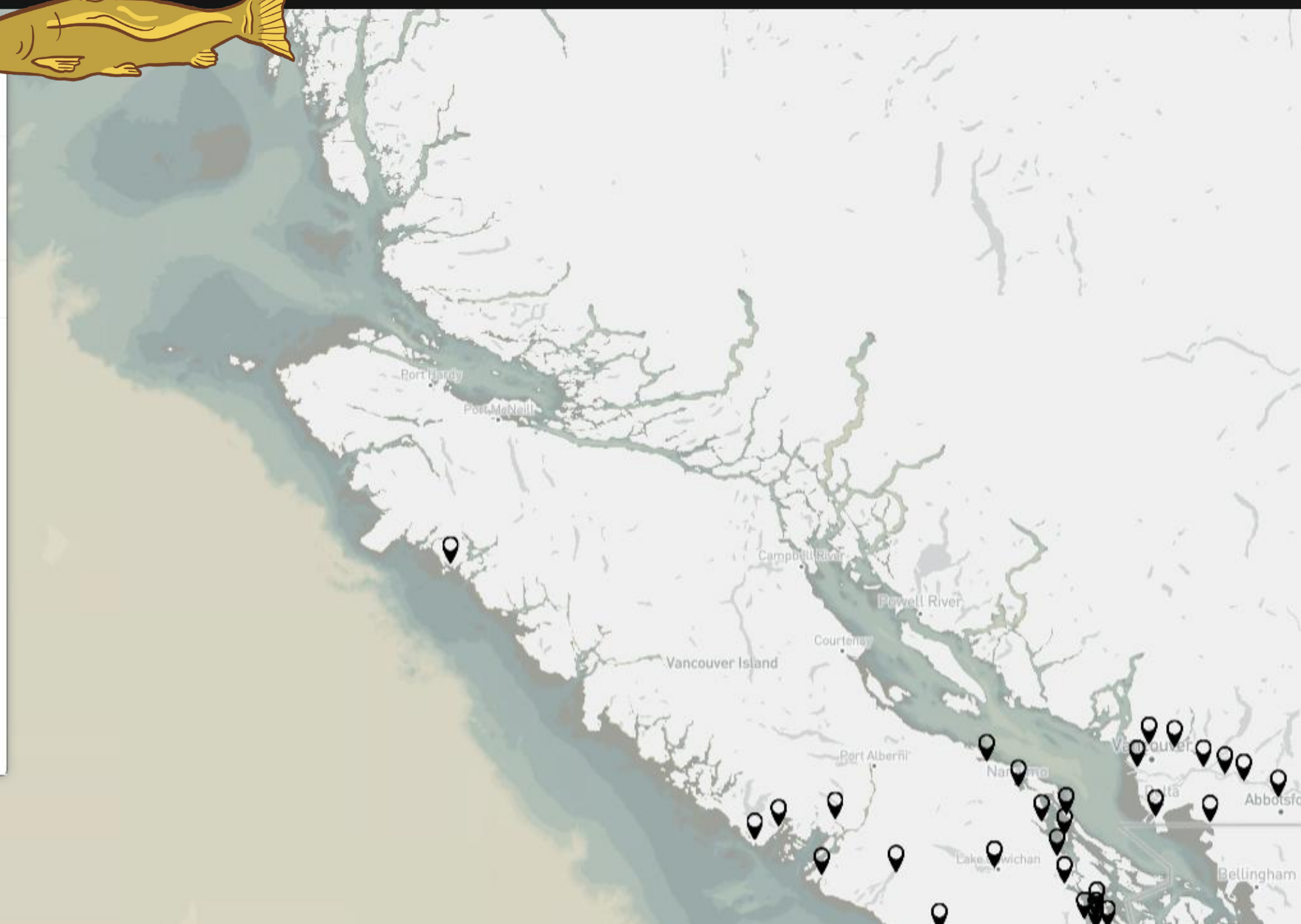


All features





DATA CATALOGUE







- BOUNDARIES
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LAYERS


ADDED TO MAP    


First Nations Invited to Participate in SSI   















 All features

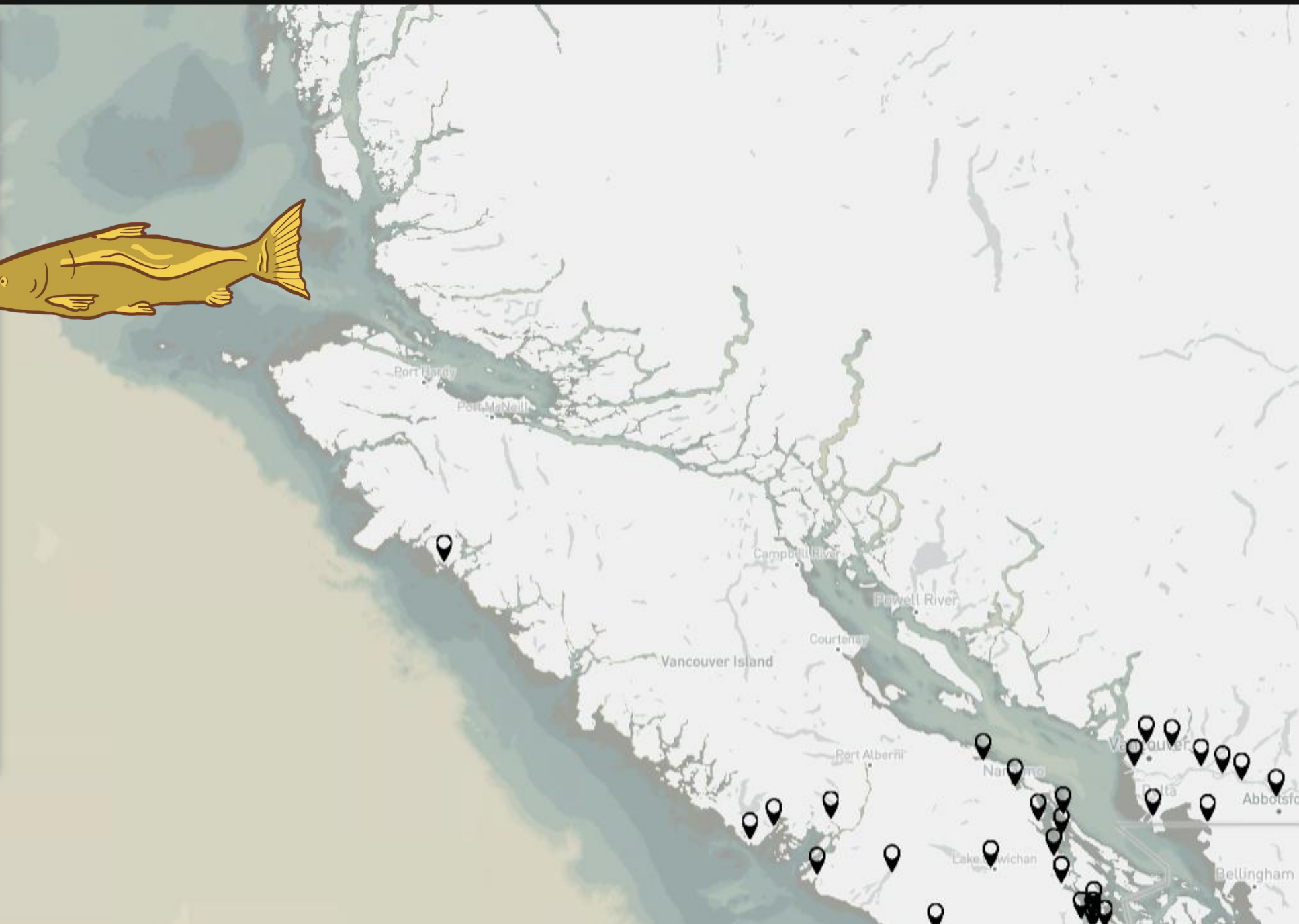
DATA CATALOGUE

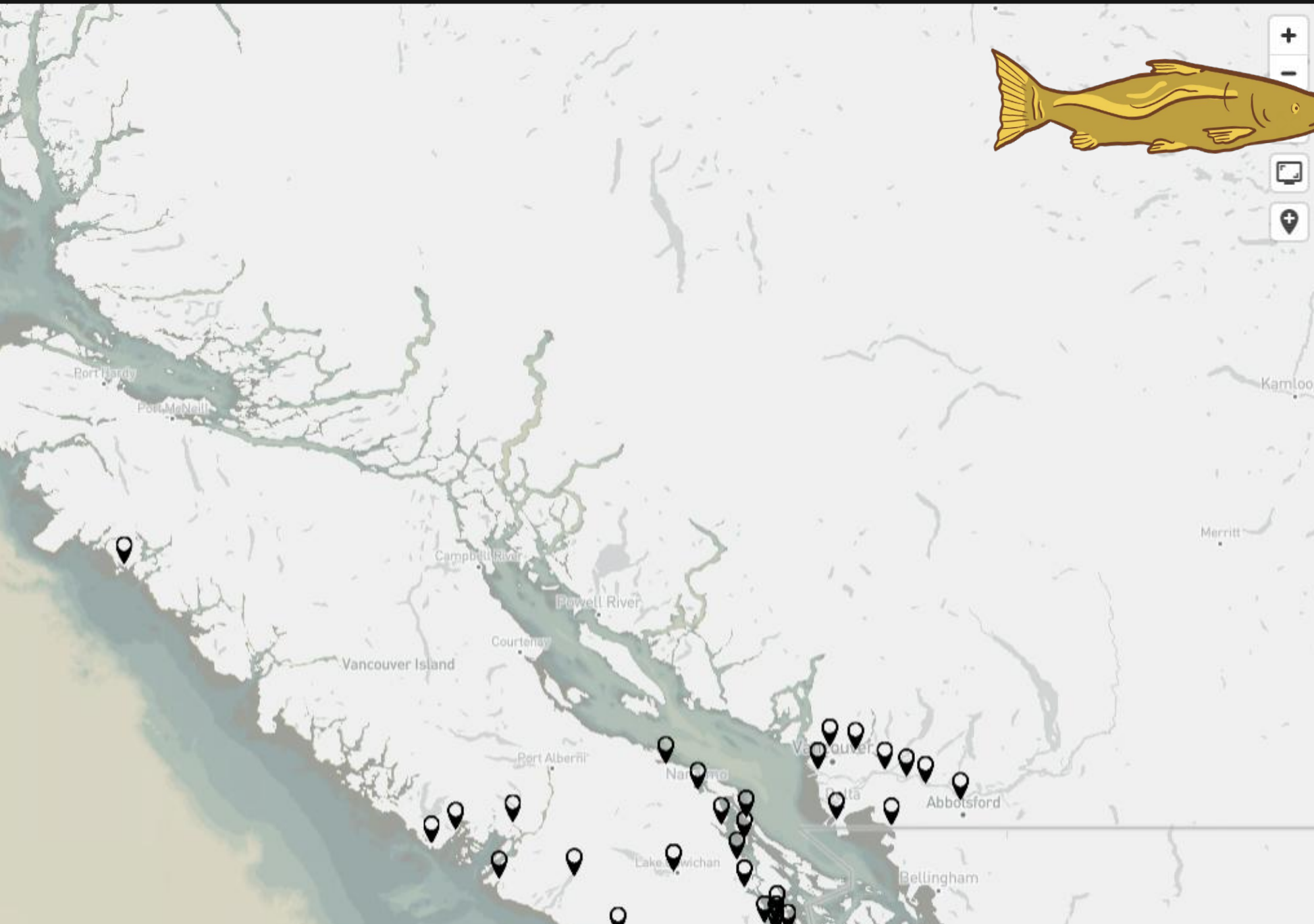
 

 Search layers names by text

 Search layers by drawing

-  HUMAN USE 
-  MARINE INFRASTRUCTURE 
-  MARINE TRANSPORTATION 
-  OCEAN PROPERTIES 
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Default Placenames Satellite

Not For Navigational Purposes ⓘ





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LAYERS

ADDED TO MAP

- First Nations Invited to Participate in SSI
- All features

DATA CATALOGUE

