



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada

# FIELDNOTES

## 2020 – 2021

### Pacific Science Field Operations

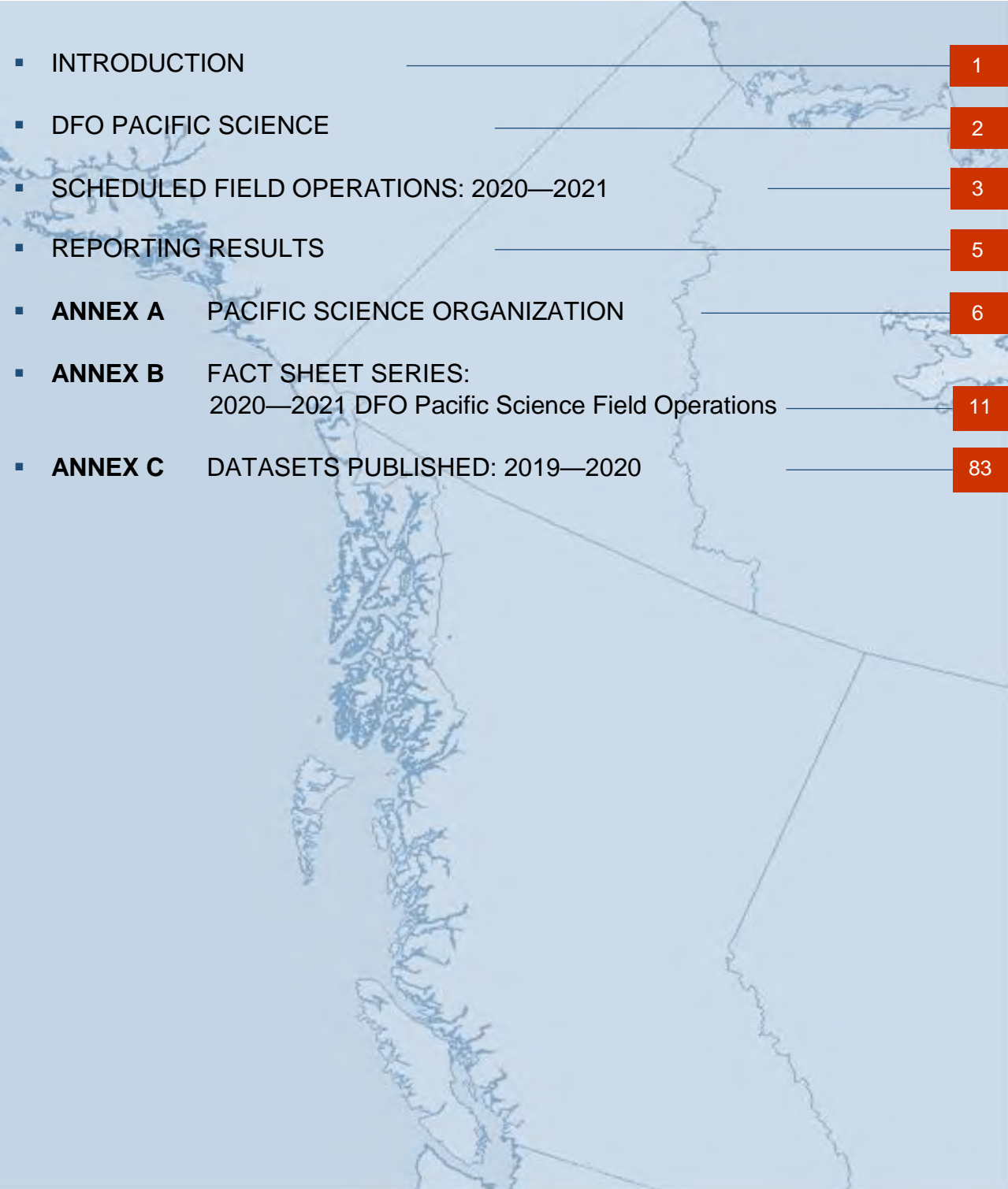


**Cover illustration:** Steller Sea Lions (*Eumetopias jubatus*) at a haul-out site on the north coast of British Columbia.

**Photo credit:** Fisheries and Oceans Canada.



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## INTRODUCTION

Fisheries and Oceans Canada (DFO) conducts research and undertakes monitoring surveys of the marine and freshwater environment in support of sustainable fisheries, healthy aquatic ecosystems and living resources, and safe and effective marine services.

In an effort to effectively inform and ensure Canadians feel engaged in the delivery of its science mandate, DFO produces *Fieldnotes*, an annual compendium of planned science field operations in the North Pacific and Arctic oceans, as well as in the coastal and interior waters of British Columbia and Yukon.

*Fieldnotes* aims to:

- inform Canadians of research and monitoring programming scheduled for the coming year;
- promote the sharing of key information and data in a coordinated, timely, open and transparent manner in order to encourage dialogue and collaboration;
- provide a platform from which to build and nurture fundamentally more inclusive, trust- and respect-based relationships with all Canadians;
- reaffirm and honour the [reconciliation commitment](#) to renewed relationships with Indigenous peoples based on the recognition of rights, respect, cooperation and partnerships;
- foster conditions that facilitate the pooling of collective expertise, experience, and resources, and,
- further DFO's commitment to the principles and pursuit of [scientific integrity](#).

To sum up, *Fieldnotes* is a contribution to DFO's commitment to continuous improvement, stronger relationships, and to doing better together.



### COVID-19



*In light of the evolving COVID-19 situation, DFO has suspended all non-critical field operations until further notice.*

*During this time, only field programming that supports departmental or Government of Canada critical services to Canadians will be undertaken.*

*All field operations that proceed will adhere to guidance provided by public health authorities.*

*DFO is taking every possible measure to ensure the health and safety of its employees and their families, as well as that of collaborators and Indigenous communities.*

*DFO will continue to assess priorities for the remainder of the year and work to identify mitigation measures to address any information loss.*

*For up-to-date information on the suspension timeline, please contact the Lead Scientists identified in Annex B, or visit [DFO's website](#).*

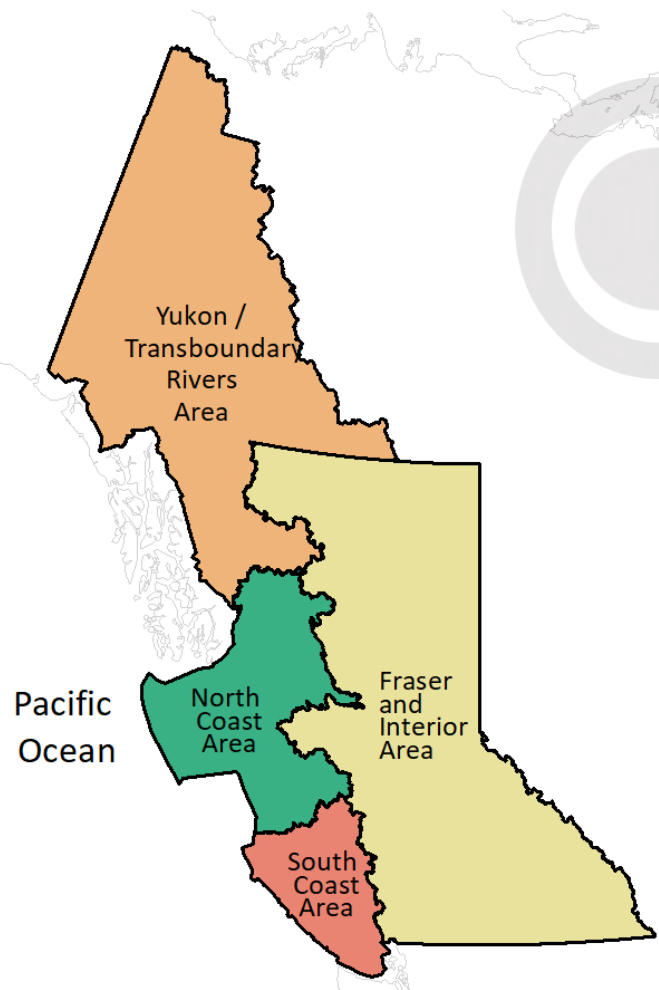


## DFO PACIFIC SCIENCE

On behalf of all Canadians, approximately 750 DFO Science employees in Pacific Region are committed to fulfilling DFO's vision of healthy oceans, aquatic ecosystems, species, and sustainable fisheries while ensuring the well-being and prosperity of the Indigenous and coastal communities that depend on these vital resources for their livelihoods.

Through focused and collaborative initiatives aligned with the Department's [core priorities](#), [Science Branch](#) employees provide foundational services, products and advice for the Department's management and conservation decisions, and play a pivotal role in ensuring commitments under several international treaties are realized.

Refer to Annex A to learn more about the innovative, high quality research and extensive monitoring Science Branch employees undertake; the robust science advice, products and services they deliver; and the valuable data and information management services they provide in support of evidence-based decision-making.



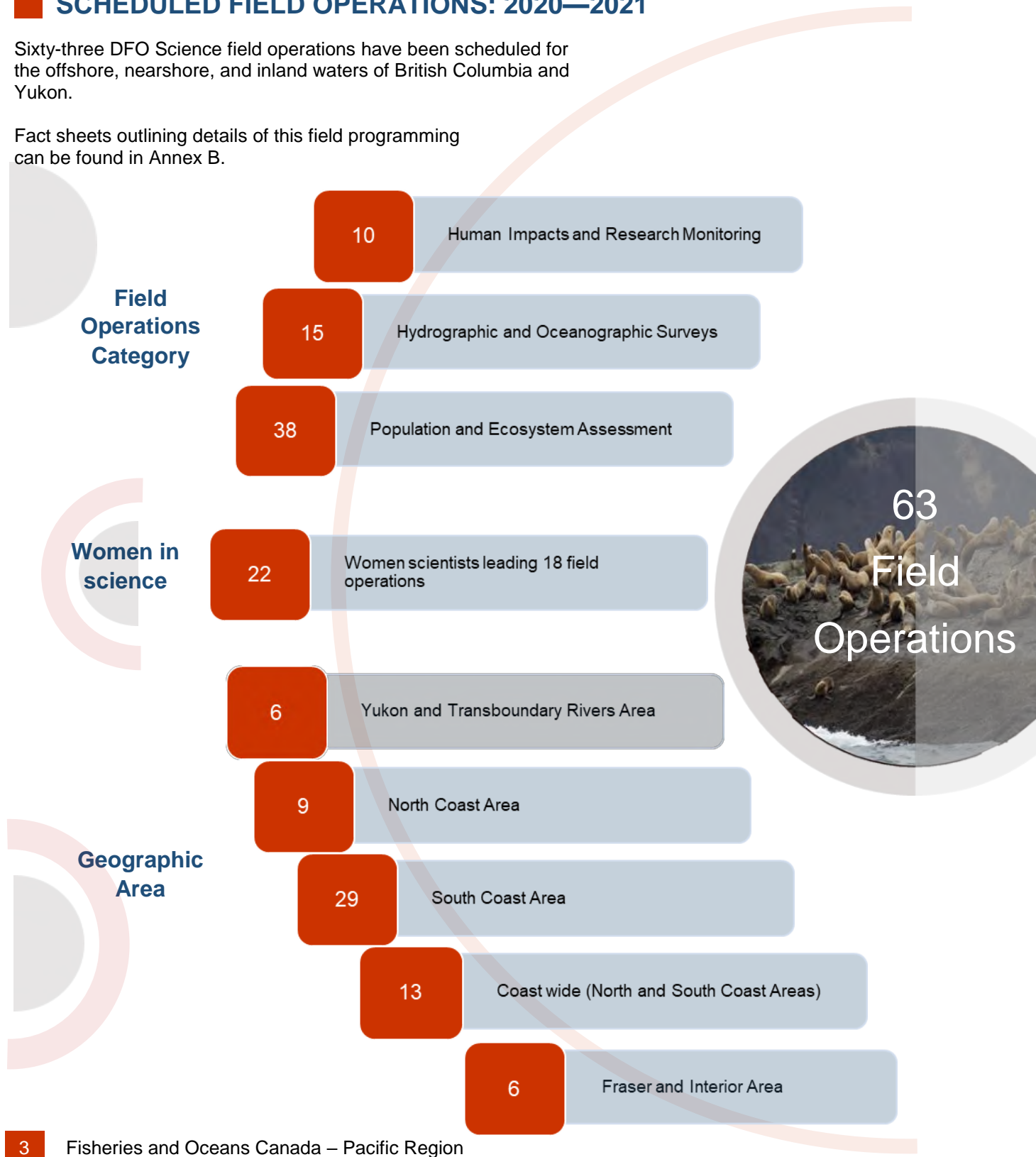
Pacific Region researchers and scientists conduct their work throughout the North Pacific, coastal and interior British Columbia, the Yukon, as well as the Western Arctic.

Further, with a functional presence across the Region, Pacific Science staff are uniquely positioned to play a key role in the transformation of the Government of Canada's [relationship with Indigenous peoples](#) based on the recognition and implementation of rights, respect, cooperation and partnership related to fisheries, oceans, habitat and marine waterways.

## SCHEDULED FIELD OPERATIONS: 2020—2021

Sixty-three DFO Science field operations have been scheduled for the offshore, nearshore, and inland waters of British Columbia and Yukon.

Fact sheets outlining details of this field programming can be found in Annex B.





Collaborators in Science





## REPORTING RESULTS

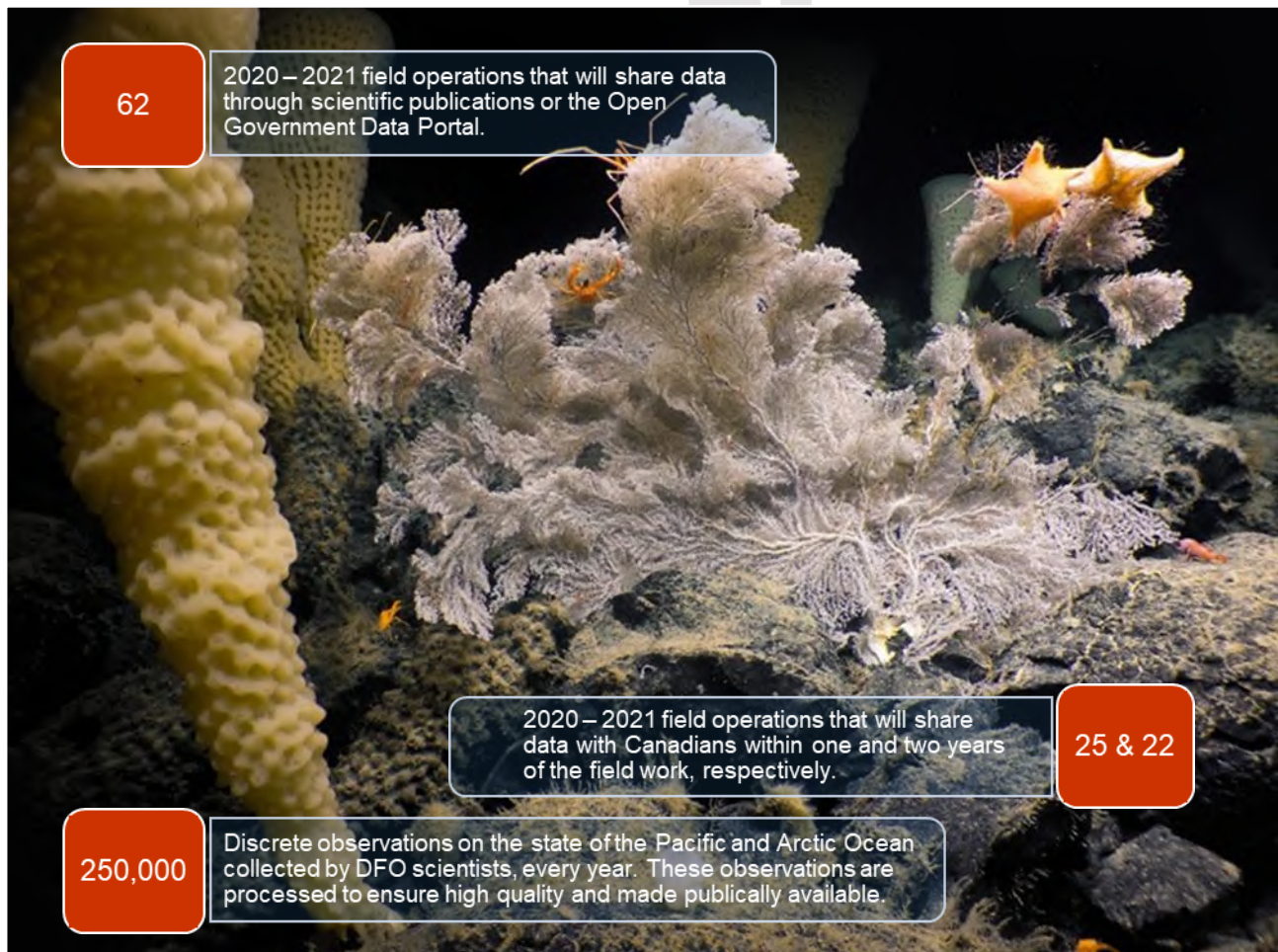
Ensuring that research and scientific information is produced and disseminated in an open, timely and transparent manner is essential to the successful fulfillment of DFOs' science mandate.

Field program results are communicated through technical and data reports available on the [Federal Science Library](#), [Open Government Portal](#), and in publications from the [Centre for Science Advice Pacific](#).

Nautical charts, navigational products and survey results can be accessed from the [Canadian Hydrographic Service](#).

Additionally, each September, Pacific Science publishes a [technical report](#) on the State of the Pacific Ocean presenting results of the most recent year's monitoring information about the state of the physical, biological and selected fishery resources of Pacific Canadian marine ecosystems.

Refer to Annex C for a list of datasets published on the Open Government Portal in 2019 – 2020, and instructions on how to access them.



62

2020 – 2021 field operations that will share data through scientific publications or the Open Government Data Portal.

250,000

Discrete observations on the state of the Pacific and Arctic Ocean collected by DFO scientists, every year. These observations are processed to ensure high quality and made publicly available.