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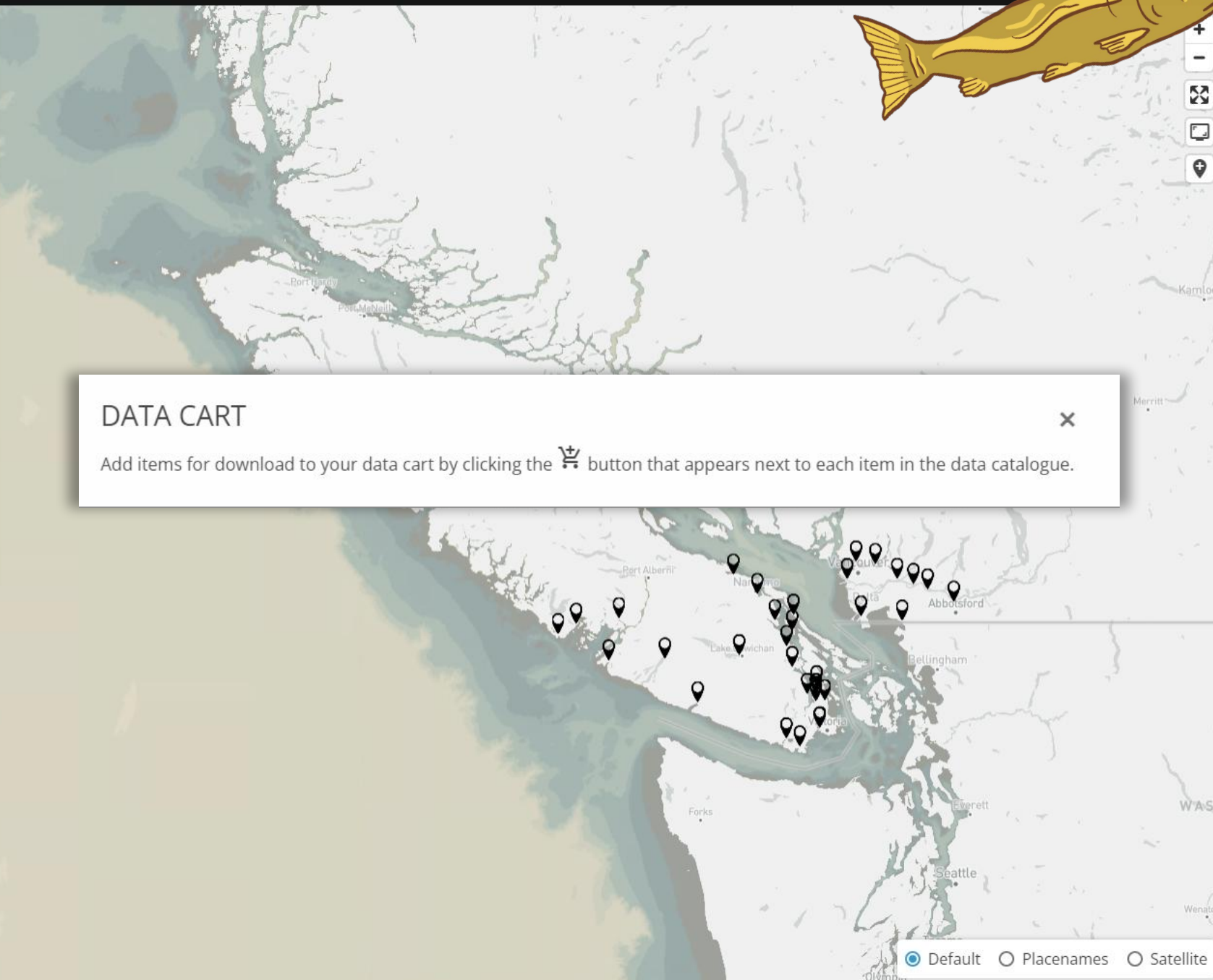
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DATA CART

Add items for download to your data cart by clicking the  button that appears next to each item in the data catalogue.



Default
 Placenames
 Satellite

Not For Navigational Purposes

LAYERS

ADDED TO MAP



First Nations Invited to Participate in SSI



All features

DATA CATALOGUE



BOUNDARIES



CULTURAL



ECOLOGY



FIRST NATIONS



HUMAN USE



MARINE INFRASTRUCTURE



MARINE TRANSPORTATION



OCEAN PROPERTIES



PHYSICAL



SPECIES AT RISK



USER IDENTIFIED PLACES



RESOURCES AND TOOLS



[Salish Sea Initiative Interactive Map User's Manual](#)

[Salish Sea Initiative Stewardship Program Planning](#)

OTHER BACKGROUND INFORMATION / DATA SOURCES



INTERACTIVE MAPS



MONITORING TOOLS



VALUED COMPONENTS



STORY MAPS



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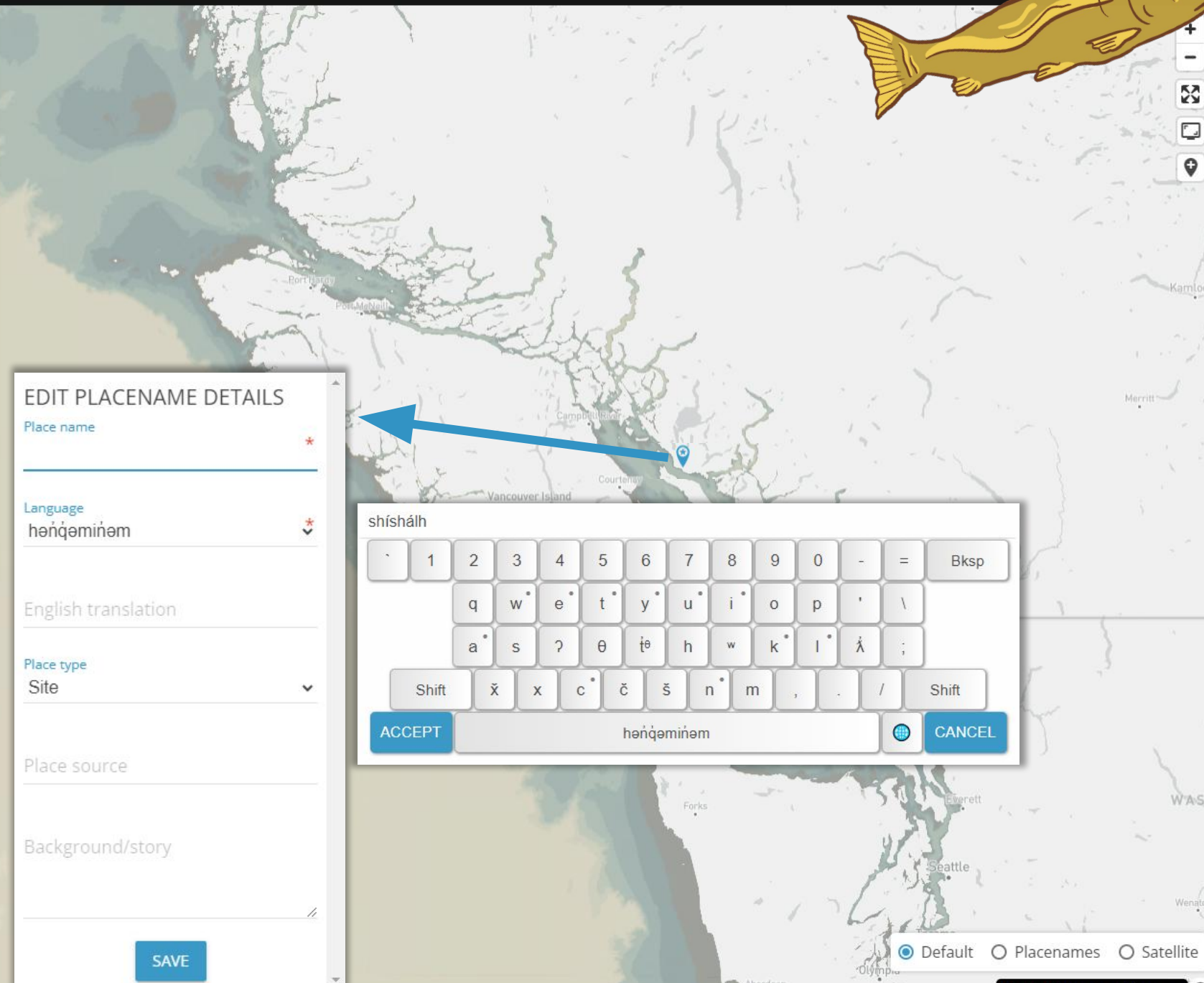
LAYERS

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- USER IDENTIFIED PLACES



EDIT PLACENAME DETAILS

Place name

Language

hən̓q̓əmin̓əm

English translation

Place type

Site

Place source

Background/story

SAVE

shishálh

1	2	3	4	5	6	7	8	9	0	-	=	Bksp
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ACCEPT hən̓q̓əmin̓əm **CANCEL**

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LAYERS

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hənqəminəm

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ACCEPT





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Default Placenames Satellite

Not For Navigational Purposes

LAYERS

ADDED TO MAP

Vessel Traffic Density 2015-2019

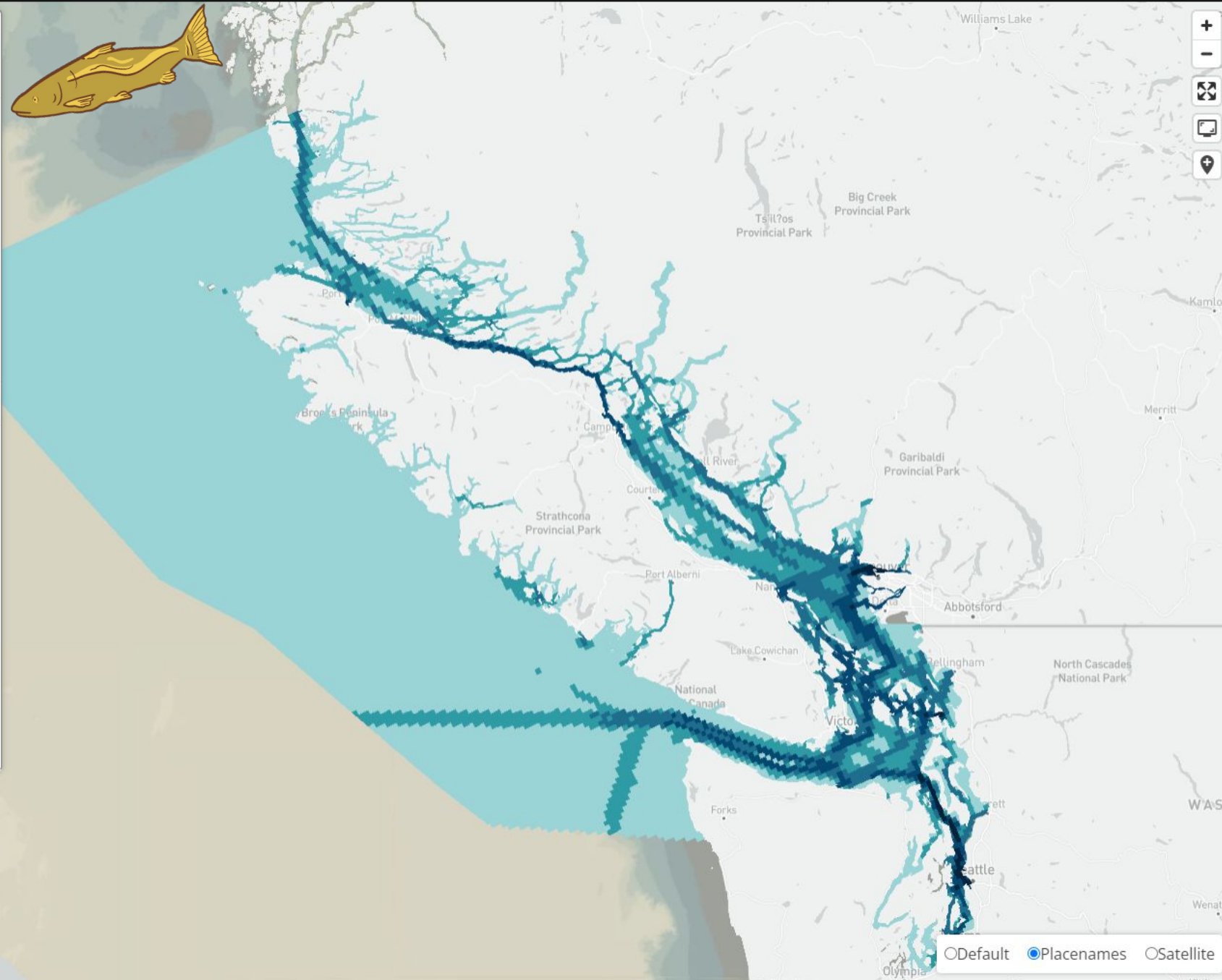
Year: 2019

Vessel type: All Vessel Transits

- 1 to 600
- 601 to 1800
- 1801 to 4800
- 4801 to 10700
- 10701 to 20894
- No recorded vessels

DATA CATALOGUE

- BOUNDARIES
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VESSEL TRAFFIC DENSITY 2015-2019
 Transport Canada | Original source: Received directly from Transport Canada.

This data represents vessel traffic patterns within the southern portion of the Pacific region of Canada from 2015-2019. The data can help with marine infrastructure planning, conservation initiatives, and emergency response planning.

Description

This dataset plots the density of vessel traffic by counting the number of vessel transits within grid cells (area = ~ 9 km²) per year. Vessel density can be mapped by Total Transit Count, Vessel Type categories or by Gross Tonnage (GT), per the [International Convention on Tonnage Measurement of Ships, 1969](#). The Vessel Type category includes: cargo, container, dry bulk, ferry, fishing, government/research, passenger, pleasure, tanker, tug/port and 'other' vessels. Vessel information for this dataset is collected through the Automatic Identification System (AIS). The purpose of [AIS](#) is to help identify ships, assist in target tracking, assist in search and rescue operation, simplify information exchange, and provide additional information to assist situational awareness ([International Maritime Organization, A 29/Res.1106](#)). The Canadian Coast Guard is responsible for the construction and operation of shore-based stations in the system network. The stations are built in specific locations to track vessels to within 50 nautical miles (~ 72 - 92 km of the coastline).

- #### Attributions:
- Dataset decoding, fusion and processing by [Transport Canada](#).
 - Terrestrial AIS (2015-19) provided by [Canadian Coast Guard](#).
 - Satellite AIS (2015-Feb. 2017) provided by [Spire](#).
 - Satellite AIS (Mar. 2017-2019) provided by [Maerospace](#).