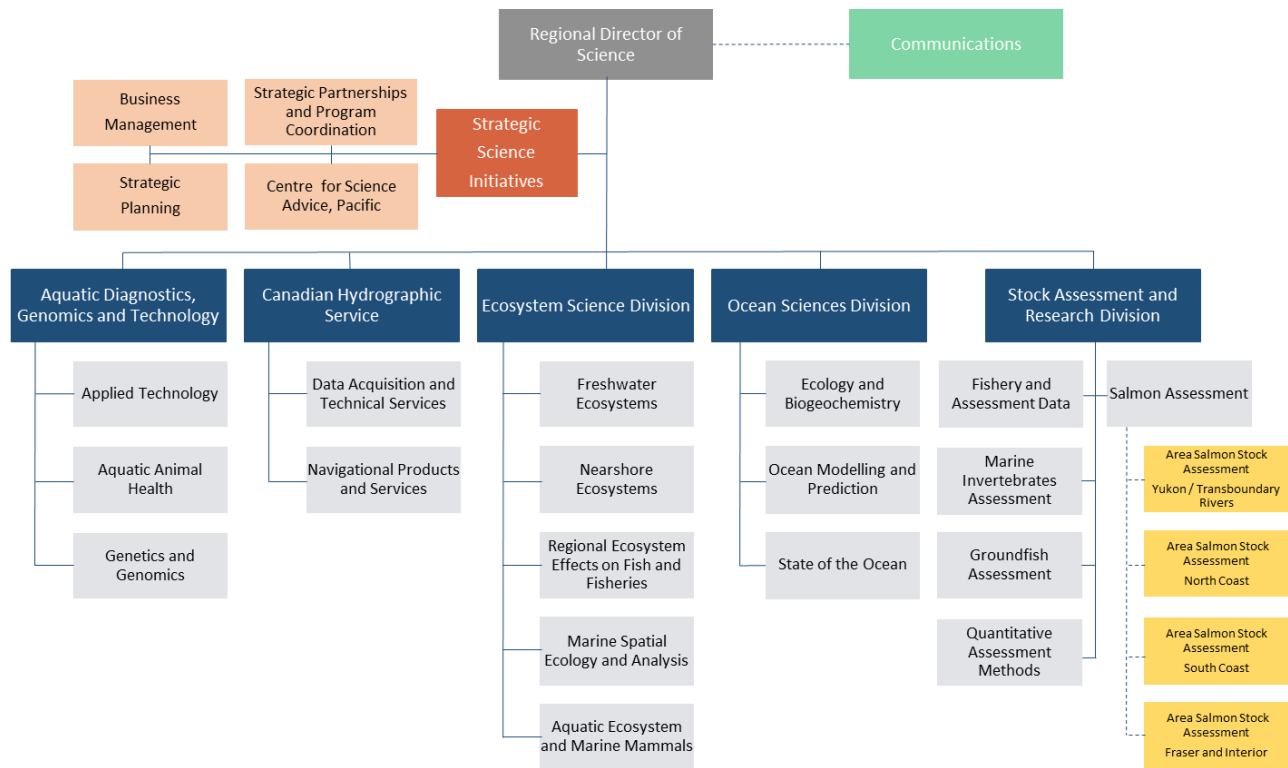
2020 – 2021 field operations that will share data with Canadians within one and two years of the field work, respectively.

25 & 22



## ANNEX A: PACIFIC SCIENCE ORGANIZATION

Science in the Pacific Region is delivered through a workforce housed in six divisions (blue and orange boxes) at four regional science centers and through salmon stock assessment science staff located in four Area Offices (yellow boxes).



### Strategic Science Initiatives (SSI)

**Business Management Unit:** Provides financial management and human resource planning support for Science Branch, supports planning and reporting functions, and oversees health and safety, site operations, storage and warehousing.

**Strategic Planning Unit:** Provides strategic science and planning oversight for horizontal files across Science Branch, and develops strategic solutions to facilitate the delivery of science programs.

**Strategic Partnerships and Program Coordination Unit:** Establishes and nurtures strategic partnerships, supports planning, coordination and engagement on priority files, and leads corporate Science efforts to advance reconciliation with Indigenous Peoples.

**Centre for Science Advice – Pacific:** Coordinates the scientific peer review and publication of science advice for Pacific region. CSAP provides a formal, transparent process for the delivery of science advice to the department’s decision makers.



Approximately 26 employees are located at the Pacific Biological Station (PBS) in Nanaimo and at the Institute of Ocean Sciences (IOS) in Sidney.

#### Director

Brenda McCorquodale **Email:** [Brenda.McCorquodale@dfo-mpo.gc.ca](mailto:Brenda.McCorquodale@dfo-mpo.gc.ca) **Tel:** (250) 756-7120

**Aquatic Diagnostics, Genomics, and Technology Division (ADGT)**

**Develops, improves and applies new technologies to support fisheries and aquaculture management. Work includes:**

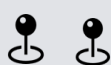
- Providing genetic research and advice on best practices for breeding programs, develops and applies molecular tools that are required for fishery enhancement management, regulation, and policy development within DFO;
- Contributing to the applied research and resource management mandates of other DFO research by developing tools and analysis for high-resolution identification; monitoring and assessment of organisms and their environments; and by assessing the cumulative impacts of stressors on organisms and ecosystems;
- Developing and maintaining expertise and equipment, including shared multi-user live-animal research facilities, a fisheries acoustics and remote operating vehicle program, and marine spatial planning processes; and,
- Conducting risk assessments of novel organisms and pathogens.

**Departmental Core Responsibility:** Fisheries

**2020–2021 Fact Sheet ID**

We ensure Canada’s fisheries, including aquaculture, are protected, managed sustainably and support Indigenous participation, and that our national network of harbours is open and in good repair.

27



Approximately 96 ADGT employees are located at the Pacific Biological Station (PBS) in Nanaimo, and at the Pacific Science Enterprise Centre (PSEC) located in West Vancouver.

**Manager**

Lesley MacDougall **Email:** [Lesley.MacDougall@dfo-mpo.gc.ca](mailto:Lesley.MacDougall@dfo-mpo.gc.ca) **Tel:** (250) 756-7395

**Canadian Hydrographic Service (CHS)**

**Provides products and services to aid safe navigation of vessels in Canada’s marine waters.**

**Work includes:**

- Providing up-to-date, authoritative, and standardized hydrosatial information in the form of bathymetric surveys, hydrographic charts, and water level information in real-time;
- Maintaining a national network of tide gauges to measure and disseminate water level data;
- Producing printed products, Sailing Directions, Tide and Current Tables and tidal atlases, Notices to Mariners, and Notices to Shipping, and through its network of tide gauges, participating in the tsunami warning process.

**Departmental Core Responsibility:** Marine Navigation

**2020–2021 Fact Sheet ID**

We maintain waterways year round so they are safely navigable by mariners and all Canadians. (Provide information and services to facilitate navigation in Canadian waters.)

7 and 47



Approximately 63 CHS employees are located at the Institute of Ocean Sciences (IOS) in Sidney.

**Director**

Mark Leblanc **Email:** [Mark.Leblanc@dfo-mpo.gc.ca](mailto:Mark.Leblanc@dfo-mpo.gc.ca) **Tel:** (250) 363-6347

**Ecosystem Science Division (ESD)**

**Conducts research and monitoring activities to enhance understanding of aquatic ecosystems, and supports the integrated management of diverse human activities. Work includes:**

- Conducting research on marine mammals, species at risk and marine ecosystem characterization;
- Conducting ecosystems research and monitoring for Pacific Region freshwater and anadromous species, especially salmon;
- Conducting research on aquaculture including nutrition and invertebrates, monitoring aquatic invasive species and the effects of human activity on coastal marine and estuarine environments;
- Identifying conservation priorities and ecologically important areas, monitoring of MPAs and spatial closures, habitat mapping, ecological risk assessment, trade-off analysis, and conducting research on habitat ecology, deep sea biology, seascape connectivity, and biological impacts of climate change;
- Executing surveys, completing analysis, supporting assessments and developing models of regional freshwater and marine ecosystem effects on fish and associated capture and culture fisheries.

**Departmental Core Responsibility:** Aquatic Ecosystems

**2020–2021 Fact Sheet ID**

We protect our oceans, freshwater and aquatic ecosystems and species from the negative impact of humans and invasive species through sound science and in collaboration with Indigenous communities.

9, 10, 14, 15, 16, 18, 20, 21, 26, 30, 31, 40, 41, 42, 43, 44, 45, 46, 49, 55, 56, 57, 59, 60, 61, 62, 63



Approximately 200 ESD employees are located at the Pacific Biological Station (PBS) in Nanaimo, the Institute of Ocean Sciences in Sidney, the Pacific Science Enterprise Centre (PSEC) in West Vancouver, and at the Cultus Lake Salmon Research Laboratory.

**Director**

Eddy Kennedy

**Email:** [Eddy.Kennedy@dfo-mpo.gc.ca](mailto:Eddy.Kennedy@dfo-mpo.gc.ca)

**Tel:** (250) 756-3360

**Ocean Sciences Divisions (OSD)**

**Conducts monitoring and research to provide information and advice on the past and current state of the North Pacific and Western Arctic Oceans and to predict future trends in their physical, chemical and biological states. Work includes:**

- Conducting collaborative research and development on ocean and coastal models in support of enhanced environmental protection and improved safety for navigation;
- Conducting Arctic oceanography research and monitoring to support decision-making and planning for all Arctic marine issues, such as climate change, navigation, oil spills, etc.; and,
- Contributing data to cumulative effects assessment, harmful algal blooms, noise, and other stressors on the marine ecosystem.

**Departmental Core Responsibility:** Aquatic Ecosystems

**2020–2021 Fact Sheet ID**

We protect our oceans, freshwater and aquatic ecosystems and species from the negative impact of humans and invasive species through sound science and in collaboration with Indigenous communities.

1, 2, 3, 4, 5, 6, 8, 17, 19, 22, 23, 24, 25, 32, 39, 48, 50, 58



Approximately 115 OSD employees are located at the Pacific Biological Station (PBS) in Nanaimo and at the Institute of Ocean Sciences (IOS) in Sidney.

**Manager**

Kim Houston

**Email:** [Kim.Houston@dfo-mpo.gc.ca](mailto:Kim.Houston@dfo-mpo.gc.ca)

**Tel:** (250) 363-6378

**Stock Assessment and Research Division (StAR) – Core**

**Conducts fishery-independent, multi-species surveys, and fish monitoring to provide data for quantitative assessment of the current status and health of finfish and marine invertebrate stocks. Work includes:**

- Conducting research on new methods, tools, and approaches to assessment, including data limited approaches, and developing methods to address and incorporate climate change and environmental variability into assessments and forecasts;
- Delivering surveys, fishery monitoring, assessments, and forecasts of aquatic species in Pacific Region’s fresh and marine waters;
- Providing analytical support for regional Pacific Salmon assessment programs;
- Coordinating operational salmon assessment programs; and,
- Providing science advice on conservation and the future effects of fishing on the species or stock to inform fisheries management decision-making.

**Departmental Core Responsibility:** Fisheries

We ensure Canada’s fisheries, including aquaculture, are protected, managed sustainably and support Indigenous participation, and that our national network of harbours is open and in good repair.

**2020–2021 Fact Sheet ID**

11, 12, 13, 28, 29, 33, 34, 35,  
36, 37, 38, 51, 52, 53, 54, 64,  
65



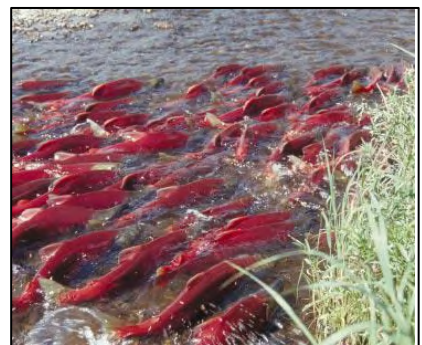
Approximately 94 StAR employees are located at the Pacific Biological Station (PBS) in Nanaimo.

**Manager**

John Holmes

**Email:** [John.Holmes@dfo-mpo.gc.ca](mailto:John.Holmes@dfo-mpo.gc.ca)

**Tel:** (250) 756-7145





**Stock Assessment and Research Division (StAR) – Areas**

Operational Salmon assessment programs are delivered through four Area offices to facilitate the effective collection of information, surveys, and assessments of Pacific Salmon status and abundance. Science staff work closely with staff from other sectors, and often with external partners, to deliver salmon stock assessment. Area Science staff report to Area Directors.

**Departmental Core Responsibility:** Fisheries

We ensure Canada’s fisheries, including aquaculture, are protected, managed sustainably and support Indigenous participation, and that our national network of harbours is open and in good repair.

**Yukon – Transboundary Rivers Area (YTRA)**



YTRA includes the geographic extent of the Yukon Territory (exclusive of north slope (Beaufort Sea) watersheds), as well as transboundary watersheds located in northwestern British Columbia (Chilkat, Taku, Whiting, Stikine, Unuk, Chickamin rivers). This area has approximately 590,000 km<sup>2</sup>, of which 15,000km<sup>2</sup> is inland freshwaters.



Approximately 33 StAR employees are located at the YTRA headquarters in Whitehorse.

**Area Chief** Steve Smith      **Email:** [Steve.J.Smith@dfo-mpo.gc.ca](mailto:Steve.J.Smith@dfo-mpo.gc.ca)      **Tel:** (867) 393-6719

**North Coast Area (NCA)**



NCA extends from the Canada-Alaska border in the north to Brooks peninsula on northwest Vancouver Island and Quadra Island and Bute Inlet in the south. NCA encompasses an area of approximately 88,000 km<sup>2</sup>.



Approximately 43 StAR employees are located at the NCA headquarters in Prince Rupert.

**Area Chief** Shaun Davies      **Email:** [Shaun.Davies@dfo-mpo.gc.ca](mailto:Shaun.Davies@dfo-mpo.gc.ca)      **Tel:** (250) 627-3472

**South Coast Area (SCA)**



SCA includes the Vancouver Island, the Sunshine Coast and Mainland inlets north to Cape Caution. Vancouver Island is about 32,000km<sup>2</sup> and includes lakes, rivers, inlets, and estuaries.



Approximately 46 StAR employees are located at the SCA headquarters in Nanaimo.

**Area Chief** Wilf Luedke      **Email:** [Wilf.Luedke@dfo-mpo.gc.ca](mailto:Wilf.Luedke@dfo-mpo.gc.ca)      **Tel:** (250) 756-7222

**Fraser and Interior Area (FIA)**



FIA encompasses the Fraser River Basin, as well as the Thompson, Okanagan, and Columbia Rivers.



Approximately 38 StAR employees are located at the FIA headquarters in Delta, BC, and in Kamloops, BC.

**Area Chief** Timber Whitehouse      **Email:** [Timber.Whitehouse@dfo-mpo.gc.ca](mailto:Timber.Whitehouse@dfo-mpo.gc.ca)      **Tel:** (250) 851-4833

**ANNEX B: FACT SHEET SERIES**

Field Operations Category



Human Impacts  
Research and Monitoring



Hydrographic  
and Oceanographic Surveys



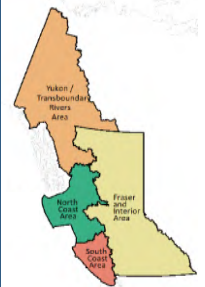
Population  
and Ecosystem Assessments

Fact Sheet  
Identification  
number

Research  
Platform

Title of  
Field Operation

Geographic  
area






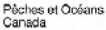



Dates  
Recurrence  
Locations  
DFO lead scientist  
Contact information

Description of the  
programming and  
associated objectives

Collaborators

For more  
information

 <b>An Observation Network Studying Marine Biogeochemistry (ArcticNET)</b>		<b>1</b> Yukon & Arctic
Dates: Summer 2020 Recurrence: Annually, since 2003 Locations: Canadian Archipelago, Baffin Bay, Beaufort Sea, Hudson Bay Vessel: CCGS Amundsen Lead scientist: Lisa Miller (250) 363 6673 <a href="mailto:Lisa.Miller@dfo-mpo.gc.ca">Lisa.Miller@dfo-mpo.gc.ca</a>		 <p><b>CCGS Amundsen</b></p>
<p><u>Description</u></p> <p>In combination with improved observations and modelling, data from annual time series of ocean carbon chemistry in the Canadian Arctic supports the development of adaptation strategies to minimize negative impacts and maximize positive outcomes resulting from the transformation of the Canadian Arctic.</p> <p><u>Objectives</u></p> <ol style="list-style-type: none"> <li>1. Use a distributed network of research vessels, ocean observatories, and land-based instrument installations to measure marine biogeochemical processes across the Canadian Arctic to understand regional impacts on greenhouse gas cycling, primary production, and ocean acidification; and,</li> <li>2. Use expanded observational network to provide real-time environmental observations to Inuit communities, extend training and research opportunities to Northern residents, and connect with other potential stakeholders.</li> </ol> <p><u>Collaborators</u></p> <ul style="list-style-type: none"> <li>• University of Calgary</li> <li>• University of Manitoba</li> </ul>		 <p><b>Map 1. Study area.</b></p>
<p><u>Collaborators</u></p> <ul style="list-style-type: none"> <li>• University of Calgary</li> <li>• University of Manitoba</li> </ul>		 <p><b>Image 1. Sampling surface waters.</b></p>
<p><b>FOR MORE INFORMATION – ArcticNet:</b></p> <p><a href="http://www.arcticnet.ulaval.ca/project/co-operative-observation-network-address-community-research-priorities-while-studying">http://www.arcticnet.ulaval.ca/project/co-operative-observation-network-address-community-research-priorities-while-studying</a></p>		
 Fisheries and Oceans Canada		 Pêches et Océans Canada
		

Map  
of  
study  
area

## COVID-19



*In light of the evolving COVID-19 situation, DFO has suspended all non-critical field operations until further notice.*

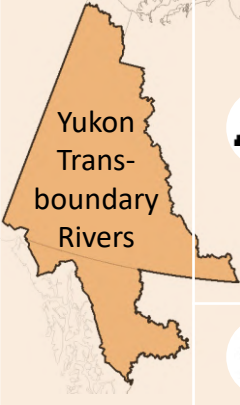

*During this time, only field programming that supports departmental or Government of Canada critical services to Canadians will be undertaken.*




*All field operations that proceed will adhere to guidance provided by public health authorities.*

*DFO is taking every possible measure to ensure the health and safety of its employees and their families, as well as that of collaborators and Indigenous communities.*

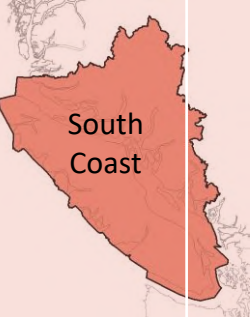



*DFO will continue to assess priorities for the remainder of the year and work to identify mitigation measures to address any information loss.*

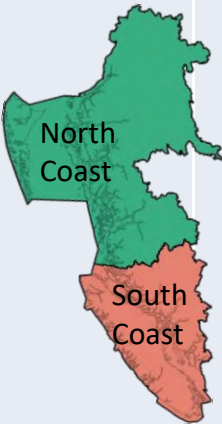



*For up-to-date information on the suspension timeline, please contact the Lead Scientists identified in Annex B, or visit [DFO's website](#).*