Supplemental links

More on the [Automatic Identification System \(AIS\)](#) on ships

[International Maritime Organization \(IMO\), A29/Res.1106](#) (adopted on 2-Dec-2015)

○Default ●Placenames ○Satellite

Not For Navigational Purposes

LAYERS

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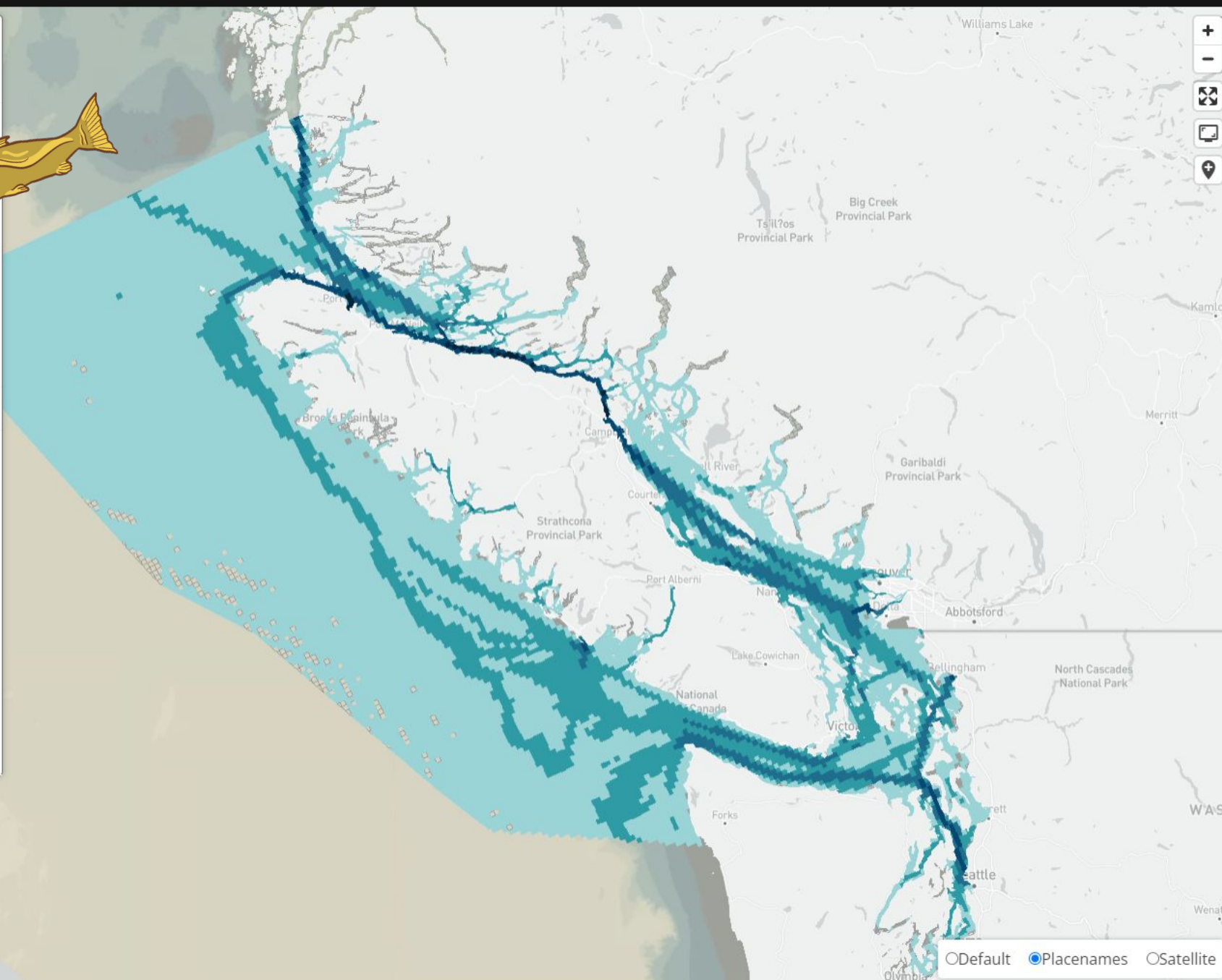
Year: 2019

Vessel type: Fishing Vessels

- 1 to 75
- 76 to 250
- 251 to 650
- 651 to 1500
- 1501 to 2884
- No recorded vessels

DATA CATALOGUE

- BOUNDARIES
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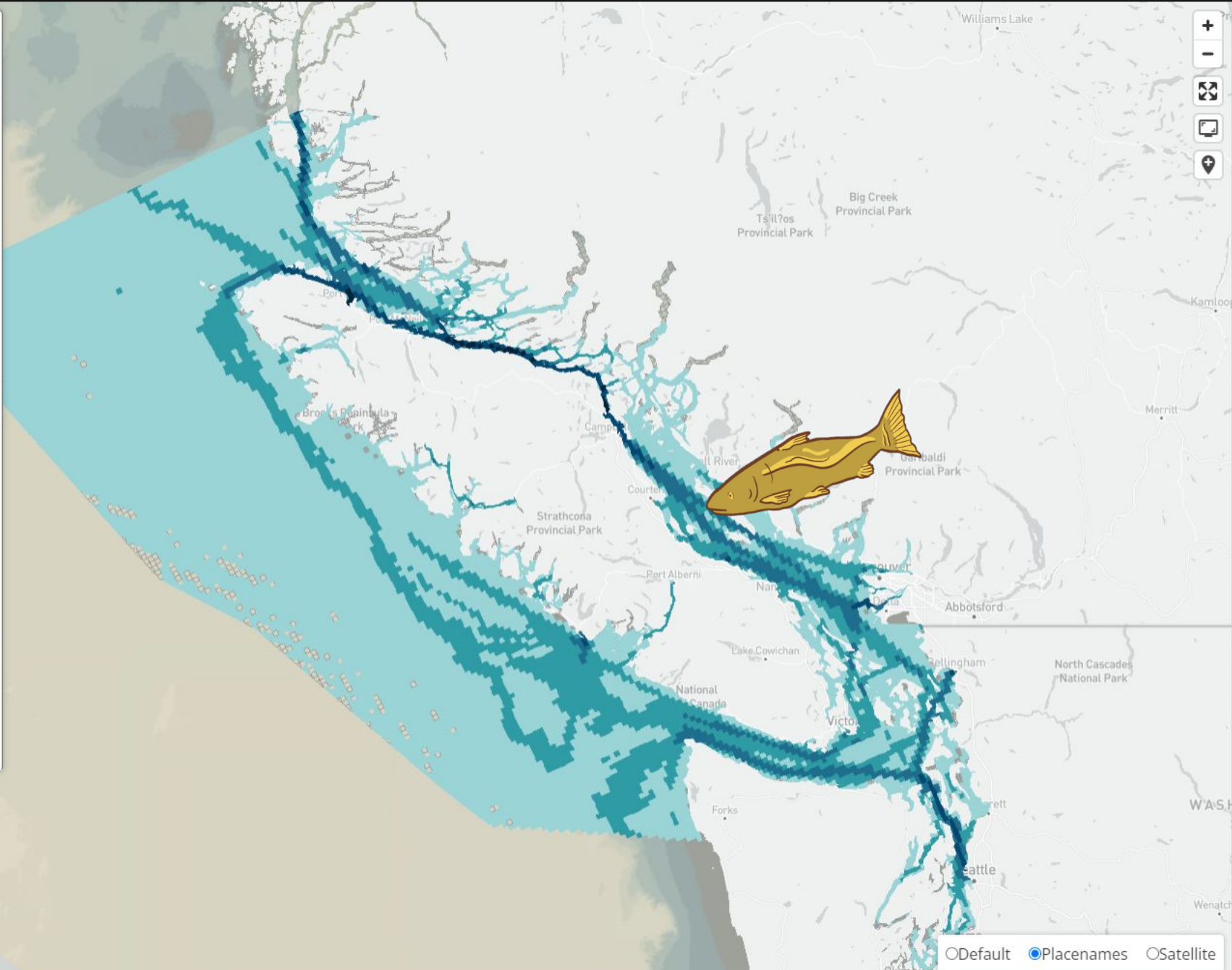
Year

Vessel type

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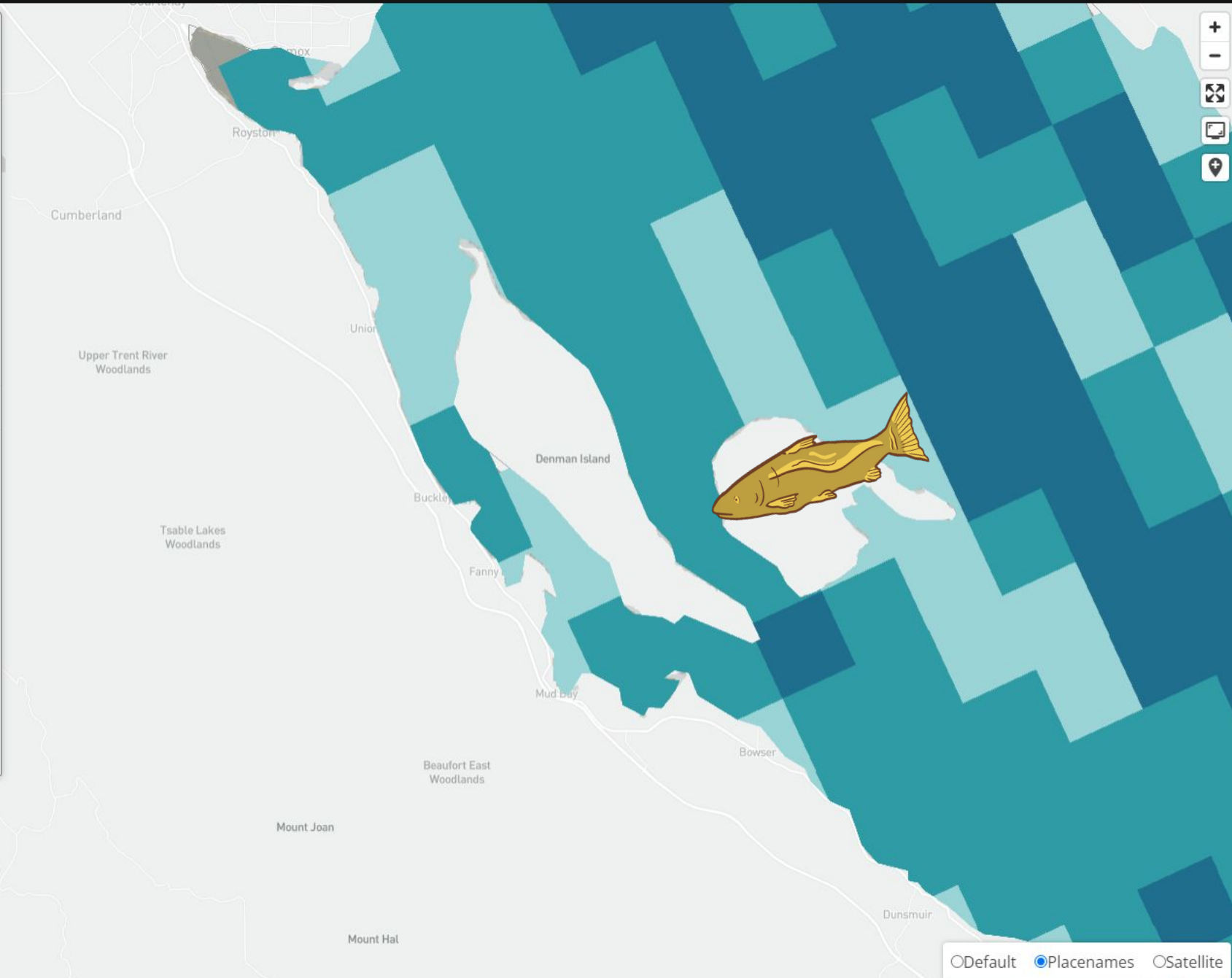
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This data represents vessel traffic patterns within the southern portion of the Pacific region of Canada from 2015-2019. The data can help with marine infrastructure planning, conservation initiatives, and emergency response planning.

Description

This dataset plots the density of vessel traffic by counting the number of vessel transits within grid cells (area = ~ 9 km²) per year. Vessel density can be mapped by Total Transit Count, Vessel Type categories or by Gross Tonnage (GT), per the [International Convention on Tonnage Measurement of Ships, 1969](#). The Vessel Type category includes: cargo, container, dry bulk, ferry, fishing, government/research, passenger, pleasure, tanker, tug/port and 'other' vessels. Vessel information for this dataset is collected through the Automatic Identification System (AIS). The purpose of [AIS](#) is to help identify ships, assist in target tracking, assist in search and rescue operation, simplify information exchange, and provide additional information to assist situational awareness ([International Maritime Organization, A 29/Res.1106](#)). The Canadian Coast Guard is responsible for the construction and operation of shore-based stations in the system network. The stations are built in specific locations to track vessels to within 50 nautical miles (~ 72 - 92 km of the coastline).

- ### Attributions:
- Dataset decoding, fusion and processing by [Transport Canada](#).
 - Terrestrial AIS (2015-19) provided by [Canadian Coast Guard](#).
 - Satellite AIS (2015-Feb. 2017) provided by [Spire](#).
 - Satellite AIS (Mar. 2017-2019) provided by [Maerspace](#).

Supplemental links

More on the [Automatic Identification System \(AIS\)](#) on ships

[International Maritime Organization \(IMO\), A29/Res.1106](#) (adopted on 2-Dec-2015)

○Default ●Placenames ○Satellite

Not For Navigational Purposes

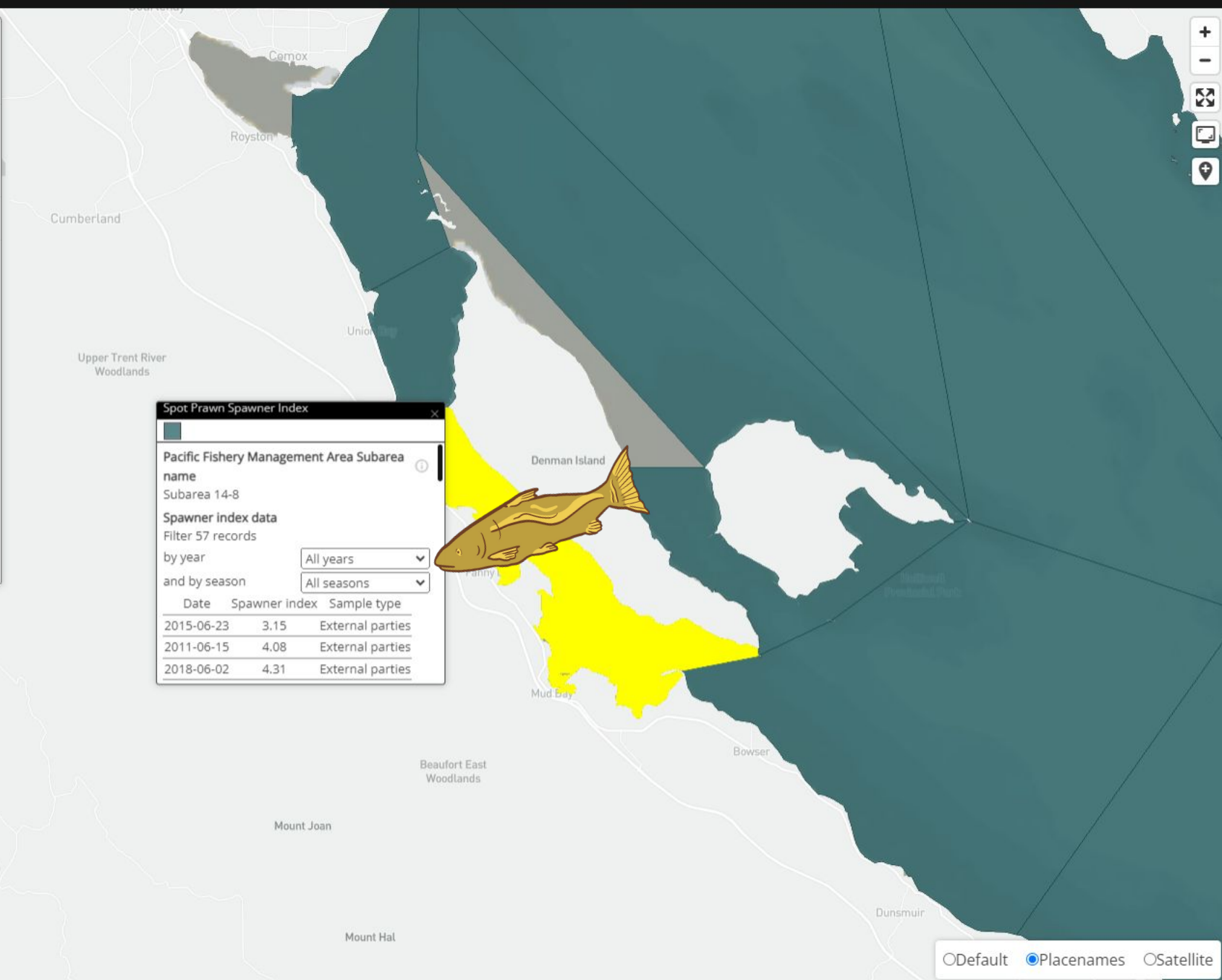
LAYERS

ADDED TO MAP

- Spot Prawn Spawner Index
 - All features

DATA CATALOGUE

- BOUNDARIES
- CULTURAL
- ECOLOGY
- FIRST NATIONS
- HUMAN USE
- MARINE INFRASTRUCTURE
- MARINE TRANSPORTATION
- OCEAN PROPERTIES
- PHYSICAL
- SPECIES AT RISK
- USER IDENTIFIED PLACES



Spot Prawn Spawner Index

Pacific Fishery Management Area Subarea name
Subarea 14-8

Spawner index data
Filter 57 records

by year:

and by season:

Date	Spawner index	Sample type
2015-06-23	3.15	External parties
2011-06-15	4.08	External parties
2018-06-02	4.31	External parties

SPOT PRAWN SPAWNER INDEX

Fisheries and Oceans Canada | Original source: [Link](#)

This data can be used to observe the Spawner Index sampling results within the Pacific Fisheries Management Areas from 1995 to 2020.

Photo Credit: [Fisheries and Oceans Canada](#).

Description

Overfishing of a species' breeding population (termed "recruitment overfishing") can threaten the survival of that species and the communities and industries dependent on them. Recruitment overfishing of Spot Prawns, *Pandalus platyceros*, by the trap fisheries in British Columbia, is managed using a fixed escapement system ([Boutillier, et al. 2000](#)). Fixed escapement targets are set and implemented according to the number of female spawners caught per trap in the commercial fishery, obtained by monitoring the age and sex composition of the catch.