Area	Type	Field Operations	ID
 <p>Yukon Trans-boundary Rivers</p>		ArcticNET Observation Network: Marine Biogeochemistry	1
		Oceanographic Monitoring: Beaufort Gyre	2
		Marine Hazards Assessment: Canadian Polar Shelf	3
		Wintertime Ocean Sampling: Northwest Passage	4
		Oceanographic Exploration: Kitikmeot Sea	5
		Ocean and Clam Beds Monitoring: Bering and Chukchi Seas	6
		Chinook and Coho Salmon: Coded Wire Tag Program	64
		Salmon Stock Assessment	65

Area	Type	Field Operations	ID
 <p>North Coast</p>		Bathymetry, Seabed Classification, and Tide Gauge Servicing	7
		Nutrient Sampling: Chatham Sound	8
		Algae, Invertebrates, and Habitat Dive Surveys	9
		Subtidal and Intertidal Biodiversity Survey	10
		Hard Bottom Longline Hook Survey: Outside Area	11
		Synoptic Bottom Trawl Survey: West Coast Haida Gwaii	12
		Shrimp Assessment Survey: Chatham Sound and Queen Charlotte Strait	13
		Northern Resident Killer Whale: Annual Census	14
		Coastal Environmental Baseline: Port of Prince Rupert	15
		Chinook and Coho Salmon: Coded Wire Tag Program	64
		Salmon Stock Assessment	65



Area	Type	Field Operations	ID
 <p>South Coast</p>		Aquaculture Monitoring and Modelling Program	16
		Juvenile Pacific Salmon: Acoustic Monitoring	17
		Northern Resident Killer Whales: Rubbing Beach Study	18
		Southern Resident Killer Whales: Impacts of Underwater Noise	19
		Harmful Algal Bloom Mitigation	20
		Developing Cost Effective Tools to Assess Log Handling Areas	21
		Oceanographic Survey: Southern Canadian Continental Shelf	22
		Coastal Weather Stations Monitoring	23
		Line P Monitoring Program	24
		Water Properties Survey: Salish Sea	25
		Juvenile Salmon Survey: Salish Sea	26
		Juvenile Salmon Sampling: Clayoquot Sound	27
		Hard Bottom Longline Hook Survey: Inside Area	28
		Synoptic Bottom Trawl Survey: West Coast Vancouver Island	29
		Pelagic Integrated Ecosystem Science Survey	30
		Pacific Sandlance and Surf Smelt Habitat Survey	31
		Pacific Sandlance: Acoustic Monitoring	32
		Small-Mesh Multi Species Bottom Trawl Survey: WCVI	33
		Intertidal Clam: Monitoring Surveys	34
		Olympia Oyster: Monitoring Surveys	35
		Crab Assessment Survey: Strait of Georgia	36
		Prawn Assessment Survey: Howe Sound	37
		Shrimp Assessment Survey: Strait of Georgia	38
		Zooplankton Surveys: Strait of Georgia	39
		Harbour Seals: Deployment of Satellite Telemetry Tags	40
		Harbour Seals and Sea Lions: Diet Analysis	41
Southern Resident Killer Whale: Habitat Use Study	42		
Salmon – Killer Whales Interactions: Mooring Deployment	43		
Coastal Environmental Baseline: Port of Vancouver	44		

Area	Type	Field Operations	ID
		Aquatic Invasive Species: Settlement Plate Survey	45
		Invasive European Green Crab: Monitoring	46
		Bathymetry, Seabed Classification, and Tide Gauge Servicing	47
		Recovery and Deployment of Oceanographic Moorings	48
		International Year of the Salmon Multi-Nation Winter Survey	49
		Pacific Hake: Assessment Survey	50
		Halibut, Lingcod, Rockfish: IPHC Fishery Independent Setline Survey	51
		Sablefish: Research and Assessment Survey	52
		Pacific Herring: Biological Sampling Surveys	53
		Pacific Herring: Spawn Surveys	54
		Sea Lion: Aerial Survey (Non-Breeding Period)	55
		Large Whales: Assessment Surveys	56
		Northern Resident Killer Whale: DTAG Study	57
		Chinook and Coho Salmon: Coded Wire Tag Program	64
	Salmon Stock Assessment	65	

Area	Type	Field Operations	ID
		Tailings Pond Monitoring: Quesnel Lake	58
		Sockeye Salmon: Freshwater Migratory Stress	59
		Juvenile Sockeye Salmon: Acoustic and Trawl Surveys	60
		Rocky Mountain Ridged Mussel: Annual Surveys	61
		Juvenile Sockeye Salmon: Nursery Lake Ecosystem Assessments	62
		Water Temperature Monitoring	63
		Chinook and Coho Salmon: Coded Wire Tag Program	64
		Salmon Stock Assessment	65



**Dates:** Summer 2020  
**Recurrence:** Annually, since 2003  
**Locations:** Canadian Archipelago, Baffin Bay, Beaufort Sea, Hudson Bay  
**Vessel:** CCGS Amundsen  
**Lead scientist:** Lisa Miller (250) 363 6673  
[Lisa.Miller@dfm-mpo.gc.ca](mailto:Lisa.Miller@dfm-mpo.gc.ca)



## Description

In combination with improved observations and modelling, data from annual time series of ocean carbon chemistry in the Canadian Arctic support the development of adaptation strategies to minimize negative impacts and maximize positive outcomes resulting from the human-induced transformation of the Canadian Arctic.

## Objectives

1. Use a distributed network of research vessels, ocean observatories, and land-based instrument installations to measure marine biogeochemical processes across the Canadian Arctic to understand regional impacts on greenhouse gas cycling, primary production, and ocean acidification; and,
2. Use expanded observational network to provide real-time environmental observations to Inuit communities, extend training and research opportunities to Northern residents, and connect with other potential stakeholders.

## Collaborators

- University of Calgary
- University of Manitoba



Map 1. Study area.

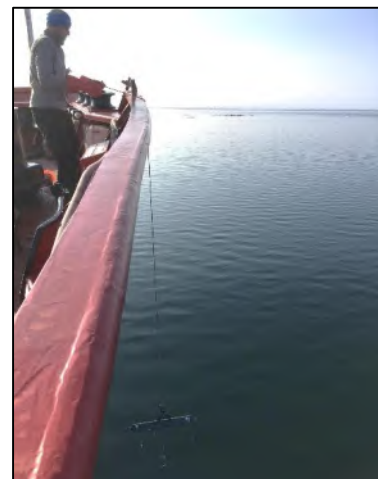


Image 1. Sampling surface waters.

**FOR MORE INFORMATION** – ArcticNet:

<http://www.arcticnet.ulaval.ca/project/co-operative-observation-network-address-community-research-priorities-while-studying>





**Dates:** September 5 – October 30, 2020  
**Recurrence:** Annually, since 2003  
**Locations:** Beaufort Gyre, Canada Basin in the Arctic  
**Vessels:** CCGS Louis S. St-Laurent  
**Lead scientist:** Bill Williams (250) 363-6343  
[Bill.Williams@dfo-mpo.gc.ca](mailto:Bill.Williams@dfo-mpo.gc.ca)



## Description

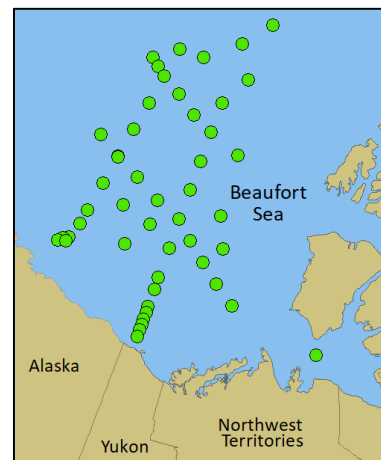
The Beaufort Gyre is one of the Arctic Ocean’s primary circulation features, storing and transporting freshwater, sea ice, and heat across the Canadian Basin. The Joint Ocean Ice Studies program collects biogeochemical water samples and deploys moorings and ice buoys to monitor the response of the Beaufort gyre to climate change.

## Objectives

1. Monitor ocean acidification due to sea-ice retreat and melt;
2. Monitor the wind-forced freshwater accumulation in the gyre from Arctic rivers sea ice melt;
3. Monitor the changing contributions of Pacific- and Atlantic-origin water in the gyre; and,
4. Monitor the increasing summertime melt and loss of old ice.

## Collaborators

- Université de Sherbrooke, Université Laval, Concordia University, University of British Columbia, Yale University, University of Montana, Oregon State University, Tokyo University of Marine Science and Technology, Kitami Institute of Technology
- United States National Science Foundation
- Japan Agency for Marine-Earth Science and Technology
- Woods Hole Oceanographic Institution



Map 1. Study locations.



Image 2. Deployment of a rosette, a deep water sampling apparatus.

**FOR MORE INFORMATION – Beaufort Gyre Exploration Project**

<https://www.whoi.edu/beaufortgyre>







**Dates:** September 22 – October 7, 2020  
**Recurrence:** Annually, since 1990  
**Locations:** Canadian Polar Shelf—Beaufort and Chukchi Seas  
**Vessel:** CCGS Sir Wilfrid Laurier  
**Lead scientist:** Humfrey Melling (250) 363-6552  
[Humfrey.Melling@dfo-mpo.gc.ca](mailto:Humfrey.Melling@dfo-mpo.gc.ca)

CCGS Sir Wilfrid Laurier



### Description

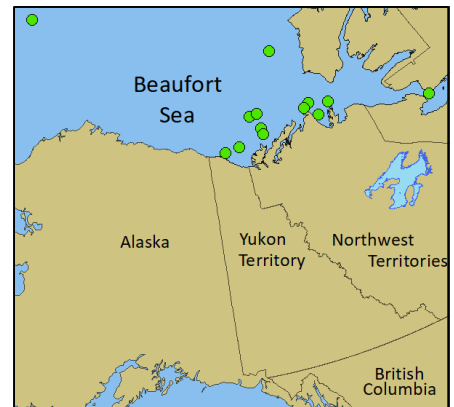
An initiative to document conditions related to sea ice, waves and storm surge that are hazardous to coastal infrastructure, ships and offshore structures in the Arctic Ocean; as well as the progressive impacts of climate change on the marine Arctic.

### Objectives

1. Recover and service recording instruments from 10 to 20 submerged moorings, retrieve data, and redeploy the observing array;
2. Collect marine mammal sound recordings, sea-surface temperature, salinity, fluorescence, water & airborne contaminants, and mapping of the seabed; and,
3. Establish estimates of the recurrence intervals for rare extreme marine hazards of high severity, & reliable projections of the future state of the marine Arctic under the influence of climate change.

### Collaborators

- Environment and Climate Change Canada
- ArcticNet Inc. (Integrated Beaufort Observatory)
- National Oceanographic and Atmospheric Administration
- Inuit communities via the Inuvialuit Environmental Impact Screening Committee



Map 1. Study locations.



Image 1. Crew retrieves ocean mooring among ice floes.

### FOR MORE INFORMATION

Contact the Lead Scientist at [Humfrey.Melling@dfo-mpo.gc.ca](mailto:Humfrey.Melling@dfo-mpo.gc.ca)





**Dates:** April 2020 and February 2021  
**Recurrence:** Annually, since 2009  
**Locations:** Northwest Passage (Cambridge Bay, Kugluktuk, Paulatuk, Gjoa Haven).  
**Lead scientist:** Mike Dempsey (250) 363-6452  
[Mike.Dempsey@dfo-mpo.gc.ca](mailto:Mike.Dempsey@dfo-mpo.gc.ca)

### Description:

The Canadian Ranger Ocean Watch (CROW) is a partnership between DFO and the Canadian Rangers to collect winter oceanographic sampling data in frozen conditions in the Canadian Arctic Archipelago. The results add seasonality to over 30 years of summer ship based observations. Snow and ice data is shared with Canadian Ice Service.

### Objectives

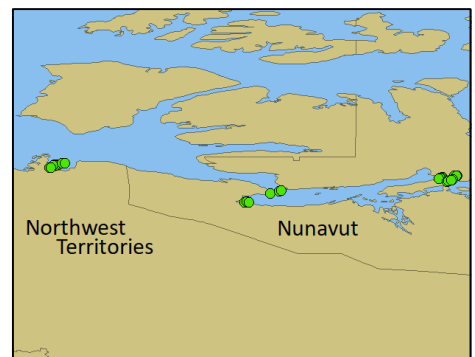
1. Monitor wintertime oceanographic conditions at standard locations by collecting full depth Conductivity, Temperature, and Depth (CTD) profile, ice thickness, snow depths measurements, and geochemical (nutrients/dissolved inorganic carbon/alkalinity) and zooplankton samples;
2. Describe the seasonal cycle across the region, by combining winter and summer data; and,
3. Engage local residents in an exchange of information about the ocean.

### Collaborators

- Canadian Rangers from the Inuit communities of Kugluktuk, Cambridge Bay, Gjoa Haven, and Paulatuk
- Environment and Climate Change Canada
- Department of National Defense



Image 1. Ranger snowmobile patrol.



Map 1. Study locations.



Image 2. Kugluktuk Rangers take water samples through the ice.

## FOR MORE INFORMATION

Contact the Lead Scientist at [Mike.Dempsey@dfo-mpo.gc.ca](mailto:Mike.Dempsey@dfo-mpo.gc.ca)





**Dates:** August 15 – 28, 2020  
**Recurrence:** Annually, since 2014  
**Locations:** Kitikmeot Sea  
**Vessel:** R/V Martin Bergmann  
**Lead scientist:** Kristina Brown (250) 363-6559  
[Kristina.Brown@dfo-mpo.gc.ca](mailto:Kristina.Brown@dfo-mpo.gc.ca)



### Description:

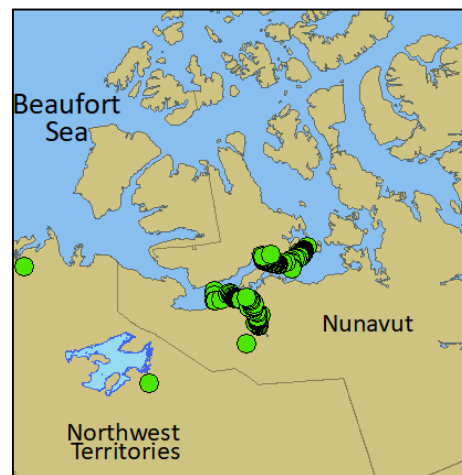
The Kitikmeot Sea Science Study uses the Arctic Research Foundation's *R/V Martin Bergmann* and community-based monitoring to conduct oceanographic exploration of the Kitikmeot Sea in the Northwest Passage.

### Objectives

1. Evaluate large-scale circulation and nutrient balances in the Kitikmeot Sea;
2. Evaluate tidal-mixing of ocean nutrients in narrow straits with rapid tides;
3. Evaluate river-to-ocean flow and geochemistry;
4. Explore the remote and little-studied Bathurst Inlet; and,
5. Investigate seasonal variation of oceans and rivers through year-round moorings data collection and Community-Based Monitoring.

### Collaborators

- Universities of Victoria, Calgary, and Manitoba
- University of Alaska Fairbanks
- University of Tromsø
- Canadian Rangers from the Inuit community of Kugluktuk



Map 1. Study locations.



Image 1. Benthic sampling.

### FOR MORE INFORMATION

<https://www.arcticfocus.org/stories/expedition-season-kitikmeot-sea-science-study/>





**Dates:** July 3 – 23, 2020  
**Recurrence:** Annually, since 1998  
**Locations:** Bering Sea and Chukchi Sea  
**Vessels:** CCGS Sir Wilfrid Laurier  
**Lead scientist:** John Nelson (250) 363-6584  
[John.Nelson@dfo-mpo.gc.ca](mailto:John.Nelson@dfo-mpo.gc.ca)



CCGS Sir Wilfrid Laurier

### Description

Canada's Three Oceans West program collects hydrographic, biogeochemical and biological data to monitor ocean and clam bed conditions. These data support the international Distributed Biological Observatory program.

### Objectives

1. Monitor the impacts of ice retreat and ocean warming on clam beds that provide critical food for walrus and eider ducks;
2. Monitor the Bering Sea's winter-formed "cold pool" water that forms the southern boundary of the Arctic ecosystem;
3. Monitor the northward flow of nutrient-rich Pacific Ocean water, which plays a significant role in the ecology of the Canadian Arctic; and,
4. Monitor the northward transport of Pacific Ocean plankton and their possible invasion of the Arctic.

### Collaborators

- University of Victoria
- University of Maryland
- Clark University
- U.S. Fish and Wildlife Service



Map 1. Study locations.



Image 1. A Chukchi Sea walrus (Odobenus rosmarus).

## FOR MORE INFORMATION

Contact the Lead Scientist at [John.Nelson@dfo-mpo.gc.ca](mailto:John.Nelson@dfo-mpo.gc.ca)







**Dates:** June 17 – August 11, 2020  
**Recurrence:** Annually, since 1891  
**Locations:** Scott Islands, Queen Charlotte Sound, Queen Charlotte Strait, central BC coast.  
**Vessel:** CCGS Vector  
**Lead scientist:** Stacey Verrin (250) 363-6377  
[Stacey.Verrin@dfo-mpo.gc.ca](mailto:Stacey.Verrin@dfo-mpo.gc.ca)



## Description

Mapping of the seabed and collection of bathymetry to enhance navigation safety with periodic tide gauge servicing.

## Objectives

1. Collect multibeam bathymetry to improve navigational charts & products and aid scientific research;
2. Detect and classify subsurface shipping hazards;
3. Deploy and service tide gauges to support bathymetric surveying and Canadian Hydrographic Services water levels network;
4. Collect acoustic data to determine seabed classification for navigation and scientific research;
5. Deploy Launch and ASV for additional inshore bathymetry capture.



Map 1. Study areas.

## Collaborators

- Natural Resources Canada (NRCAN)
  - Geological Survey of Canada
- Environment Climate change Canada (ECCC)
  - Canadian Wildlife Service
  - Environmental Stewardship Branch



Image 1. Launching the Shoal Seeker off the CCGS Vector's deck.

**FOR MORE INFORMATION – Canadian Hydrographic Service:**

<http://charts.gc.ca/>





**Dates:** May 26 – June 3, 2020  
**Recurrence:** Annually, year three of three (2018-2020)  
**Locations:** Chatham Sound, Portland Inlet, Lower Skeena River  
**Vessel:** CCGS Vector  
**Lead scientist:** Sophia Johannessen (250) 363-6616  
[Sophia.Johannessen@dfo-mpo.gc.ca](mailto:Sophia.Johannessen@dfo-mpo.gc.ca)



## Description

Nutrients from wastewater or other land-based discharges can cause problems for marine life, including fish. This project will measure the natural sources and burial of nutrients in Chatham Sound to provide context for evaluation of future development proposals.

## Objectives

1. Collect water samples at stations in Chatham Sound and Portland Inlet for analysis of nutrients, oxygen and suspended particles;
2. Measure temperature and salinity throughout the water column to help understand how water circulation affects the nitrogen budget;
3. Collect surface water samples from the lower Skeena River to characterize the contribution of the river to the regional nitrogen budget; and,
4. Collect water samples at standard stations on the way to and from Chatham Sound.

## Collaborators

- Skeena Fisheries Commission

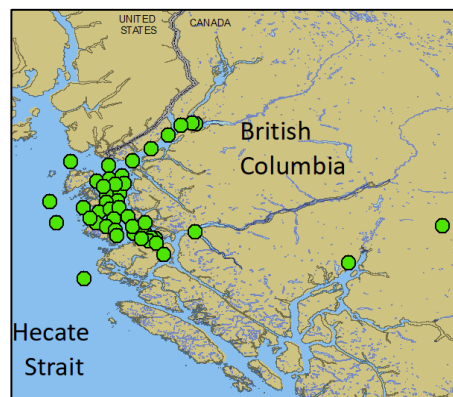


Image 1. Deployment of a rosette, a deep water sampling apparatus.

## FOR MORE INFORMATION

Contact the Lead Scientist at [Sophia.Johannessen@dfo-mpo.gc.ca](mailto:Sophia.Johannessen@dfo-mpo.gc.ca)





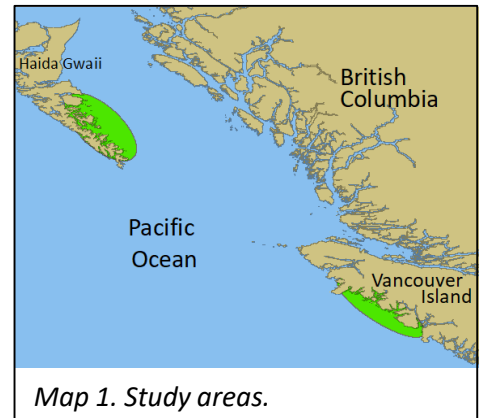
**Dates:** September 9 – October 7, 2020  
**Recurrence:** Annually, since 2013  
**Locations:** Gwaii Haanas, West Coast Vancouver Is.  
**Vessel:** CCGS Vector  
**Lead scientists:** Joanne Lessard, Janet Lohead  
[Joanne.Lessard@dfo-mpo.gc.ca](mailto:Joanne.Lessard@dfo-mpo.gc.ca) (250) 714-3799  
[Janet.Lohead@dfo-mpo.gc.ca](mailto:Janet.Lohead@dfo-mpo.gc.ca) (250) 756-7139



## Description

These surveys will collect shallow benthic habitat data which will feed into existing habitat mapping projects and provide an ecosystem approach to dive fishery stock assessment. Two types of surveys are planned:

1. Qualitative habitat mapping dive surveys of ~ 100 species of invertebrates and ~ 50 species of algae;
2. Quantitative multi-species surveys to collect abundance and size of urchins, geoduck, sea cucumber and abalone (a species at risk) as well as other habitat information.



## Objectives

1. Develop Species and Habitat Distribution Models to inform emergency response as well as several other spatial planning processes, including Marine Protected Areas;
2. Provide status on several important benthic species and stock assessment.

## Collaborators

- Haida Nation
- Nuu-chah-nulth Tribal Council



*Image 1. Divers collecting invertebrate, algae, and substrate data along a transect line.*

## FOR MORE INFORMATION

DFO Science at Sea: <http://dfo-mpo.gc.ca/science/atsea-enmer/missions/2019/invertebrate-invertebres-eng.html>

Ocean Protection Plan: <http://www.tc.gc.ca/eng/oceans-protection-plan.html>

Marine Conservation Target: <http://www.dfo-mpo.gc.ca/oceans/conservation/plan-eng.html>

Species at Risk: <http://www.dfo-mpo.gc.ca/species-especes/sara-lep/index-eng.html>

Dive Fisheries: <http://www.dfo-mpo.gc.ca/fm-gp/commercial/shellfish-mollusques/index-eng.html>





**Dates:** May 3 – 26, 2020  
**Recurrence:** Annually, year two of two (2019 – 2020)  
**Locations:** Central Coast and Saanich Inlet  
**Vessel:** CCGS Vector  
**Lead scientists:** Tammy Norgard, Sarah Dudas  
[Tammy.Norgard@dfo-mpo.gc.ca](mailto:Tammy.Norgard@dfo-mpo.gc.ca) (250) 756-7005  
[Sarah.Dudas@dfo-mpo.gc.ca](mailto:Sarah.Dudas@dfo-mpo.gc.ca) (250) 756-3365



## Description

This collaborative survey will assess deep water and intertidal habitats and species from the Central Coast of British Columbia to Saanich Inlet. Findings will support marine conservation initiatives and contribute to long-term monitoring.

## Objectives

1. Conduct deep water surveys to assess the abundance of coral and sponges; rockfish habitat; and biological communities;
2. Survey benthic habitat and species in Saanich Inlet to continue long-term time series;
3. Conduct intertidal fish and invertebrate surveys including aquatic invasive species using standard and novel technologies such as environmental DNA and passive acoustics; and,
4. Conduct community outreach activities during and/or after the surveys.

## Collaborators

- Central Coast Indigenous Resource Alliance
- Heiltsuk Nation
- Kitsoo/Xai'Xais Nation
- Royal British Columbia Museum



**FOR MORE INFORMATION – Science at Sea 2019:**

<https://www.dfo-mpo.gc.ca/science/atsea-enmer/missions/2019/biodiversity-biodiversite-eng.html>







**Dates:** August 1 – September 15, 2020  
**Recurrence:** Annually—south in odd years, north in even years—since 2006  
**Locations:** West Coast of Vancouver Island, Queen Charlotte Sound, Hecate Strait, Dixon Entrance, Haida Gwaii  
**Vessels:** Chartered commercial longline vessels  
**Lead scientists:** Malcolm Wyeth, Dana Haggarty  
[Malcolm.Wyeth@dfo-mpo.gc.ca](mailto:Malcolm.Wyeth@dfo-mpo.gc.ca) (250) 756-7300



*Image 1. A captured Yelloweye Rockfish (Sebastes ruberrimus).*

## Description

This fishing survey uses standardized longline fishing gear to provide relative abundance indices for commonly caught species, distributional and occurrence data for all other species, and detailed biological data for inshore groundfish species. These data are incorporated into stock assessments, status reports, and research publications. Each year, approximately 200 randomly selected locations are fished, alternating between the northern (purple) and southern (green) regions.



*Map 1. Study areas: north in purple, south in green.*

## Objectives

1. Collect detailed species composition data from each set;
2. Collect detailed size and sex composition data as well as ageing structures and tissue samples from inshore rockfish species and Lingcod; and,
3. Collect environmental data using temperature-depth recorders attached to the fishing gear.



*Image 2. A Yelloweye Rockfish hiding behind anemones.*

## Collaborators

- Pacific Halibut Management Association of BC

## FOR MORE INFORMATION

Contact the Lead Scientist at [Malcolm.Wyeth@dfo-mpo.gc.ca](mailto:Malcolm.Wyeth@dfo-mpo.gc.ca)





**Dates:** August 25 – September 1, 2020  
**Recurrence:** Every 2 years, since 2006  
**Location:** West Coast of Haida Gwaii  
**Vessel:** Charter Vessel Nordic Pearl  
**Lead scientists:** Malcolm Wyeth, Norm Olsen  
[Malcolm.Wyeth@dfo-mpo.gc.ca](mailto:Malcolm.Wyeth@dfo-mpo.gc.ca) (250) 756-7300



### Description

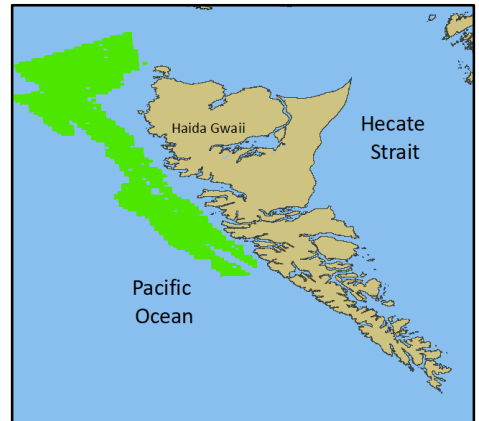
This fishing survey uses bottom trawl gear to provide relative abundance indices for commonly caught species, distributional and occurrence data for all other species, and detailed biological data from groundfish species. These data are incorporated into stock assessments, status reports, and research publications. Each year, approximately 125 randomly selected locations are fished.

### Objectives

1. Collect detailed species composition data from each set;
2. Collect detailed size and sex composition for all species;
3. Collect ageing structures and tissue samples from selected species; and,
4. Collect environmental data including temperature, conductivity, and dissolved oxygen from recorders attached to the fishing gear.

### Collaborators

- Canadian Groundfish Research and Conservation Society



Map 1. Study area.



Image 1. Juvenile Giant Blobsculpin (Psychrolutes phricus).

### FOR MORE INFORMATION

Contact the Lead Scientist at [Malcolm.Wyeth@dfo-mpo.gc.ca](mailto:Malcolm.Wyeth@dfo-mpo.gc.ca)





**Dates:** September 10 – 27, 2020  
**Recurrence:** Annually, since 1998  
**Locations:** Chatham Sound  
**Vessel:** CCGS Neocaligus  
**Lead scientist:** Rick Ferguson (250) 756-7195  
[Rick.Ferguson@dfo-mpo.gc.ca](mailto:Rick.Ferguson@dfo-mpo.gc.ca)

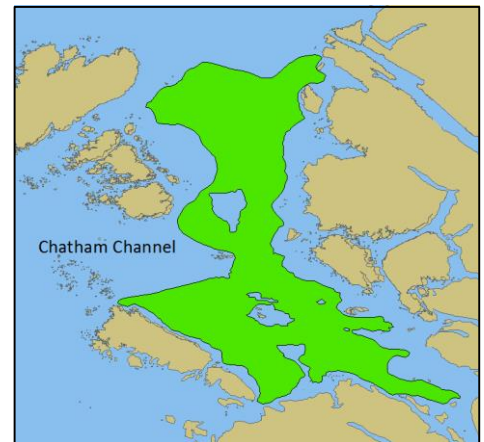


## Description

Shrimp assessment surveys estimate the abundance of shrimp stocks (Smooth and Spiny Pink shrimp, and Sidedstripe shrimp) in select Shrimp Management Areas. The results from these surveys are used to track long-term trends in abundance of shrimp stocks and to set annual quotas for the commercial shrimp trawl fishery.

## Objectives

1. Conduct fishery independent surveys of shrimp grounds using bottom trawl gear to determine stock status of Pink and Sidedstripe shrimp in Shrimp Management Areas PRD (PFMA 4 – Chatham Sound);
2. Maintain Pink shrimp and Sidedstripe shrimp abundance index time series for monitoring trends in abundance; and,
3. Collect species distribution and abundance information on other fish and invertebrate species.



Map 1. Study area, Chatham Sound.



Image 1. Sidedstripe Shrimp (Pandalopsis Dispar).

**FOR MORE INFORMATION – Pacific Region Shrimp Trawl Fishery:**

<http://www.pac.dfo-mpo.gc.ca/fm-gp/commercial/shellfish-mollusques/shrimp-pcrevette/index-eng.html>







**Dates:** May 1 – August 31, 2020  
**Recurrence:** Annually, since 1973  
**Locations:** Johnstone Strait to Chatham Sound  
**Vessel:** MV Roller Bay  
**Lead scientist:** Thomas Doniol-Valcroze (250) 729-8375  
[Thomas.Doniol-Valcroze@dfo-mpo.gc.ca](mailto:Thomas.Doniol-Valcroze@dfo-mpo.gc.ca)



## Description

The Cetacean Research Program has been conducting an annual census of the Northern Resident Killer Whale (NRKW) population since 1973, making it one of the longest time series of data for any marine mammal. This information is important to monitor changes in abundance, population structure and life-history parameters.

## Objectives

1. Using visual and acoustic methods, locate NRKW and collect photo-identifications of all members of group present;
2. Deploy and recover acoustic devices;
3. Collect prey samples from sharing events during encounters where whales are foraging;
4. Document each animal in the population; and,
5. Document new offspring since previous year's census and identify the mother.

## Collaborators

- Coastal ENGOs
- Gitga'at Nation
- University of British Columbia
- Canadian Coast Guard
- Parks Canada



Map 1. Study area.



Images 1 and 2. Recovering acoustic recorder (top) and a killer whale pod (bottom).

**FOR MORE INFORMATION** – State of the Pacific Ocean:

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>







**Dates:** April 1, 2020 – March 31, 2021  
**Recurrence:** Annually, year four of five (2017-2022)  
**Locations:** Port of Prince Rupert, Chatham Sound, Skeena River Estuary  
**Vessels:** CCGS Vector, Tanu and Neocaligus  
**Lead scientists:** Paul Covert, James Mortimor  
[Paul.Covert2@dfo-mpo.gc.ca](mailto:Paul.Covert2@dfo-mpo.gc.ca) (250) 363-6765  
[James.Mortimor@dfo-mpo.gc.ca](mailto:James.Mortimor@dfo-mpo.gc.ca) (250) 756-7354



### Description

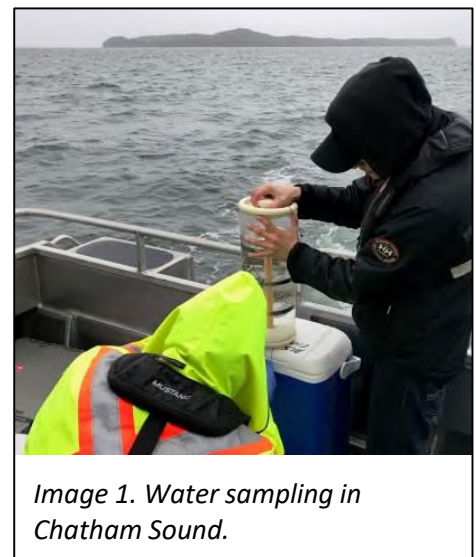
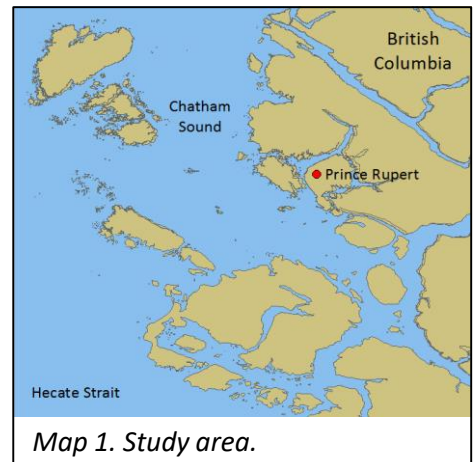
An initiative of the Oceans Protection Plan, the Coastal Environmental Baseline Program aims to collect comprehensive marine ecosystem data for the Port of Prince Rupert pilot site.

### Objectives

1. Measure physical and chemical water properties;
2. Conduct contaminant sampling of sediment and invertebrate biota (bivalves and crabs);
3. Characterize inter-tidal and sub-tidal habitats;
4. Record abundance and distribution of invertebrate and vertebrate marine biota; and,
5. Provide high-quality, open-data to all Canadians to inform science-based decision making.

### Collaborators

- Local First Nations
- Prince Rupert Port Authority
- Coastal environmental organizations



**FOR MORE INFORMATION – Coastal Environmental Baseline Program:**

<http://dfo-mpo.gc.ca/science/environmental-environnement/cebp-pdecr/index-eng.html>  
<https://www.dfo-mpo.gc.ca/science/environmental-environnement/cebp-pdecr/projects/prince-rupert-eng.html>





**Dates:** June and Oct 2020; Feb 2021  
**Recurrence:** Annually, since 2017  
**Location:** Clayoquot Sound  
**Vessel:** AMD Sturgeon Bay  
**Lead scientist:** David Gaspard (604) 666-6135  
[David.Gaspard@dfo-mpo.gc.ca](mailto:David.Gaspard@dfo-mpo.gc.ca)



## Description

This national program aims to detect, monitor and model chemical and biological inputs from aquaculture activities in the far-field marine environment. The program helps inform policy and regulatory development and decision making to evaluate the spatio-temporal characteristics of the zone directly influenced by finfish and shellfish aquaculture.

## Objectives

1. Collect benthic sediment samples to test for drugs, pesticides, trace metals, sulphides, organic content and sediment grain size;
2. Collect water samples to measure chlorophyll and organic matter;
3. Deploy oceanographic instruments to measure currents, turbidity, temperature, salinity, oxygen and chlorophyll;
4. Collect plankton tows near shellfish farm to collect zooplankton specimens; and,
5. Inform oceanographic model development.

## Collaborators

- Uu-a-thluk Fisheries



## FOR MORE INFORMATION

Contact the Lead Scientist at [David.Gaspard@dfo-mpo.gc.ca](mailto:David.Gaspard@dfo-mpo.gc.ca)





**Dates:** April 1 – July 31, 2020  
**Recurrence:** Annually, year six of six (2015-2020)  
**Location:** Discovery passage, Okisollo channel  
**Vessels:** Small inshore boat, rigid inflatable boats  
**Lead scientist:** Stéphane Gauthier (250) 363-6587  
[Stephane.Gauthier@dfo-mpo.gc.ca](mailto:Stephane.Gauthier@dfo-mpo.gc.ca)



## Description

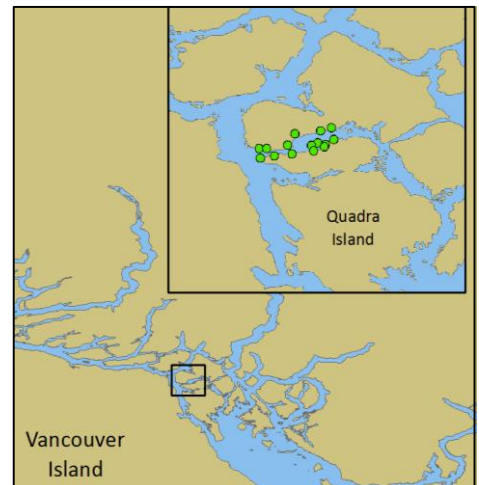
Monitoring of juvenile Pacific salmon out-migration through the Discovery Islands area and assessment of interactions with aquaculture facilities.