Fishery independent sampling occurs during periods when the commercial fishery is closed to provide supporting abundance indices. The Spawner Index values, sampled from within the associated [Pacific Fisheries Management Areas \(PFMA\)](#), are evaluated in tandem with other population metrics and utilised in the [Pacific Region Integrated Fisheries Management Plan](#), which informs management decisions for the industry. This dataset includes all Spawner Index values sampled from 1995 to 2020. Values are updated at the source when possible.

- ### Supplemental links
- [Boutillier, J.A. and J.A. Bond. 2000. Using a fixed escapement strategy to control recruitment overfishing in the shrimp trap fishery in British Columbia. J. Northw. Atl. Fish. Sci, Vol 27:261-271. <https://doi.org/10.2960/J.v27.a22>](#)
 - [General information on prawns](#)
 - [Pacific Fisheries Management Areas \(PFMA\)](#)
 - [Pacific Region Integrated Fisheries](#)

Default Placenames Satellite

Not For Navigational Purposes

CROWN TENURES

Lands | Original source: [Link](#)

This data shows provincial and federal administered land in BC that has been leased or licenced out for a designated purpose by an individual, company or organization.

Description

The [Ministry of Forests, Lands, Natural Resource Operations & Rural Development \(FLNRORD\)](#) administers the [Land Act](#) and is responsible for the sale, lease and license of Crown lands throughout British Columbia. Crown land tenures are agreements between an individual or company and the provincial or federal government which provides them with an interest in the land, in other words, it allows them access to land (or marine area) on which to conduct some agreed-upon activity. Tenures are granted for specific purposes and periods of time. This **Crown Tenures** dataset can be filtered by specific tenure purposes (such as Aquaculture, Ocean Power, Transportation, etc.).

They are symbolized by the tenure stage, which includes:

- Tenure** – a disposition issued under the Land Act (a reviewed and accepted Application).
- Application** – a request for a Crown land disposition.
- Pre-Tantalis** – historical dispositions recorded from a legacy system.
- Inventory** – land identified for possible marketing.

While exploring features, labels will identify the tenures by *type*, including:

- Crown Grant** – fee simple dispositions or sales made either under the [Land Act](#) or [Ministry of Lands, Parks and Housing Act](#).
- Inventory** – land identified for possible marketing.
- Lease** – exclusive use of the land, permanent improvements and usually long-term use.
- Licence** – non-exclusive use of the land, where minimal improvements are needed.
- Reserve/Notation** – could be a variety of legal or administrative tools that either withdraw the land disposition for



LAYERS

ADDED TO MAP

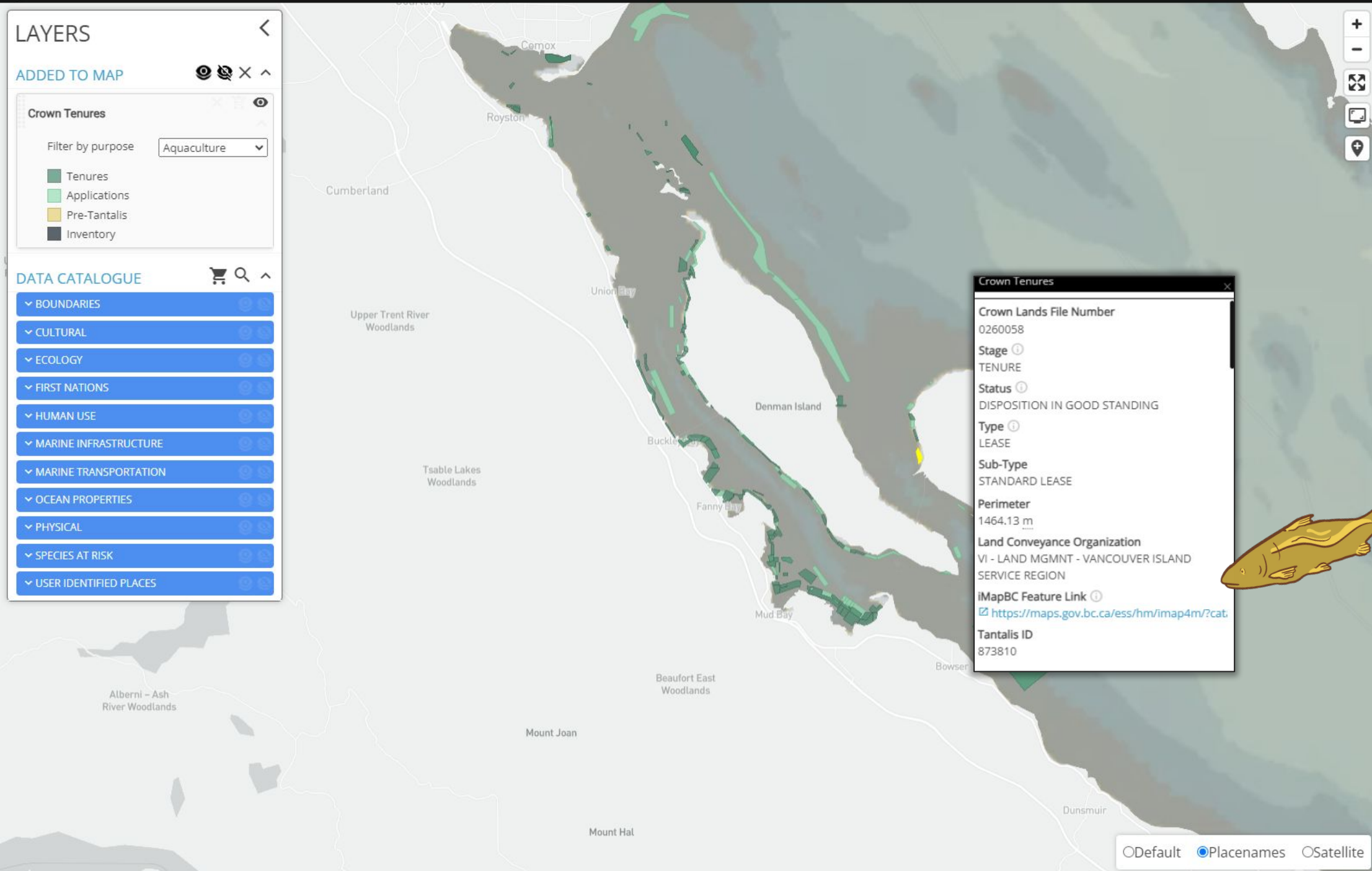
Crown Tenures

Filter by purpose: Aquaculture

- Tenures
- Applications
- Pre-Tantalis
- Inventory

DATA CATALOGUE

- BOUNDARIES
- CULTURAL
- ECOLOGY
- FIRST NATIONS
- HUMAN USE
- MARINE INFRASTRUCTURE
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- OCEAN PROPERTIES
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- SPECIES AT RISK
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Crown Tenures

Crown Lands File Number
0260058

Stage
TENURE

Status
DISPOSITION IN GOOD STANDING

Type
LEASE

Sub-Type
STANDARD LEASE

Perimeter
1464.13 m

Land Conveyance Organization
VI - LAND MGMNT - VANCOUVER ISLAND SERVICE REGION

iMapBC Feature Link
<https://maps.gov.bc.ca/ess/hm/imap4m/?cat>

Tantalus ID
873810

Default Placenames Satellite

Not For Navigational Purposes

This data can give insight into the shoreline characteristics of British Columbia. It can be used for linking habitat use and life-history strategy of nearshore fish and other intertidal organisms; habitat capability modelling; ground-truthing of aerial data on smaller spatial scales; natural resource planning and environmental hazard mitigation; and for recreation, education, outreach, and conservation.



Photo credit: ShoreZone®
<https://www.flickr.com/photos/132870913@N05/51585036513/in/album-72157720009318494/>

Description

ShoreZone is a coastal benthic habitat mapping system, developed in the late 1970s to map coastal features in British Columbia and Washington State. The system was substantially revised in the early 1990s with the addition of a biological component. The [Alaska ShoreZone](#) was started in 2001 and that data is hosted by the National Oceanic and Atmospheric Administration (NOAA). ShoreZone now represents a spatially contiguous dataset of imagery and habitat attributes spanning 115,000 kilometres of coastline from California to the Beaufort Sea.

The survey data (georeferenced, oblique, low altitude aerial images and video footage) is acquired by helicopter during the lowest tides of the year in order to clearly capture as much of the coastal zone as possible. The coast is divided up into equal interval 'Units', and the data are then interpreted by analysts and computer programs to classify each Unit by the dominant geological and biological attributes. These interpretations are supported by ground surveys where necessary. The resulting database is a searchable inventory of intertidal and nearshore habitat attributes which can be used as a tool for science, education, and environmental planning.