## Objectives

1. Monitor wild juvenile salmon migration through the area using moored inverted echosounders mounted on the bottom of the channel;
2. Monitor activity of wild fish in the direct vicinity of aquaculture sites using high resolution imaging sonar (DIDSON) mounted on aquaculture facilities; and,
3. Inspect sites and instruments on a regular basis to ensure proper data collection, and collect visual information on presence and status of wild juvenile salmon in the area.

## Collaborators

- Mowi ASA, formerly known as Marine Harvest Canada
- Cermaq Canada



*Map 1. Study locations in Okisollo channel, between Quadra and Sonora Islands.*



*Image 1. Acoustic mooring before deployment.*

**FOR MORE INFORMATION – State of the Pacific Ocean:**

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>







**Dates:** July 1 – August 31, 2020  
**Recurrence:** Annually, year two of four (2019-2022)  
**Location:** Johnstone Strait  
**Vessels:** Nahwitti Ranger (BC Parks); Zodiac to access to RBMBER rubbing beaches  
**Lead scientist:** Sheila J Thornton (604) 666-1298  
[Sheila.Thornton@dfo-mpo.gc.ca](mailto:Sheila.Thornton@dfo-mpo.gc.ca)



## Description

Northern Resident Killer Whales rub on smooth pebble beaches along the coast. This project evaluates the benefits of Robson Bight Michael Bigg Ecological Reserve (RBMBER) in reducing physical and acoustic disturbance on this behaviour.

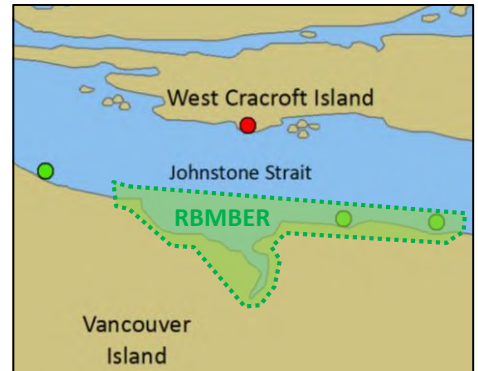
Hydrophones near the rubbing beaches record the ambient noise environment and rubbing behaviour of the whales. The influence of ambient noise and distance of vessels to the rubbing beach on whale behaviour will be evaluated.

## Objectives

1. Quantify rubbing beach use and bout length on beaches inside and outside the reserve; and,
2. Assess vessel presence, distance from the beach, and the ambient acoustic environment on the beaches to evaluate the level of protection provided by the ecological reserve.

## Collaborators

- Province of British Columbia (BC Parks)
- Cetus Research & Conservation Society / Straitwatch



Map 1. RBMBER study area with observation station (red circle) and hydrophone locations (green circles).



Image 1. Observation cliff station, 'Eagle Eye', overlooking RBMBER.

**FOR MORE INFORMATION – RBMB Ecological Reserve:**

[http://www.env.gov.bc.ca/bcparks/eco\\_reserve/robsonb\\_er.html](http://www.env.gov.bc.ca/bcparks/eco_reserve/robsonb_er.html)







**Dates:** June 3 – 10, August 25 – 31, October 26 – 31, 2020; March 2021  
**Recurrence:** Annually, year three of five (2018-2023)  
**Locations:** Swiftsure Bank, Juan de Fuca Strait, Haro Strait, Boundary Pass, Strait of Georgia  
**Vessel:** CCGS Vector  
**Lead scientist:** Svein Vagle (250) 363-6339  
[Svein.Vagle@dfo-mpo.gc.ca](mailto:Svein.Vagle@dfo-mpo.gc.ca)



## Description

Monitor the underwater noise in Southern Resident Killer Whale (SRKW) critical habitats to establish baselines, track changes, and evaluate impacts of human-generated noise on SRKW. Small moorings equipped with hydrophone systems sampling the noise field continuously represent the backbone of this ongoing study.

## Objectives

1. Recover, service and re-deploy six hydrophone moorings and install two new ones (Image 1);
2. Collect water property data;
3. Perform sound propagation studies;
4. Collect bird information; and,
5. Monitor marine mammals.

## Collaborators

- Environment and Climate Change Canada
- Dalhousie University



Map 1. Study locations.



Image 1. Recovering a mooring from the Vector.

**FOR MORE INFORMATION – State of the Pacific Ocean:**

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>



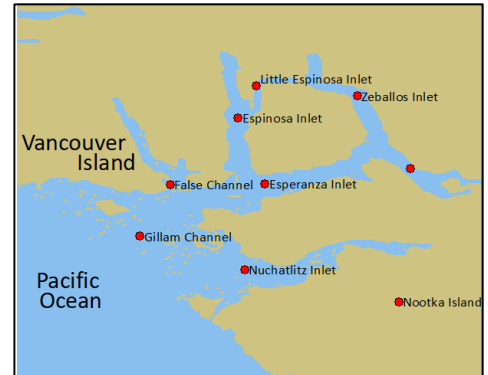


**Dates:** April 25 – May 3, August 31 – September 8, 2020  
**Recurrence:** Annually, since 2020  
**Locations:** Nootka Sound, Esperanza Inlet  
**Vessels:** CCGS Vector  
**Lead scientist:** Terri Sutherland (604) 666-8537  
[Terri.Sutherland@dfo-mpo.gc.ca](mailto:Terri.Sutherland@dfo-mpo.gc.ca)



## Description

Harmful algal blooms (HABs) have been responsible for mass mortalities of cultured salmonids in British Columbia resulting in financial losses to the aquaculture industry. HABs kill fish through gill damage through toxin production or abrasion of algal spines. This study will understand the conditions that develop and mitigate harmful algal blooms.



Map 1. Study area.

## Objectives

1. Assess the efficacy of a high-technology early-warning HAB detection system; and,
2. Assess the efficacy of a mitigation system to prevent the mortality of cultured fish in the environment.

## Collaborators

- Grieg Seafood Inc.



Image 1. Sea water extraction from an instrument profiler that measures water quality.

## FOR MORE INFORMATION

Contact the Lead Scientist at [Terri.Sutherland@dfo-mpo.gc.ca](mailto:Terri.Sutherland@dfo-mpo.gc.ca)





**Dates:** April 1, 2020 – March 31, 2021  
**Recurrence:** Annually, since 2018  
**Location:** Howe Sound (Gambier Island)  
**Vessel:** CAER Hurricane 733  
**Lead scientist:** Herb Herunter (604) 666-7924  
[Herb.Herunter@dfo-mpo.gc.ca](mailto:Herb.Herunter@dfo-mpo.gc.ca)

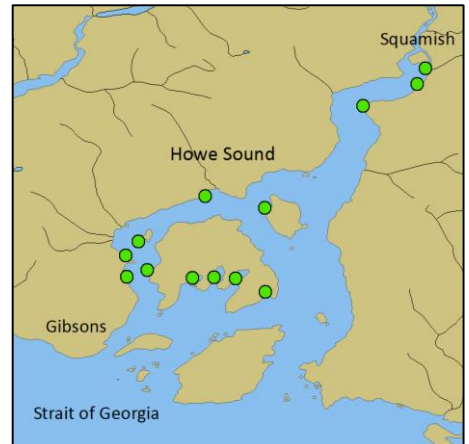


## Description

Testing a variety of techniques to determine extent and recovery of benthic environments impacted by log boom storage.

## Objectives

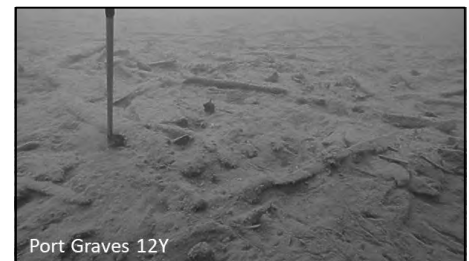
1. Assess the efficacy of a suite of sampling tools (acoustic, video, geotechnical, geochemical, and biotic) designed to detect wood waste debris fields; and,
2. Characterize and quantify the extent and benthic impact of wood waste depositional fields surrounding log handling areas in Howe Sound.



*Map 1. Study locations.*

## Collaborators

- Natural Resources Canada
- Ocean Wise
  - Coastal Ocean Research Institute



*Image 1. Benthic substrate of a log storage area 12 years following decommission.*

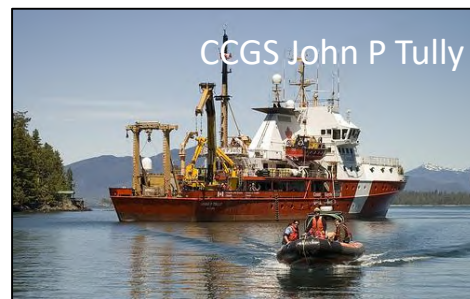
## FOR MORE INFORMATION

Contact the Lead Scientist at [Herb.Herunter@dfo-mpo.gc.ca](mailto:Herb.Herunter@dfo-mpo.gc.ca)





**Dates:** May 19 – June 1, September 8 – 21, 2020  
**Recurrence:** Annually, since 1979  
**Locations:** West coast Vancouver Island, Southern Queen Charlotte Sound, Strait of Georgia  
**Vessel:** CCGS John P. Tully  
**Lead scientist:** Ian Perry (250) 756-7137  
[Ian.Perry@dfo-mpo.gc.ca](mailto:Ian.Perry@dfo-mpo.gc.ca)



## Description

This oceanographic survey examines water properties and plankton to identify changing ocean conditions, and to inform understanding of abundance and survival of fish populations.

## Objectives

1. Identify changes in species composition and abundance of plankton;
2. Understand the causes of these changes;
3. To the extent possible, forecast the consequences of these changes in plankton to marine food webs;
4. Characterise and synthesise the large-scale changes to the marine ecosystems of British Columbia, including the development of sets of indicators of ecosystem status and trends useful for management.



Map 1. Study locations.



Image 1. "Bongo" nets used to sample the zooplankton.

## Collaborators

- University of British Columbia
- University of Victoria
- Hakai Institute

**FOR MORE INFORMATION** – State of the Pacific Ocean:

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>







**Dates:** Continuous  
**Recurrence:** Varied, since 2009  
**Locations:** Queen Charlotte Strait, Discovery Islands, West Coast Vancouver Island  
**Vessels:** Local work boats  
**Lead scientist:** Peter Chandler (250) 363-6750  
[Peter.Chandler@dfo-mpo.gc.ca](mailto:Peter.Chandler@dfo-mpo.gc.ca)



*Image 1. Weather station installed at remote site.*

## Description

Numerical models used to simulate coastal water circulation require the specification of a wind field to force the movement of the surface layer of the ocean, and the heat flux to balance the transfer of heat into and out of the ocean.

Models have been developed for the major aquaculture regions in British Columbia and a network of weather stations has been maintained to provide the wind forcing for these models.



*Map 1. Study locations.*

## Objectives

1. Maintain the weather stations installed at remote locations that require manual downloading of stored data every 100 days; and,
2. Maintain the weather stations installed on fish farms that provide data via the internet.

## Collaborators

- Grieg Seafoods
- Cermaq Canada
- Mowi ASA, formerly known as Marine Harvest Canada



*Image 2. Weather station installed at fish farm.*

**FOR MORE INFORMATION** – Canadian Aquaculture R&D Review 2017:

<http://dfo-mpo.gc.ca/aquaculture/sci-res/rd2017/misc-eng.html>





**Dates:** May 3 – 9, Aug 22 – September 8, 2020;  
Feb 1 – 18, 2021

**Recurrence:** Annually, since 1956

**Locations:** Northeast Pacific

**Vessel:** CCGS John P. Tully

**Lead scientist:** Marie Robert (250) 363-6612  
[Marie.Robert@dfo-mpo.gc.ca](mailto:Marie.Robert@dfo-mpo.gc.ca)



## Description

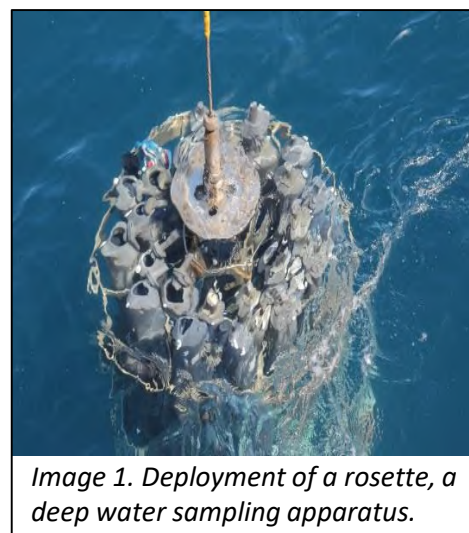
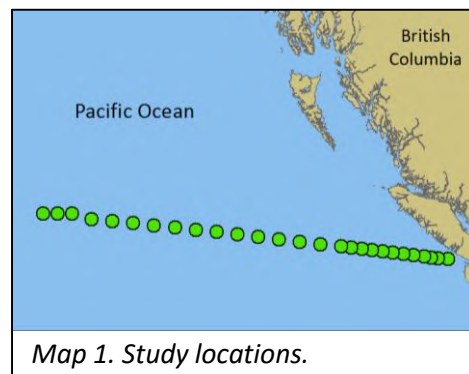
Long standing program surveys a 1,700 km long section three times per year. Data collected since 1956 shows evidence of the impact of climate variability on ocean productivity. Line P has been collecting data since 1956.

## Objectives

1. Collect water property data and samples for carbon, oxygen, pH, chlorophyll, pigments, nutrients, salinity, cesium, and dimethyl sulfide;
2. Collect zooplankton and phytoplankton samples;
3. Collect environmental DNA samples; and,
4. Recover, service and deploy oceanographic moorings.

## Collaborators

- University of: Victoria, British Columbia, Saskatchewan, Washington
- National Oceanographic and Atmospheric Administration



**FOR MORE INFORMATION** – State of the Pacific Ocean:

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>





**Dates:** April 23 – May 1, June 16 – 22, Oct 7–14, 2020  
**Recurrence:** Annually, since 1999  
**Locations:** Juan de Fuca Strait, Strait of Georgia  
**Vessels:** CCGS John P. Tully and CCGS Vector  
**Lead scientist:** Peter Chandler (250) 363-6750  
[Peter.Chandler@dfo-mpo.gc.ca](mailto:Peter.Chandler@dfo-mpo.gc.ca)



## Description

A water properties survey first introduced in 1999 and carried out four times per year to collect oceanographic data in the Strait of Georgia and Juan de Fuca Strait (zooplankton, nutrients, dissolved oxygen, dissolved inorganic carbon, temperature, and salinity). The information collected is used to monitor the seasonal cycle and year to year variability in the properties of the environment and their impact on the ecosystem, and to contribute to an archive of oceanographic information for the region upon which scientific advice can be based.



Map 1. Study locations.

## Objectives

1. Continue the time series of observations at over 80 stations monitoring the physical, chemical and biological characteristics of the region; and
2. Extend the survey into Burrard Inlet and Indian Arm and compare observations with previous surveys.



Image 1. Deployment of a rosette, a deep water sampling apparatus.

## Collaborators

- Tseil-Waututh First Nation

## FOR MORE INFORMATION

State of the Pacific Ocean: <http://www.pac.dfo-mpo.gc.ca/science/oceans/reports-rapports/state-ocean-etat/index-eng.html>

Salish Sea Water Quality: <http://www2.epa.gov/salish-sea/marine-water-quality>







**Dates:** June 16 – July 5, September 8 – 29, 2020  
**Recurrence:** Annually, since 1998  
**Locations:** Johnstone Strait, Strait of Georgia, Juan de Fuca Strait, mainland inlets  
**Vessel:** CCGS Sir John Franklin  
**Lead scientist:** Chrys Neville (250) 756-7185  
[Chrys.Neville@dfo-mpo.gc.ca](mailto:Chrys.Neville@dfo-mpo.gc.ca)



### Description

Early summer and fall surveys examine the abundance, distribution and condition of juvenile Pacific salmon rearing in the inland waters of the Salish Sea in order to improve understanding of factors regulating their early marine survival.

### Objectives

1. Improve understanding of factors regulating the early marine survival of Pacific salmon (early marine growth and energetics, interactions with salmon farms or other industry, changes in climate, etc.);
2. Determine the relationship between the growth and condition of juvenile salmon that rear in this area and their subsequent total marine survival;
3. Develop forecast methods to identify changes in trends of salmon production and/or provide early return forecasts for specific stock groups;
4. Enumerate and sample all species collected in the surface 75m to improve our understanding of species interactions and competition, as well as changes in marine productivity driven by changes in ocean climate.



Map 1. Study area.



Image 1. Crew shaking down a modified trawl net.

**FOR MORE INFORMATION – State of the Pacific Ocean:**

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>







**Dates:** March 1 – 7, 2021  
**Recurrence:** Annually, year two of three (2020-2022)  
**Locations:** Clayoquot Sound  
**Vessel:** Small inshore boats  
**Lead scientist:** Kristi Miller-Saunders (250) 756-7155  
[Kristi.Saunders@dfo-mpo.gc.ca](mailto:Kristi.Saunders@dfo-mpo.gc.ca)

## Description

Sampling overwintering juvenile Pacific salmon and environmental DNA (eDNA) in west coast marine waters to study resident and non-resident salmon habitat utilization and the risk of disease transmission.

## Objectives

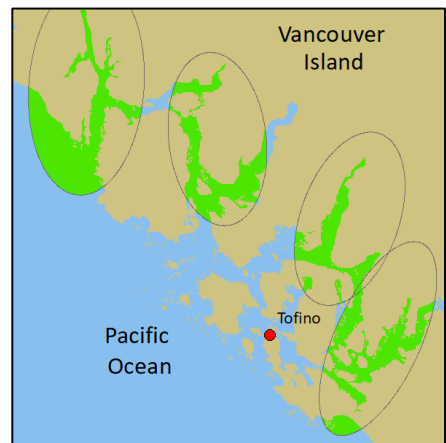
1. Improve understanding of salmon usage of marine habitats within Clayoquot Sound via non-lethal genetic stock identification; assess infectious burden, stressors, health and condition using Fit-Chips and 45-70 infectious agent arrays; lethally subsample fish for complete histopathological and molecular analysis;
2. Collect water samples along 2km transects to characterize, using non-invasive eDNA, the overwinter distributions of marine fish and salmon and to quantify salmon infective agents. Goal is to identify critical salmon overwinter habitats and hot spots of infective agents.

## Collaborators

- Cedar Coast Field Station, in collaboration with:
  - Nuuchah-nulth Tribal Council
  - Ahousaht First Nation
  - Tla-o-qui-aht First Nation
  - Tofino Fishing Charter Companies



*Image 1. Field set-up to filter environmental DNA sample.*



*Map 1. Study areas.*



*Image 2. Research scientist preparing micro-trolling gear.*

**FOR MORE INFORMATION – State of the Pacific Ocean:**

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>





**Dates:** July 27 to August 28, 2020  
**Recurrence:** Annually – north in odd years, south in even years – since 2003  
**Locations:** Strait of Georgia, Johnstone Strait  
**Vessel:** CCGS Neocaligus  
**Lead scientists:** Malcolm Wyeth, Dana Haggarty  
[Malcolm.Wyeth@dfo-mpo.gc.ca](mailto:Malcolm.Wyeth@dfo-mpo.gc.ca) (250) 756-7300



## Description

This fishing survey uses standardized longline hook gear to provide relative abundance indices for commonly caught species, distributional and occurrence data for all other species, and detailed biological data for inshore groundfish species. These data are incorporated into stock assessments, status reports, and research publications. Each year, approximately 70 randomly selected locations are fished, alternating between the northern (purple) and southern (green) regions.



Map 1. Study areas: north in purple, south in green.

## Objectives

1. Collect detailed species composition data from each set;
2. Collect detailed size and sex composition for all species;
3. Collect ageing structures and tissue samples from inshore rockfish species and Lingcod; and,
4. Collect environmental data using temperature-depth recorders attached to the fishing gear as well as vertical conductivity-temperature-depth recorder (CTD) casts.

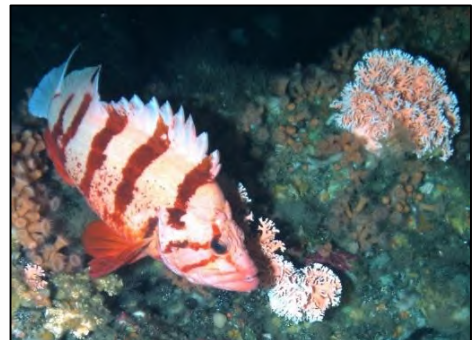


Image 1. A Tiger Rockfish (*Sebastes nigrocinctus*), one of the nearshore groundfish species caught on this survey.

## FOR MORE INFORMATION

Contact the Lead Scientist at [Malcolm.Wyeth@dfo-mpo.gc.ca](mailto:Malcolm.Wyeth@dfo-mpo.gc.ca)





**Dates:** May 19 – June 16, 2020  
**Recurrence:** Every 2 years, since 2004  
**Location:** West Coast of Vancouver Island  
**Vessel:** CCGS Sir John Franklin  
**Lead scientists:** Malcolm Wyeth, Norm Olsen  
[Malcolm.Wyeth@dfo-mpo.gc.ca](mailto:Malcolm.Wyeth@dfo-mpo.gc.ca) (250) 756-7300



## Description

This fishing survey uses bottom trawl gear to provide relative abundance indices for commonly caught species, distributional and occurrence data for all other species, and detailed biological data from groundfish species. These data are incorporated into stock assessments, status reports, and research publications. Each year, approximately 175 randomly selected locations are fished.

## Objectives

1. Collect detailed species composition data from each set;
2. Collect detailed size and sex composition for all species;
3. Collect ageing structures and tissue samples from selected species; and,
4. Collect environmental data including temperature, conductivity, and dissolved oxygen from recorders attached to the fishing gear.



## FOR MORE INFORMATION

Contact the Lead Scientist at [Malcolm.Wyeth@dfo-mpo.gc.ca](mailto:Malcolm.Wyeth@dfo-mpo.gc.ca)





**Dates:** July 5 – August 5, 2020  
**Recurrence:** Annually, since 1998  
**Locations:** West Coast Vancouver Island,  
North West Coast of Vancouver Island  
**Vessel:** CCGS Sir John Franklin  
**Lead scientists:** Jackie King and Jennifer Boldt  
[Jackie.King@dfo-mpo.gc.ca](mailto:Jackie.King@dfo-mpo.gc.ca) (250) 756-7176  
[Jennifer.Boldt@dfo-mpo.gc.ca](mailto:Jennifer.Boldt@dfo-mpo.gc.ca) (250) 756-7110



### Description

This survey is part of an integrated project designed to study the structure and function of the pelagic ecosystem on the Vancouver Island Continental Shelf (< 200 m bottom depth). The main goal of the survey is to understand factors affecting the distribution, abundance, and food web linkages of pelagic fish species, such as Pacific herring and juvenile salmon. Stations from randomly selected blocks in each stratum (*Map 1*) will be sampled with a midwater trawl net towed at the surface or 15 m depth during daylight and night time hours.



*Map 1. Study areas. Coloured zones are depth and ecosystem strata.*

### Objectives

1. Examine species distribution, composition, and abundance;
2. Collect biological and diet data, as well as biological samples; and,
3. Examine the prey environment by sampling zooplankton (vertical bongo net hauls) and conducting oceanographic monitoring (temperature, salinity, fluorescence).



*Image 1. Survey participants collecting biological data from fish.*

**FOR MORE INFORMATION – State of the Pacific Ocean:**

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>







**Dates:** November 1, 2020 – February 27, 2021  
**Recurrence:** Annually, year two of two (2019-2021)  
**Locations:** North-central Strait of Georgia  
**Vessel:** Various small vessels and intertidal  
**Lead scientist:** Cliff Robinson (250) 756-7049  
[Cliff.Robinson@dfo-mpo.gc.ca](mailto:Cliff.Robinson@dfo-mpo.gc.ca)

## Description

This two year project is collecting nearshore substrate and environmental data to field-test model predictions of intertidal and subtidal habitat distribution important to two forage fish species, Pacific Sandlance and Surf Smelt.

## Objectives

1. Develop spatial habitat models to identify spawning and burying habitats of forage fish in nearshore waters along the east coast of Vancouver Island;
2. Collect seabed substrate and environmental data to field validate models; and,
3. Collect sand and water samples for environmental DNA testing to confirm species habitat use.

## Collaborators

- Comox Valley Project Watershed Society and partners
- Mount Arrowsmith Biosphere Reserve
- University of Victoria



*Map 1. Study area.*



*Image 1. Survey along a beach.*



*Image 2. Grab sample of Pacific Sandlance burying habitat.*

## FOR MORE INFORMATION

Contact the Lead Scientist at [Cliff.Robinson@dfo-mpo.gc.ca](mailto:Cliff.Robinson@dfo-mpo.gc.ca)





**Dates:** April 1 – Oct 31, 2020  
**Recurrence:** Annually, year one of two (2020-2021)  
**Location:** West Strait of Georgia, Gulf Islands (e.g. Sydney Channel, Cordova Channel)  
**Vessel:** Small inshore boat, rigid inflatable boats  
**Lead scientist:** Stéphane Gauthier (250) 363-6587  
[Stephane.Gauthier@dfo-mpo.gc.ca](mailto:Stephane.Gauthier@dfo-mpo.gc.ca)



## Description

Pacific Sandlance is an important forage fish species in British Columbia waters. It is a key prey for many predators, including marine birds and Chinook Salmon, and little is known about their population status. This pilot project focuses on the potential detection and monitoring of Pacific Sandlance using fisheries acoustics technologies.

## Objectives

1. Test the use of portable scientific echosounders to detect and discriminate Pacific Sandlance schools from other fish echoes (such as those from Pacific Herring);
2. Test the use of moored autonomous echosounders to detect and monitor Pacific Sandlance while they are foraging through the water column; and,
3. Test the use of moored autonomous echosounder to detect and monitor Pacific Sandlance as they are entering and exiting sand substrate.

## Collaborators

- Environment and Climate Change Canada



Map 1. Study area.



Image 1. Acoustic mooring before deployment.

**FOR MORE INFORMATION** – State of the Pacific Ocean:

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>





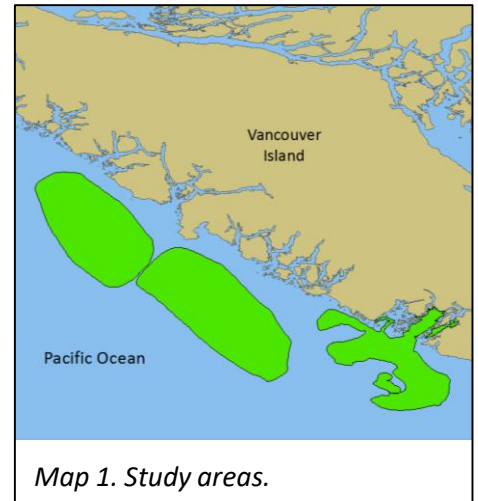
**Dates:** April 22 – May 19, 2020  
**Recurrence:** Annually, since 1973  
**Location:** West Coast Vancouver Island  
**Vessel:** CCGS Sir John Franklin  
**Lead scientist:** Dominique Bureau (250) 756-7114  
[Dominique.Bureau@dfo-mpo.gc.ca](mailto:Dominique.Bureau@dfo-mpo.gc.ca)



## Description

The West Coast Vancouver Island (WCVI) small-mesh multi-species survey was implemented in 1973 and now serves as one of the longest continuous bottom trawl time series for monitoring a diversity of fish and invertebrate species on the west coast of British Columbia.

Data gathered from this survey provides Smooth Pink shrimp stock status for management of the commercial shrimp trawl fishery; informs the annual State of the Oceans report, as well as informs stock assessments for groundfish and pelagic fish species.



Map 1. Study areas.

## Objectives

1. Index the abundance of Smooth Pink shrimp off WCVI using a fishery-independent trawl survey; and,
2. Multi-species indexing of other invertebrates, pelagic fish, and groundfish species.

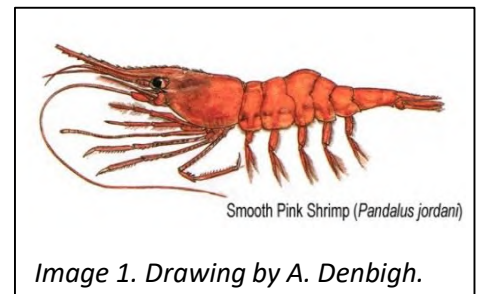


Image 1. Drawing by A. Denbigh.

## FOR MORE INFORMATION

Pacific Region Shrimp Fishery: <http://www.pac.dfo-mpo.gc.ca/fm-gp/commercial/shellfish-mollusques/shrimp-pcrevette/index-eng.html>

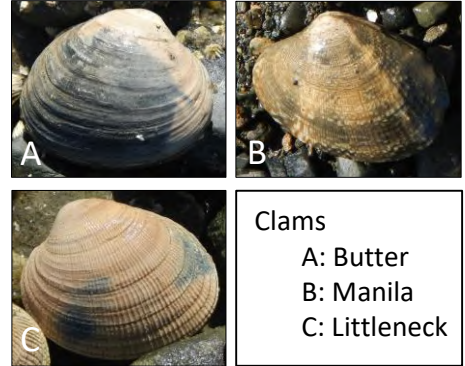
State of the Pacific Ocean: <http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>







**Dates:** April 1, 2020 – March 31, 2021  
**Recurrence:** Annually, since 2020  
**Locations:** West Coast Vancouver Island, Queen Charlotte Sound and Strait, Johnstone Strait, Strait of Georgia, Juan de Fuca Strait  
**Vessel:** Various small craft vessels  
**Lead scientist:** Amy Ganton (250) 756-7055  
[Amy.Ganton@dfo-mpo.gc.ca](mailto:Amy.Ganton@dfo-mpo.gc.ca)



## Description

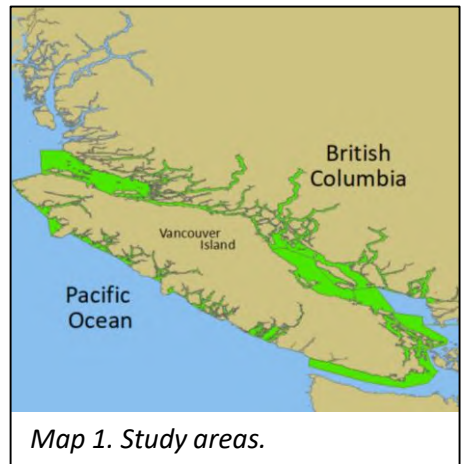
Under the revised *Fisheries Act*, intertidal clams (Butter, Littleneck and Manila) in the south coast of British Columbia require biological reference points to ensure they can be maintained at sustainable levels. Intertidal Clam Monitoring will collect data at select indicator beaches to establish biological reference points and measure intertidal clam health.

## Objectives

1. Collect population dynamics data (for example, counts, weights, lengths, ages, etc.) at indicator beaches;
2. Establish a time series of abundance; and,
3. In the next few years, develop limit reference points and monitor the health of clam stocks.

## Potential Collaborators

- Wei Wai Kum, Klahoose, K'ómoks, Tla-o-qui-aht, and Ka:'yu:'k't'h'/Che:k'tles7et'h' First Nations
- Tla'amin, Shíshálh, and Toquaht Nations
- Nuchatlaht Tribe, Nuuchahnulth Tribal Council
- Musgamagw Dzawada'enuxw Fisheries Group, A-Tlegay Fisheries Society, and Uu-a-thluk Fisheries



**FOR MORE INFORMATION** – Pacific Region Intertidal Clam:

<https://www.pac.dfo-mpo.gc.ca/fm-gp/commercial/shellfish-mollusques/clam-palourde/index-eng.html>







**Dates:** May to August 2020  
**Recurrence:** Every few years, since 2010 / annually since 2017  
**Locations:** Transfer Beach (Ladysmith), Swy-a-lana Lagoon (Nanaimo); Hillier Island, Harris Point, and Joes Bay in Barkley Sound  
**Lead scientist:** Amy Ganton (250) 756-7055  
[Amy.Ganton@dfo-mpo.gc.ca](mailto:Amy.Ganton@dfo-mpo.gc.ca)



Image 1. Counting Olympia Oysters (*Ostrea lurida*).

## Description

The Olympia Oyster (*Ostrea lurida*) is one of two oyster species found on the British Columbia coast. The only native oyster on the west coast of North America, the Olympia Oyster is listed under the federal *Species at Risk Act* as a species of Special Concern and is protected under the federal *Fisheries Act*.

The goal of the intertidal beach assessment survey is to monitor Olympia Oyster abundance at select index sites.



Map 1. Study locations.

## Objectives

1. Index the relative abundance of Olympia Oysters using a standardized survey protocol.

## Collaborators

- Parks Canada



Image 2. Measuring an Olympia Oyster (*Ostrea lurida*).

**FOR MORE INFORMATION – Species at Risk:**

<http://dfo-mpo.gc.ca/species-especes/profiles-profil/olympia-oyster-huitre-plate-eng.html>





**Dates:** May 17 – 29, October 15 – 25, 2020  
**Recurrence:** Biennially—spring since 1991, fall since 1988.  
**Location:** Strait of Georgia  
**Vessel:** CCGS Neocaligus  
**Lead scientist:** Dan Curtis (250) 756-7027  
[Dan.Curtis@dfo-mpo.gc.ca](mailto:Dan.Curtis@dfo-mpo.gc.ca)



## Description

This project conducts pre- and post- commercial fishery Dungeness crab (*Cancer magister*) surveys in Crab Management Areas I (Fraser River delta) and J (Boundary Bay) to continue the long-term historic record of crab Catch Per Unit Effort (CPUE). The survey also collects data on population structure between years by documenting variability in moult times, breeding times, egg extrusion and release, mortality rates, and provides an accurate record of trap bycatch.

These surveys have been used to investigate the effects of soak duration, bait and trap type, escape port efficiency, and provide tissue samples for toxicological and genetic analyses.

## Objectives

1. Collect pre- and post- fishery Dungeness crab biological information, including stock structure, sex ratios, shell condition, injuries, size, CPUE, tissue samples for DNA analysis, and distribution.

## Collaborators

- Tsleil-Waututh First Nation



## FOR MORE INFORMATION

Pacific Region Crab Fishery: <http://www.pac.dfo-mpo.gc.ca/fm-gp/commercial/shellfish-mollusques/crab-crabe/index-eng.html>

State of the Pacific Ocean: <http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>





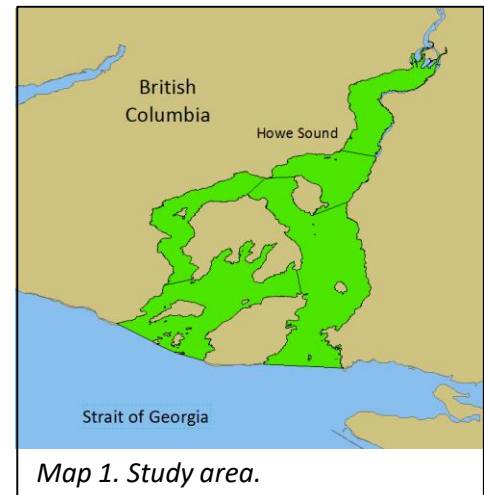
**Dates:** November 2 – 11, 2020; February 1 – 10, 2021  
**Recurrence:** Annually, since 2001  
**Location:** Howe Sound  
**Vessel:** CCGS Neocaligus  
**Lead scientist:** Rick Ferguson (250) 756-7195  
[Rick.Ferguson@dfo-mpo.gc.ca](mailto:Rick.Ferguson@dfo-mpo.gc.ca)



### Description

Prawn Assessment Trap Surveys provide estimates of key biological parameters (e.g. natural mortality, recruitment, spawner abundance) which are used in the development and refinement of the spawner escapement index for prawns.

This index forms the basis of the assessment and management of prawn stocks. The prawn survey in Howe Sound is an ongoing assessment program that provides data necessary to assess and manage all prawn stocks along the British Columbia coast.



Map 1. Study area.

### Objectives

1. Collect detailed catch, size, and sex data for estimating recruitment parameters; and,
2. Monitor stock response of escapement based thresholds.



Image 1. Spot Prawns (*Pandalus platyceros*).

**FOR MORE INFORMATION** – Pacific Region prawns:

<http://www.pac.dfo-mpo.gc.ca/fm-gp/commercial/shellfish-mollusques/prawn-gcrevette/index-eng.html>







**Dates:** June 8 –24, 2020  
**Recurrence:** Annually, since 1998  
**Location:** Strait of Georgia  
**Vessel:** CCGS Neocaligus  
**Lead scientist:** Rick Ferguson (250) 756-7195  
[Rick.Ferguson@dfo-mpo.gc.ca](mailto:Rick.Ferguson@dfo-mpo.gc.ca)



## Description

Shrimp assessment surveys estimate the abundance of shrimp stocks (Smooth and Spiny Pink shrimp, and Sidedstripe shrimp) in select Shrimp Management Areas. The results from these surveys are used to track long-term trends in abundance of shrimp stocks and to set annual quotas for the commercial shrimp trawl fishery.