LAYERS

ADDED TO MAP

ShoreZone Mapping System

Geology

Geology

Shore Type

- █ Rock Platform
- █ Rock, Sand and Gravel Beach
- █ Rock with Gravel Beach
- █ Sand and Gravel Flat
- █ Sand and Gravel Beach
- █ Estuary, Marsh or Lagoon
- █ Man-made
- █ Gravel Beach
- █ Sand Flat
- █ Rock Cliff
- █ Rock with Sand Beach
- █ Mud Flat
- █ Channel
- █ Gravel Flat
- █ Sand Beach

Biology

Biology

Filter by species

All features

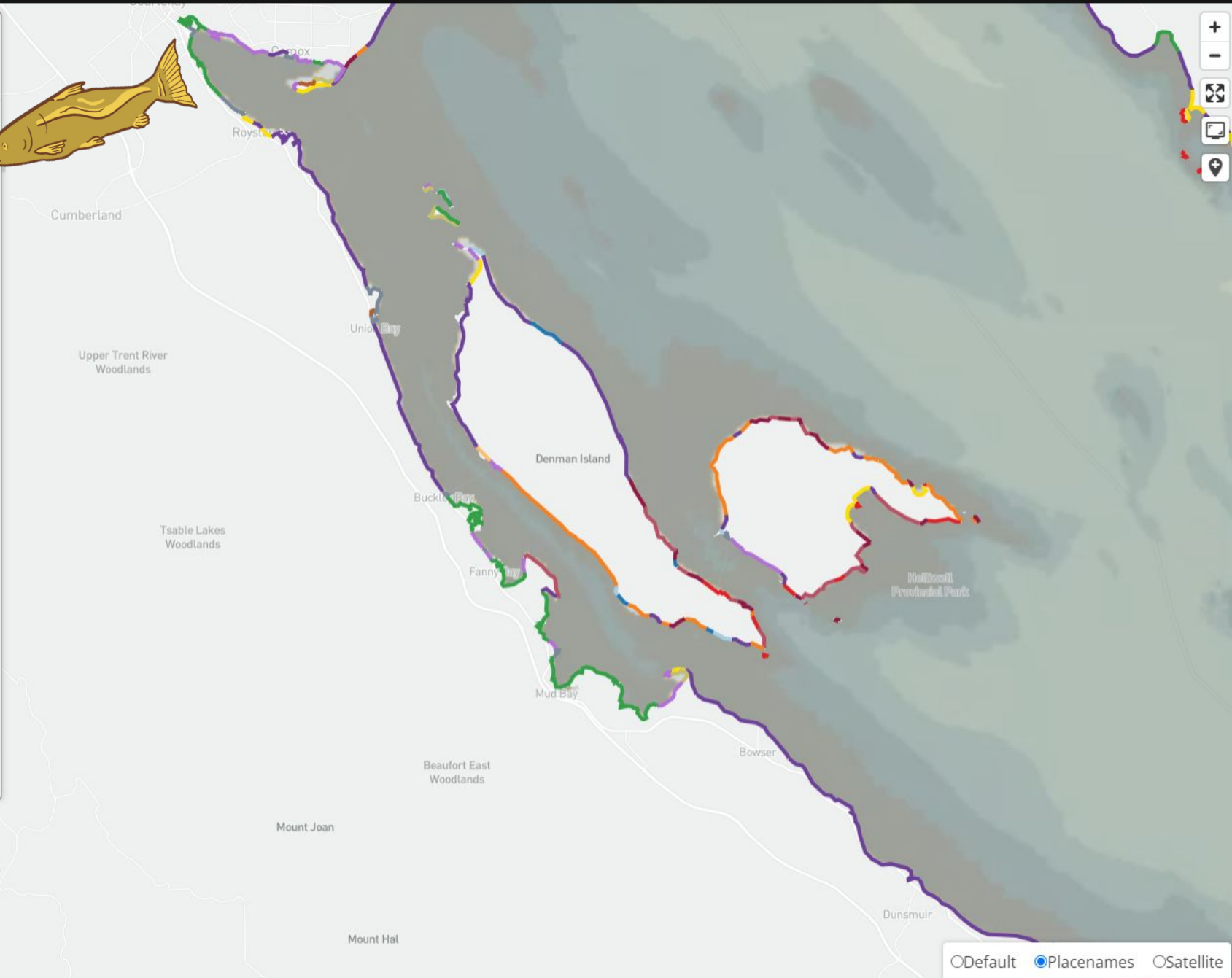
Reference

Survey Year

Filter by year

All features

DATA CATALOGUE



Default
 Placenames
 Satellite

Not For Navigational Purposes

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LAYERS

ADDED TO MAP

ShoreZone Mapping System

Geology

Geology

Shore Type

- Rock Platform
- Rock, Sand and Gravel Beach
- Rock with Gravel Beach
- Sand and Gravel Flat
- Sand and Gravel Beach
- Estuary, Marsh or Lagoon
- Man-made
- Gravel Beach
- Sand Flat
- Rock Cliff
- Rock with Sand Beach
- Mud Flat
- Channel
- Gravel Flat
- Sand Beach

Biology

Biology

Filter by species: All species

All features

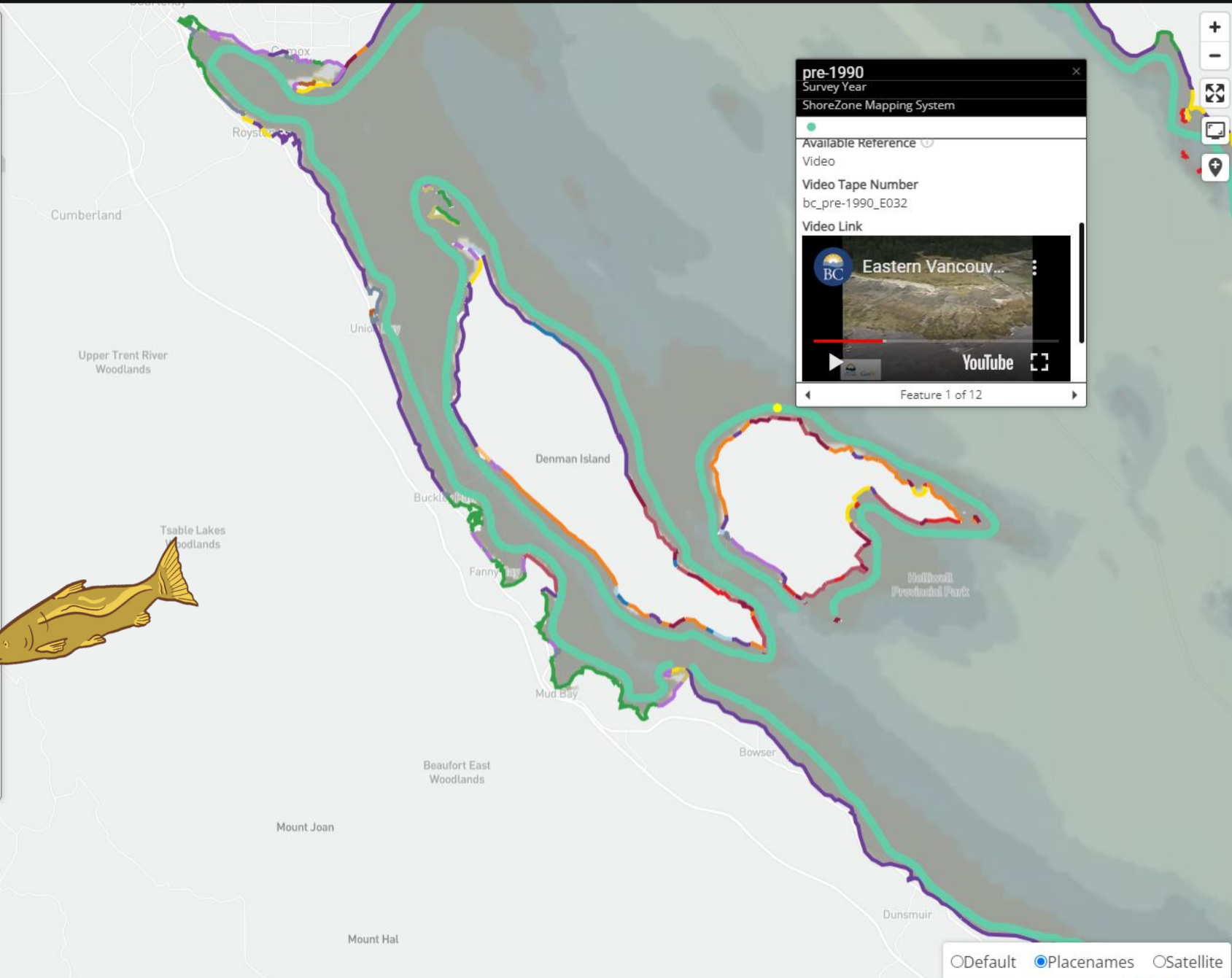
Reference

Survey Year

Filter by year: All years

All features

DATA CATALOGUE



pre-1990
Survey Year
ShoreZone Mapping System

Available Reference

Video

Video Tape Number
bc_pre-1990_E032

Video Link

Eastern Vancouv...