## Objectives

1. Conduct fishery independent surveys of shrimp grounds using bottom trawl gear to determine stock status of Pink and Sidedstripe shrimp in Shrimp Management Areas PRD (Area 28 and 29), 14, GSTE (Area 15), and 16;
2. Maintain Pink shrimp and Sidedstripe shrimp abundance index time series for monitoring trends in abundance; and,
3. Collect species distribution and abundance information on other fish and invertebrate species.



Map 1. Study areas.



Image 1. Trawl collection bin.

**FOR MORE INFORMATION – Pacific Region Shrimp Trawl Fishery:**

<http://www.pac.dfo-mpo.gc.ca/fm-gp/commercial/shellfish-mollusques/shrimp-pcrevette/index-eng.html>







**Dates:** April 6 – 11, May 11 – 16, July 14 – 19, 2020; Feb 11 – 16, March 8 – 13, 2021  
**Recurrence:** Annually, since 2015  
**Location:** Strait of Georgia  
**Vessel:** CCGS Neocaligus  
**Lead scientist:** Ian Perry (250) 756-7137  
[Ian.Perry@dfo-mpo.gc.ca](mailto:Ian.Perry@dfo-mpo.gc.ca)

CCGS Neocaligus



## Description

These surveys of biological and physical sampling at 17 stations throughout the Strait of Georgia aim to improve the understanding of plankton seasonal cycles and year-to-year variability within the Strait of Georgia. These surveys also provide baseline (prey field) data for fisheries research.

## Objectives

1. Conduct full depth Conductivity, Temperature, and Depth (CTD) profile including oxygen and fluorometer;
2. Conduct full depth (10m off bottom to surface) zooplankton net tow (one side preserved in 10% buffered formalin for taxonomy, the other size-fractionated for biochemical analysis); and,
3. At selected stations, collect water samples for salinity, nutrients, and phytoplankton biomass and composition.

## Collaborators

- University of British Columbia
- University of Victoria



Map 1. Study locations.



Image 1. Washing down a zooplankton net.

**FOR MORE INFORMATION – State of the Pacific Ocean:**

<http://www.dfo-mpo.gc.ca/oceans/publications/index-eng.html#state-ocean>





**Dates:** March 1 – July 31, 2020  
**Recurrence:** Annually, since 2019  
**Locations:** Strait of Georgia  
**Vessel:** Small DFO vessel  
**Lead scientist:** Strahan Tucker (250) 756-7092  
[Strahan.Tucker@dfo-mpo.gc.ca](mailto:Strahan.Tucker@dfo-mpo.gc.ca)

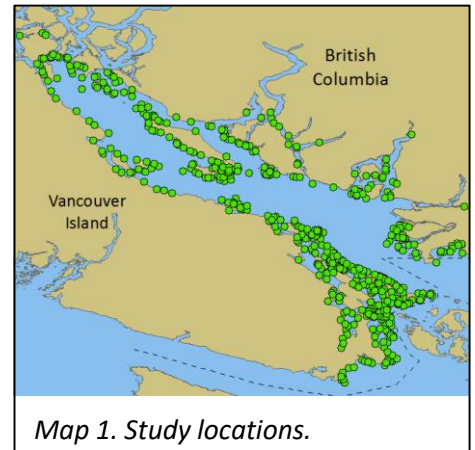


## Description

Harbour seal population estimates generated from counts taken during aerial surveys need to be corrected for the proportion of animals in the water and not counted. A correction factor is developed by following the behavior of a sample of satellite-tagged seals. The last tags were deployed in the 1990's. This project will update correction factors by deploying satellite tags and tracking seal behavior over several months.

## Objectives

1. Capture harbour seals with nets at seal haulouts;
2. Temporarily attach satellite tags (20 tags total) to fur of harbor seals; these tags will relay summaries of the wet-dry sensor during their deployment;
3. Recover satellite tags when shed during the annual fall moult;
4. Calculate correction; and,
5. Using seal dives and movements, assess the amount of time seals spent foraging, and model foraging movements to reveal seal predation hotspots.



Map 1. Study locations.



Image 1. Harbour Seal (*Phoca vitulina*) seal with satellite instrument.

**FOR MORE INFORMATION** – Science Advisory Report:

[http://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2009/2009\\_011-eng.htm](http://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2009/2009_011-eng.htm)





**Dates:** April 1 – November 30, 2020  
**Recurrence:** Annually, since 2015 (varying areas)  
**Locations:** Strait of Georgia, Queen Charlotte Strait, southern West Coast of Vancouver Island  
**Vessels:** Small DFO vessels  
**Lead scientist:** Strahan Tucker (250) 756-7092  
[Strahan.Tucker@dfo-mpo.gc.ca](mailto:Strahan.Tucker@dfo-mpo.gc.ca)



## Description

Estimating diets from scats through both hard-part (bones) identification and genetic DNA analysis provides information on species composition and size-class of prey. This survey will collect scats from Harbour seals, Steller sea lions and California sea lions on a monthly basis from spring through fall at key locations and along salmon migratory pathways. The goal is to estimate competition between pinnipeds and Resident Killer Whales for salmon prey.



Map 1. Study locations.

## Objectives

1. Approach select harbour seal and sea lion haulouts slowly by small vessel to carefully move animals off in an orderly fashion;
2. Collect and freeze scats individually from haulout sites;
3. In the laboratory, separate hard parts from the scat matrix and extract the remaining material for DNA analysis; and,
4. Estimate the fish and invertebrate composition of the diet for each scat in both the hard-part and genetic samples.

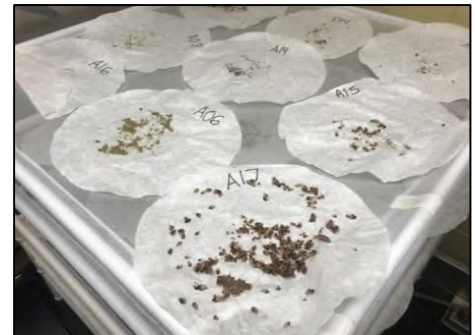


Image 1. Preparation of scat for hard part analysis.

## FOR MORE INFORMATION

Contact the Lead Scientist at [Strahan.Tucker@dfo-mpo.gc.ca](mailto:Strahan.Tucker@dfo-mpo.gc.ca)







**Dates:** June 15 – August 15, 2020  
**Recurrence:** Annually, year three of five (2018-2022)  
**Locations:** Gulf Islands, Fraser River mouth, Juan de Fuca Strait, Swiftsure / La Perouse Bank  
**Vessels:** Zodiac Hurricanes (7 m)  
**Lead scientist:** Sheila J Thornton (604) 666-1298  
[Sheila.Thornton@dfo-mpo.gc.ca](mailto:Sheila.Thornton@dfo-mpo.gc.ca)



Zodiacs

## Description

Behavioural assessment of Southern Resident Killer Whales (SRKW) individuals using group behavioural assessment and focal follow techniques to improve understanding of habitat use patterns and to assess condition of individuals (2019, 2020 black line; 2021 red line). Prey sampling and fecal sampling will inform foraging efficiency, prey selection and physiological parameters.

## Objectives

1. Using visual and acoustic methods to locate SRKW, identify behavioural state and collect photo-identifications of individuals encountered;
2. Collect prey samples from sharing events during encounters where whales are foraging;
3. Collect information on vessel presence in the vicinity of whales; and,
4. Collect fecal samples from SRKW.

## Collaborators

- National Oceanic and Atmospheric Association
- University of British Columbia
- Ocean Wise
  - Coastal Ocean Research Institute



Map 1. SRKW habitat use (green)



Images 1 and 2. Field crew on SRKW habitat use project.

**FOR MORE INFORMATION – SRKW habitat identification:**

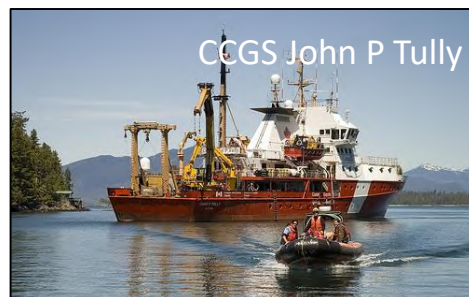
<https://waves-vagues.dfo-mpo.gc.ca/Library/40600385.pdf>







**Dates:** April 23 – May 1, October 21 – 26, 2020  
**Recurrence:** Annually, year one of three (2020-2022)  
**Locations:** Swiftsure Bank, Juan de Fuca Strait  
**Vessels:** CCGS John P. Tully & CCGS Vector  
**Lead scientist:** Cameron Freshwater (250) 756-7092  
[Cameron.Freshwater@dfo-mpo.gc.ca](mailto:Cameron.Freshwater@dfo-mpo.gc.ca)



## Description

An initiative to deploy, service, and recover moorings with passive acoustic receivers that track Chinook salmon movements and survival.

Data from this initiative will inform understanding of the interactions between different Chinook salmon stocks and with Northern and Southern Resident Killer whales in identified critical habitat.

## Objectives

1. Deploy and recover moorings with acoustic receivers;
2. Detect transmitters attached to tagged adult Chinook salmon;
3. Estimate stock-specific residence time in designated killer whale critical habitat and salmon survival rates during return migrations; and,
4. Improve understanding of fine scale Chinook salmon behavior using depth data collected by tags.

## Collaborators

- University of British Columbia
- National Marine Fisheries Service (USA)



Map 1. Study locations.

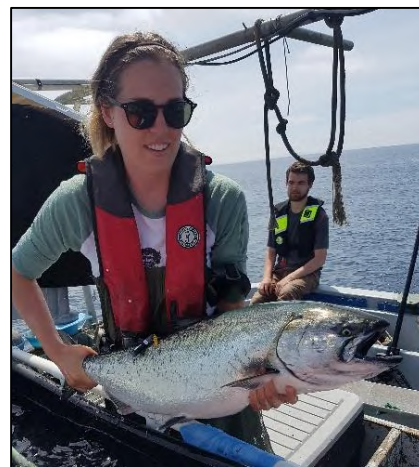


Image 1. Tagged Chinook salmon (*Oncorhynchus tshawytscha*) prior to release.

## FOR MORE INFORMATION

Contact the Lead Scientist at [Cameron.Freshwater@dfo-mpo.gc.ca](mailto:Cameron.Freshwater@dfo-mpo.gc.ca)





**Dates:** April 1, 2020 – March 31, 2021  
**Recurrence:** Annually, year four of five (2017-2022)  
**Locations:** Burrard Inlet, Fraser River delta, Howe Sound entrance  
**Vessels:** CCGS Vector, Tanu and Neocaligus  
**Lead scientists:** Paul Covert, James Mortimor  
[Paul.Covert2@dfo-mpo.gc.ca](mailto:Paul.Covert2@dfo-mpo.gc.ca) (250) 363-6765  
[James.Mortimor@dfo-mpo.gc.ca](mailto:James.Mortimor@dfo-mpo.gc.ca) (250) 756-7354



### Description

An initiative of the Oceans Protection Plan, the Coastal Environmental Baseline Program aims to collect comprehensive marine ecosystem data for the Port of Vancouver pilot site.

### Objectives

1. Measure physical and chemical water properties in Burrard Inlet;
2. Characterize inter-tidal and sub-tidal habitats;
3. Record abundance and distribution of invertebrate and vertebrate marine biota; and,
4. Provide high-quality, open-data to all Canadians to inform science-based decision making.

### Collaborators

- Tsleil-Waututh and Tsawassen First Nations
- Vancouver Port Authority
- Coastal environmental organizations



Map 1. Study area.



Image 1. Conducting beach surveys.

**FOR MORE INFORMATION – Coastal Environmental Baseline Program:**

<http://dfo-mpo.gc.ca/science/environmental-environnement/cebp-pdecr/index-eng.html>  
<https://www.dfo-mpo.gc.ca/science/environmental-environnement/cebp-pdecr/projects/vancouver-eng.html>





**Dates:** May 1 – October 31, 2020  
**Recurrence:** Annually, since 2007  
**Locations:** Strait of Juan de Fuca, Strait of Georgia, West Coast Vancouver Is, Queen Charlotte Sound & Queen Charlotte Strait, Haida Gwaii  
**Lead scientist:** Thomas Therriault (250) 756-7394  
[Thomas.Therriault@dfo-mpo.gc.ca](mailto:Thomas.Therriault@dfo-mpo.gc.ca)



*Image 1. Settlement plate with native and invasive species.*

## Description

The biofouling on commercial and recreational vessels by Aquatic Invasive Species (AIS) is a major contributor to their coast-wide spread. Through the rotational deployment of settlement plates at both new and long-term sites, this survey seeks to identify the current distribution of sessile AIS in BC waters. Understanding their distribution supports the development of effective management strategies.

## Objectives

1. Early detection of new AIS;
2. Track changes over time in AIS and native sessile species to identify possible impacts of AIS or climate change.

## Collaborators

- Council of the Haida Nation, Lax Kw'alaams, Metlakata, Tsleil-Waututh, Musqueam, Tsawwassen, Squamish, Kitasoo / Xai'xais, Nuxalk, Heiltsuk, and Wuikinuxv Nations
- Coast Mountain Community College
- Nanaimo Port Authority
- Prince Rupert Port Authority
- Port of Vancouver



*Map 1. Study locations.*



*Image 2. Identifying AIS specimens on a settlement plate.*

**FOR MORE INFORMATION – State of the Pacific Ocean:**

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>







**Dates:** March 1 – November 30, 2020  
**Recurrence:** Annually, since 2005 (rotational)  
**Locations:** Strait of Juan de Fuca, Strait of Georgia, West Coast Vancouver Is, Queen Charlotte Sound, Queen Charlotte & Hecate Straits  
**Vessel:** Styela  
**Lead scientist:** Thomas Therriault (250) 756-7394  
[Thomas.Therriault@dfo-mpo.gc.ca](mailto:Thomas.Therriault@dfo-mpo.gc.ca)



## Description

This monitoring informs efforts to prevent the spread of the highly invasive European green crab throughout coastal British Columbia. Using folding Fukui fish traps deployed in the intertidal zone, crab populations are tracked, both at sites where European green crabs have become established and at new sites where they could establish in the future. From this, insights into the types of habitats and possible impacts of green crab are gained.

## Objectives

1. Use knowledge of green crab habitat preferences to improve early detection in the Salish Sea and the Central and North coasts;
2. Advise management/partners about the spread and potential impacts of European green crab.

## Collaborators

- Puget Sound Partnership
- Coastal First Nations and Tribes
- Washington Department of Fish & Wildlife
- University of Washington
- Washington Sea Grant Crab Team



Map 1. Study areas.



Image 1. Green crabs (*Carcinus maenas*) caught using Fukui fish traps.

**FOR MORE INFORMATION** – State of the Pacific Ocean:

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>







**Dates:** April 6 – October 9, 2020  
**Recurrence:** Annually, since 1891  
**Locations:** Stuart Channel, Desolation Sound, McNaughton Group, Gwaii Haanas  
**Vessel:** CCGS Otter Bay  
**Lead scientist:** Stacey Verrin (250) 363-6377  
[Stacey.Verrin@dfo-mpo.gc.ca](mailto:Stacey.Verrin@dfo-mpo.gc.ca)



## Description

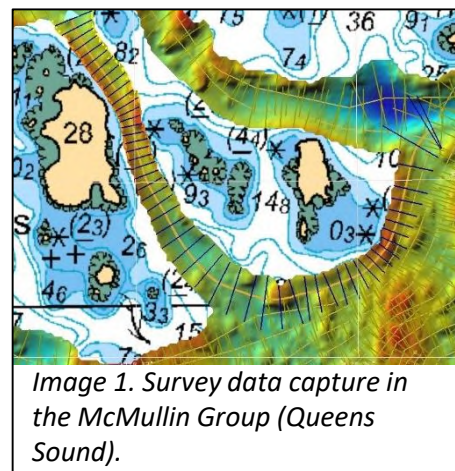
Mapping of the seabed and collection of bathymetry to enhance navigation safety with periodic tide gauge servicing.

## Objectives

1. Collect multibeam bathymetry to improve navigational charts & products and aid scientific research;
2. Detect and classify subsurface shipping hazards;
3. Deploy and service tide gauges to support bathymetric surveying and Canadian Hydrographic Services water levels network;
4. Collect acoustic data to determine seabed classification for navigation and scientific research; and,
5. Capture laser scanner data for coastline delineation and shoreline features.

## Collaborators

- Natural Resources Canada (NRCAN)
  - Geological Survey of Canada
- Parks Canada
- Canadian Coast Guard



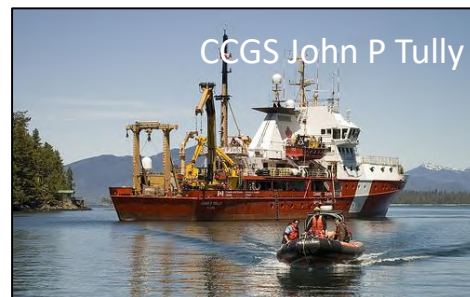
**FOR MORE INFORMATION – Canadian Hydrographic Service:**

<http://charts.gc.ca/>





**Dates:** June 22 – July 8, 2020  
**Recurrence:** Annually, since 1976  
**Locations:** Strait of Georgia; Johnstone Strait; West Coast Vancouver Is.; Queen Charlotte & Hecate Strait; Chatham Sound; Haida Gwaii  
**Vessel:** CCGS John P. Tully  
**Lead scientist:** David Spear (250) 363-6581  
[David.Spear@dfo-mpo.gc.ca](mailto:David.Spear@dfo-mpo.gc.ca)



## Description

This cruise is responsible for the deployment, recovery and servicing of oceanographic moorings. These moorings record tides, currents and water properties in support of long-term environmental monitoring programs.

## Objectives

1. Recover, service and deploy oceanographic moorings;
2. Collect water property data and biogeochemical samples;
3. Collect zooplankton, phytoplankton, sediments, and environmental DNA samples; and,
4. Deploy surface current tracking drifters.

## Collaborators

- Parks Canada / Haida Nation (Gwaii Haanas National Park Reserve)
- Skeena Fisheries Commission
- Environment and Climate Change Canada (Scott Islands National Wildlife Area)
- Smithsonian Institute (Invasive Species)



**FOR MORE INFORMATION – State of the Pacific Ocean:**

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>





**Dates:** February 20 – March 26, 2021  
**Recurrence:** Every two years, since 2019  
**Locations:** Central North Pacific (Gulf of Alaska)  
**Vessel:** CCGS Sir John Franklin  
**Lead scientist:** Jackie King (250) 756-7176  
[Jackie.King@dfo-mpo.gc.ca](mailto:Jackie.King@dfo-mpo.gc.ca)



## Description

Together with its five member countries (Canada, the United States, Japan, Russia and Korea), the North Pacific Anadromous Fish Commission will coordinate a multi-nation high seas expedition within its International Year of the Salmon initiative.