YouTube

Feature 1 of 12

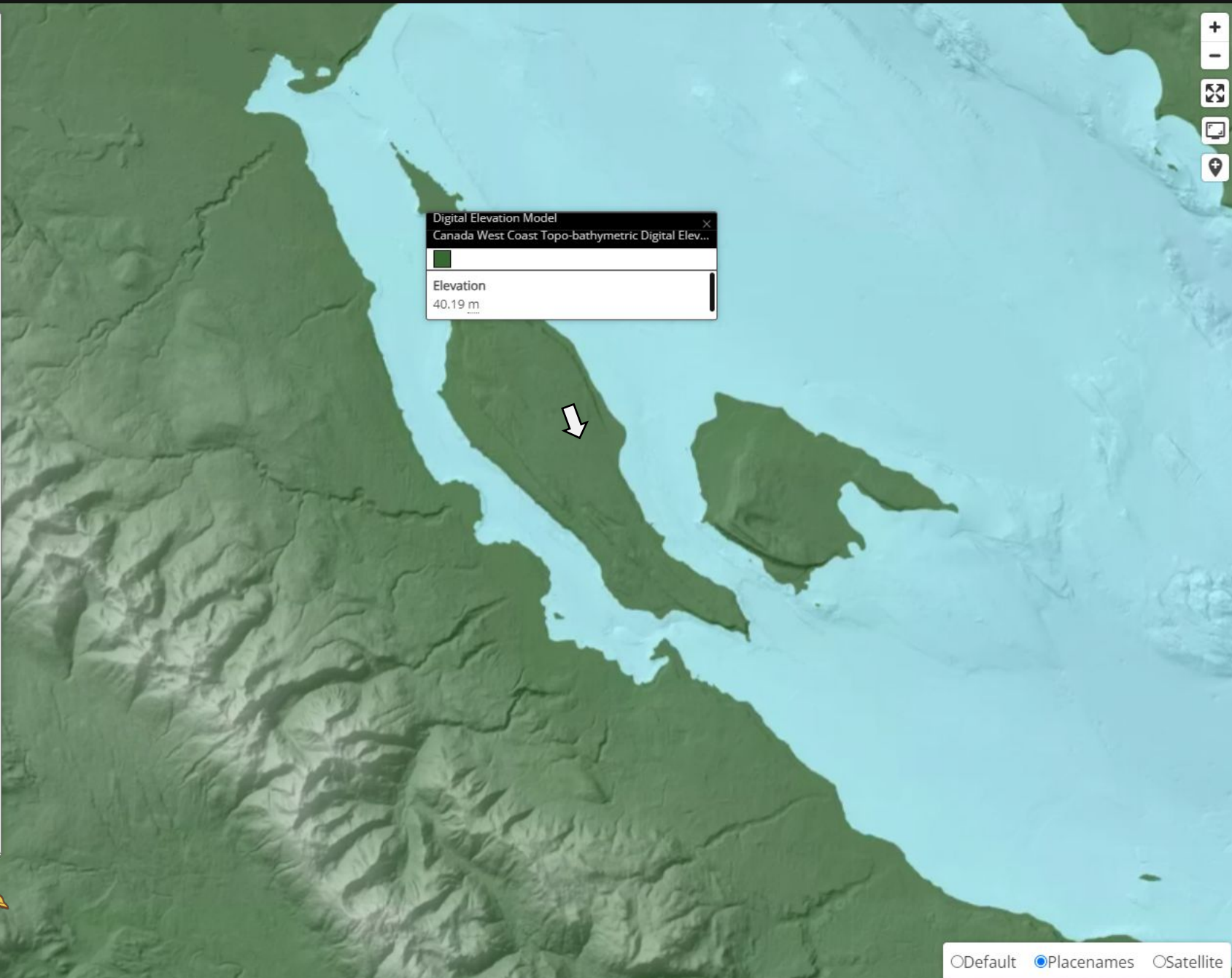
LAYERS

ADDED TO MAP

- Canada West Coast Topo-bathymetric Digital Elevation Model - 10m Resolution
 - Digital Elevation Model
 - Elevation (m)
 - 2465 m
 - 0 m
 - 2767 m
 - Hillshade
 - Elevation Data Sources
 - All features

DATA CATALOGUE

- BOUNDARIES
- CULTURAL
- ECOLOGY
- FIRST NATIONS
- HUMAN USE
- MARINE INFRASTRUCTURE
- MARINE TRANSPORTATION
- OCEAN PROPERTIES
- PHYSICAL
- SPECIES AT RISK
- USER IDENTIFIED PLACES



CANADA WEST COAST TOPO-BATHYMETRIC DIGITAL ELEVATION MODEL - 10M RESOLUTION

Natural Resources Canada | Original source: [Link](#)

This data can be used to understand the general bathymetry (ocean depths) and topography (land elevations) of the west coast of Canada.

Description

This digital elevation model (DEM) of the west coast of Canada, compiles the best data available from multiple government agencies to create a regional model gridded at 10 metre spacing. The transitions between the marine and terrestrial areas are seamless, creating a continuous surface of elevations for scientific research and mapping.

The bathymetry (ocean depths) extends to -2,767.00 metres, and topography (land measurements) rises to 2,465.125 metres in elevation.

The model was created for use by the Marine Spatial Planning Program, a joint effort between Natural Resources Canada (NRCan) and the Department of Fisheries and Oceans (DFO) and should not be used for navigational purposes.

- Data sources used to create the seamless surface:
- BC Lower Mainland DEM - Ocean Networks Canada** - A seamless topographic-bathymetric terrain model based on municipal LiDAR and airborne LiDAR elevation data. Originally 3 metre resolution. [Source](#)
 - British Columbia TRIM Digital Elevation** - Provincial topographic elevations gridded at 25 metre resolution for the Government of British Columbia. [Source](#)
 - CHS NONNA10 Bathymetry** - Non-navigational bathymetric data publicly released by Canadian Hydrographic Service at 10 metre resolution. [Source](#)
 - CHS and NRCan Multibeam Echo Sounder Bathymetry** - MBES bathymetry collected since 1997 by Canadian Hydrographic Service and Natural Resources Canada - Original

Default
 Placenames
 Satellite

Not For Navigational Purposes ⓘ

LAYERS

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- Canada West Coast Topo-bathymetric Digital Elevation Model - 10m Resolution
 - Digital Elevation Model
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DATA CATALOGUE

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CANADA WEST COAST TOPO-BATHYMETRIC DIGITAL ELEVATION MODEL - 10M RESOLUTION
 Natural Resources Canada | Original source: [Link](#)

This data can be used to understand the general bathymetry (ocean depths) and topography (land elevations) of the west coast of Canada.

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○Default ●Placenames ○Satellite

Not For Navigational Purposes ⓘ

LAYERS

ADDED TO MAP

Canada West Coast Topo-bathymetric Digital Elevation Model - 10m Resolution

Digital Elevation Model

Elevation (m)

2465 m

0 m

-2767 m

Hillshade

Elevation Data Sources

All features

DATA CATALOGUE

- BOUNDARIES
- CULTURAL
- ECOLOGY
- FIRST NATIONS
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- PHYSICAL
- SPECIES AT RISK
- USER IDENTIFIED PLACES

Benefits

- Reconciliation
- Building and strengthening relationships
- Facilitating science and data communication

Feedback

- Practical - data in one place that is easy to find
- Helpful for understanding data and locating sources
- Useful additional resources that tie things together
- Used for downloading relevant data
 - within community territory
 - relevant to community interests

CANADA WEST COAST TOPO-BATHYMETRIC DIGITAL ELEVATION MODEL - 10M RESOLUTION

Natural Resources Canada | Original source: [Link](#)

This data can be used to understand the general bathymetry (ocean depths) and topography (land elevations) of the west coast of Canada.

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Digital elevation model (DEM) of the west coast of Canada, compiles the best available from multiple government sources to create a regional model gridded at 10 metre spacing. The transitions between marine and terrestrial areas are seamless, creating a continuous surface of elevation for scientific research and mapping.

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The model was created for use by the Marine Planning Program, a joint effort between Natural Resources Canada (NRCan) and the Department of Fisheries and Oceans and should not be used for other purposes.

Resources used to create the seamless

Lower Mainland DEM - Ocean

Networks Canada - A seamless topographic-bathymetric terrain model based on municipal LiDAR and airborne LiDAR elevation data. Originally 3 metre resolution. [Source](#)

British Columbia TRIM Digital Elevation Model - Provincial topographic elevations gridded at 25 metre resolution for the Government of British Columbia. [Source](#)

CHS NONNA10 Bathymetry - Non-navigational bathymetric data publicly released by Canadian Hydrographic Service at 10 metre resolution. [Source](#)

● **CHS and NRCan Multibeam Echo Sounder Bathymetry** - MBES bathymetry collected since 1997 by Canadian Hydrographic Service and Natural Resources Canada - Original

Default Placenames Satellite

Not For Navigational Purposes

What's Next: 2024-2025

- More data layers (~300)
- More resources + tools
- Enhanced filtering and analysis tools
 - *E.g., time slider*
- Data upload portal
- Integration of Marine Survey App
 - electronic data forms and methods for data collection
- Semi-automated layer update process
- Continue to explore map host options beyond SSI (post-March 2025)



Thank you!

Nina Harvey

GIS Analyst, SSI Science

Fisheries and Oceans Canada

nina.harvey@dfo-mpo.gc.ca

Other Resources:

[Trailmark Systems \(trailmarksys.com\)](http://trailmarksys.com)

[The First Nations Principles of OCAP \(fnigc.ca/ocap-training\)](http://fnigc.ca/ocap-training)

[Salish Sea Initiative – Fisheries and Oceans Canada](#)