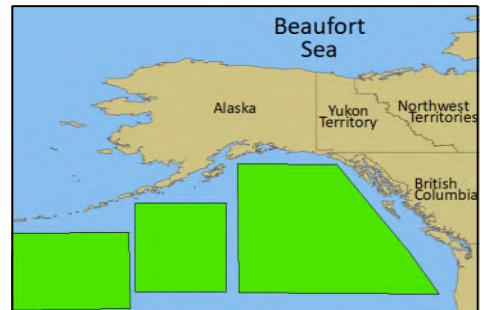
On behalf of Canada, a DFO vessel will join four others as they survey the full breadth of the North Pacific to better understand the mechanisms that regulate Pacific salmon distribution, productivity, and survival during their overwinter stage in high seas.

## Objective

1. Understand the ecology and distribution of Canadian origin Pacific salmon in the North Pacific during the marine overwinter phase of their life cycle.

## Collaborators

- North Pacific Anadromous Fish Commission
- High Seas Research Committee of British Columbia
- British Columbia High Seas Research Council (BC HRC)
- National Oceanographic and Atmospheric Administration (National Marine Fisheries Service, USA)
- Pacific Fisheries Research Centre (TINRO), Russia
- Fisheries Research Agency, Japan
- Gangneung-Wonju National University, Republic of Korea



Map 1. Study areas (March 2019).



Image 1. International science crew for the March 2019 expedition.

**FOR MORE INFORMATION** – International Year of the Salmon:

<https://yearofthesalmon.org/>







**Dates:** August 11 – September 7, 2020  
**Recurrence:** Every 1 to 2 years, since 1995  
**Location:** West Coast Vancouver Island, Queen Charlotte Strait and Sound, Hecate Strait, Dixon Entrance, Haida Gwaii  
**Vessel:** CCGS Sir John Franklin  
**Lead scientist:** Stéphane Gauthier (250) 363-6587  
[Stephane.Gauthier@dfo-mpo.gc.ca](mailto:Stephane.Gauthier@dfo-mpo.gc.ca)



### Description

The fisheries acoustic trawl survey is the primary source of fishery-independent data informing the stock assessment of Pacific hake along the West Coast of Canada and the U.S. This stock is jointly managed by Canada and the U.S. under the international Pacific Hake Treaty.

### Objectives

1. Estimate the abundance and distribution of Pacific Hake along the West Coast using fisheries acoustics techniques;
2. Collect midwater trawl samples to verify species composition of acoustic marks and collect biological samples to estimate fish size and conditions;
3. Collect information on prey species, such as krill and mesopelagic fishes; and,
4. Collect oceanographic data along survey tracks to better characterize and understand factors affecting the distribution and movements of Pacific Hake along the coast.

### Collaborators

- National Oceanographic and Atmospheric Administration (National Marine Fisheries Service)



Map 1. Study locations.

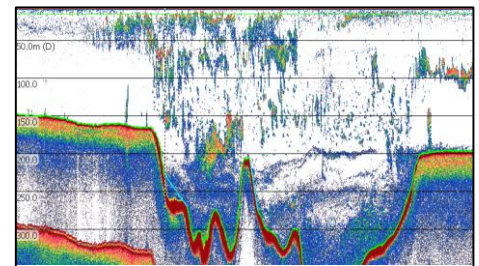


Image 1. Echogram of detected fish schools in the water column.

**FOR MORE INFORMATION – Pacific Hake treaty:**

[https://www.westcoast.fisheries.noaa.gov/fisheries/management/whiting/pacific\\_whiting\\_treaty.html](https://www.westcoast.fisheries.noaa.gov/fisheries/management/whiting/pacific_whiting_treaty.html)







**Dates:** May 26 – August 31, 2020  
**Recurrence:** Annually, since 1963  
**Locations:** West Coast of Vancouver Island, Queen Charlotte Sound, Hecate Strait, Dixon Entrance, Haida Gwaii  
**Vessels:** Chartered commercial longline vessels  
**Lead scientists:** Dana Haggarty (DFO), T. Geernaert (IPHC)  
[Dana.Haggarty@dfo-mpo.gc.ca](mailto:Dana.Haggarty@dfo-mpo.gc.ca)  
 (250) 756-7386

**INTERNATIONAL PACIFIC**



**HALIBUT COMMISSION**

*Image 1. IPHC logo displayed on chartered fishing vessels.*

Description

This fishing survey is conducted by the International Pacific Halibut Commission (IPHC) and uses longline hook gear to collect Pacific Halibut abundance and biological data. Each year, a grid of fixed locations from Oregon to the Bering Sea are fished. In British Columbia waters, DFO collaborates with the IPHC and the Pacific Halibut Management Association of BC to identify the catch of non-directed species and collect biological data from selected species.

Objectives

1. Collect Pacific Halibut abundance and biological data;
2. Collect detailed hook-by-hook catch composition data from each set;
3. Collect biological data from inshore rockfish species and Lingcod; and,
4. Collect environmental data using vertical conductivity-temperature-depth recorder (CTD) casts at each station.

Collaborators

- International Pacific Halibut Commission
- Pacific Halibut Management Association of BC



*Map 1. Study locations in British Columbia waters.*



*Image 2. Banner that is displayed on chartered fishing vessels.*

**FOR MORE INFORMATION – IPHC:**

<https://iphc.int/management/science-and-research>





**Dates:** October 10 – November 21, 2020  
**Recurrence:** Annually, since 2003  
**Locations:** West Coast of Vancouver Island, Queen Charlotte Sound, West Coast of Haida Gwaii, mainland inlets  
**Vessels:** Chartered commercial trap vessels  
**Lead scientists:** Malcolm Wyeth (250) 756-7300  
[Malcolm.Wyeth@dfo-mpo.gc.ca](mailto:Malcolm.Wyeth@dfo-mpo.gc.ca)  
Brendan Connors (250) 858-7028  
[Brendan.Connors@dfo-mpo.gc.ca](mailto:Brendan.Connors@dfo-mpo.gc.ca)



Map 1. Study areas.

### Description

This fishing survey uses standardized longline trap gear to capture sablefish for tag and release and provide a stock abundance index. Detailed biological data are also collected from sablefish and selected rockfish species. These data provide annual estimates of harvestable biomass that inform the fishery and are incorporated into stock assessments, status reports, and research publications. Each year, approximately 110 randomly selected locations are fished.

### Objectives

1. Collect detailed species composition data from each set;
2. Tag and release sablefish from each set;
3. Collect detailed size and sex composition data as well as ageing structures and tissue samples from sablefish and selected offshore rockfish species; and,
4. Collect environmental data using temperature-depth recorders attached to the fishing gear.

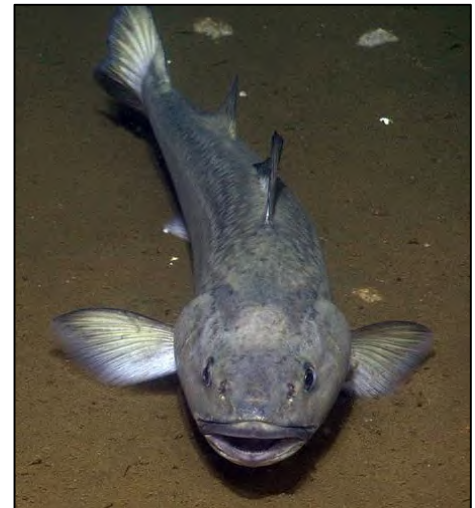


Image 1. Sablefish (*Anoplopoma fimbria*).

### Collaborators

- Wild Canadian Sablefish Ltd.

### FOR MORE INFORMATION

Contact the Lead Scientists at  
[Malcolm.Wyeth@dfo-mpo.gc.ca](mailto:Malcolm.Wyeth@dfo-mpo.gc.ca) or [Brendan.Connors@dfo-mpo.gc.ca](mailto:Brendan.Connors@dfo-mpo.gc.ca)





**Dates:** Feb 15 – April 30, 2020  
**Recurrence:** Annually, since 1972  
**Locations:** Strait of Georgia, West Coast Vancouver Island, Central & North coasts, Haida Gwaii  
**Vessels:** Various seine vessels  
**Lead scientist:** Jaclyn Cleary (250) 756-7321  
[Jaclyn.Cleary@dfo-mpo.gc.ca](mailto:Jaclyn.Cleary@dfo-mpo.gc.ca)



### Description

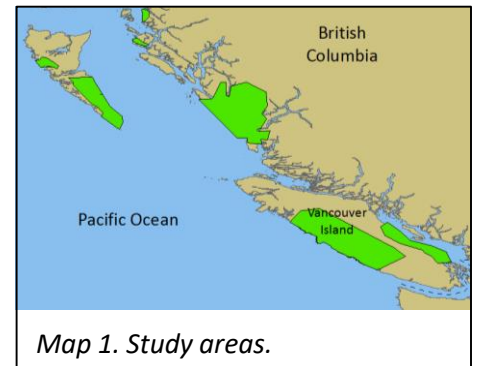
These surveys aim to collect biological samples from pre-spawning aggregations of herring throughout the British Columbia coast. Monitoring of herring biology helps track changes in age and growth which informs stock status.

### Objectives

1. Identify pre-spawning aggregations of herring in each stock area using vessel-based sounders;
2. Use a purse seine to hold herring and collect herring sample (~100 fish) using a hoop net. Release remaining fish;
3. Transport herring sample to laboratory where data on age, length, weight, sex, and maturity is gathered;
4. Use equations to estimate the size and age distribution of herring for each area; and,
5. Provide data for stock assessment.

### Collaborators

- Kitsoo and Heiltsuk Nations
- Nuuchahnulth Nations and Tribal Council
- Herring Conservation and Research Society



Map 1. Study areas.

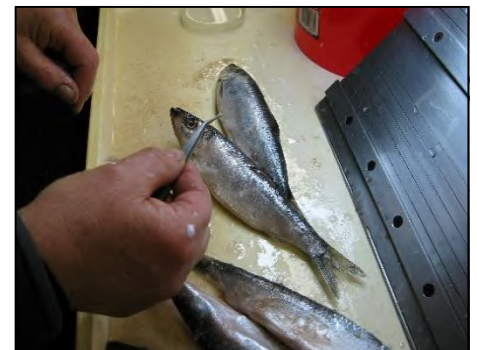


Image 1. Removing scales for age sampling.

**FOR MORE INFORMATION – State of the Pacific Ocean:**

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>





**Dates:** March 1 – April 30, 2020  
**Recurrence:** Annually, since 1951  
**Locations:** Strait of Georgia, West Coast Vancouver Is., Central and North coasts, Haida Gwaii  
**Vessels/planes:** Seine vessels, dive skiffs, float planes  
**Lead scientist:** Jaclyn Cleary (250) 756-7321  
[Jaclyn.Cleary@dfo-mpo.gc.ca](mailto:Jaclyn.Cleary@dfo-mpo.gc.ca)



*Image 1. SCUBA divers measuring herring spawn.*

## Description

Monitoring of herring spawn (egg deposition) helps to track changes in stock abundance. These surveys aim to measure herring spawn on kelp and eelgrasses in intertidal / subtidal habitats using SCUBA surveys.

## Objectives

1. Identify herring spawning activity from float planes and from small vessels (First Nation charters);
2. Confirm the presence of herring eggs and measure egg layers, substrate type, and coverage within quadrats placed along transects that are perpendicular to shore;
3. Calculate egg biomass for each spawn and from that use equations to estimate the number of adult spawners for each area; and,
4. Map herring spawning and provide data for stock assessment.

## Collaborators

- Kitasoo, Gwa'sala-'Nakwaxda'xw, Haida, and Nuu-chah-nulth Nations
- A-Tlegay Fisheries Society; Musgamagw Dzawada'enuxw Tribal Council
- Herring Conservation and Research Society



*Map 1. Study areas.*



*Image 2. Herring (Clupea pallasii) spawn.*

**FOR MORE INFORMATION** – State of the Pacific Ocean:

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>







**Dates:** October 15, 2020 – March 15, 2021  
**Recurrence:** Every 3 to 5 years, since the early 1970s  
**Locations:** West Coast of Vancouver Island, Juan de Fuca Strait, Strait of Georgia, Johnstone Strait, Queen Charlotte Strait and Sound, Hecate Strait, Dixon Entrance, Haida Gwaii  
**Lead scientist:** Strahan Tucker (250) 756-7092  
[Strahan.Tucker@dfo-mpo.gc.ca](mailto:Strahan.Tucker@dfo-mpo.gc.ca)

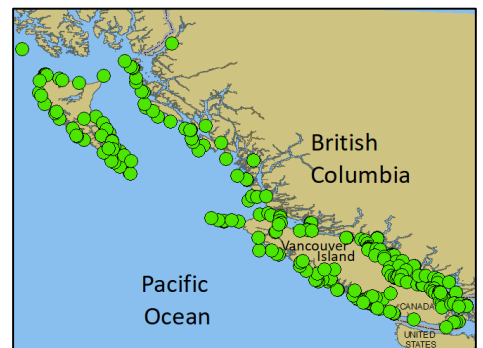


## Description

Data from this survey will help provide California and Steller Sea Lions abundance, distribution and trends data for non-breeding season to support oil spill response (and other planning exercises / impact assessments), track recovery, and support the interpretation of diet data to understand potential pressures on fisheries resources.

## Objectives

1. Weather conditions permitting, fly the aircraft at 500-650 ft. @ 125 km/hr and survey all known rookeries and year-round haulouts;
2. Opportunistically scan the shoreline and waters for sea lions between known haulout sites;
3. Photograph individuals and groups of sea lions with a hand held 35 mm SLR camera; and,
4. Count sea lions from the photographs and compile a final total estimate of abundance.



Map 1. Study locations.



Image 1. Steller Sea Lions (*Eumetopias jubatus*).

**FOR MORE INFORMATION** – Science Advisory Report:

[http://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2018/2018\\_006-eng.html](http://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2018/2018_006-eng.html)





**Dates:** August 12 –25, 2020  
**Recurrence:** Annually, since 2002  
**Locations:** West Coast Vancouver Island offshore,  
Western Queen Charlotte Sound  
**Vessel:** CCGS Vector  
**Lead scientists:** Thomas Doniol-Valcroze, Linda Nichol  
[Thomas.Doniol-Valcroze@dfo-mpo.gc.ca](mailto:Thomas.Doniol-Valcroze@dfo-mpo.gc.ca) (250) 729-8375  
[Linda.Nichol@dfo-mpo.gc.ca](mailto:Linda.Nichol@dfo-mpo.gc.ca) (250) 729-8374



### Description

The Cetacean Research Program assesses population abundance and critical habitat of species-at-risk, including several species of large whales. Dedicated surveys have been conducted since 2002 to improve understanding of the distribution of cetaceans and their use of habitats such as sea mounts and troughs.

### Objectives

1. Obtain data on distribution and abundance of cetacean species;
2. Deploy and recover acoustic recorders;
3. Increase the number of confirmed sightings of Sei Whales and North Pacific Right Whales;
4. Obtain photo-identification data on several species (e.g. killer whales, fin whales, North Pacific Right whales); and,
5. Obtain biopsy samples from several species (e.g. killer whales, fin whales, North Pacific right whales).

### Collaborators

- Parks Canada



Map 1. Study area.



Images 1 and 2. Fin whale (*Balaenoptera physalus*) foraging (top), observers at work (bottom).

**FOR MORE INFORMATION** – State of the Pacific Ocean:

<http://dfo-mpo.gc.ca/oceans/publications/index-eng.html#soto>





**Dates:** August 1 – August 31, 2020  
**Recurrence:** Annually, year three of five (2018-2022)  
**Locations:** Johnstone Strait, Queen Charlotte Strait,  
Queen Charlotte Sound  
**Vessel:** Zodiac Hurricane – Merlin (7 m)  
**Lead scientist:** Sheila J Thornton (604) 666-1298  
[Sheila.Thornton@dfo-mpo.gc.ca](mailto:Sheila.Thornton@dfo-mpo.gc.ca)



### Description

Deployment of suction-cup data-logging tags to assess night time activity budget, diving and foraging behaviours, vocalizations, and received sound levels in Northern Resident Killer Whales, in relation to the acoustic environment. These data will assist in providing the best available science advice for management actions related to decreasing acoustic impacts on Killer Whales.

### Objectives

1. Evaluate foraging effort during the night and compare to daytime effort;
2. Evaluate foraging effort in relation to acoustic environment;
3. Examine catch per unit effort behaviour of tagged whales and factors that may affect foraging success; and,
4. Correlate foraging behaviour with physiological parameters (e.g. stress hormones from biopsy and fecal samples).

### Collaborators

- National Oceanic and Atmospheric Association
- University of British Columbia
- Ocean Wise
  - Coastal Ocean Research Institute



Map 1. Study areas.



Image 1. Killer Whale (*Orcinus orca*) with suction-cup tag.

**FOR MORE INFORMATION** – Fine scale foraging research:

<https://movementecologyjournal.biomedcentral.com>







**Dates:** September 29 – October 4, 2020  
**Recurrence:** Annually, since 2014  
**Locations:** West Basin, West Arm, North Arm and East Arm of Quesnel Lake  
**Vessel:** R/V Elvis  
**Lead scientist:** Svein Vagle (250) 363-6339  
[Svein.Vagle@dfo-mpo.gc.ca](mailto:Svein.Vagle@dfo-mpo.gc.ca)



## Description

The 2014 breach of the Mount Polley mine tailings impoundment released 25 M m<sup>3</sup> of tailings and water into the West Basin of Quesnel Lake, an important Sockeye salmon nursery lake. Five moorings are maintained in the lake to monitor turbidity, temperatures, and currents in support of research on ecosystem recovery.

## Objectives

1. Understand water movement in Quesnel Lake and its three arms;
2. Track sediment transport in the lake;
3. Understand the influence of autumn and spring lake turnover on sediment resuspension; and,
4. Track year to year changes in sediment load and how these changes impact the ecosystem in the lake and the downstream Quesnel River, especially for sockeye and chinook salmon.

## Collaborators

- University of British Columbia
- University of Northern British Columbia



Map 1. Study locations.



Image 1. Project crew preparing to deploy a mooring.

## FOR MORE INFORMATION

Petticrew, E. L., S.J. Albers, S.A. Baldwin, E.C. Carmack, S.J. Dery, N. Gantner, K. E. Graves, B. Laval, J. Morrison, P.N. Owens, D.T. Selbie, and S. Vagle (2015), The impact of a catastrophic mine tailings impoundment spill into one of North America's largest fjord lakes: Quesnel Lake, British Columbia, Canada. *Geophys. Res. Lett.*, 42, doi:10.1002/2015GL063345.







**Dates:** April – November 2020  
**Recurrence:** Annually, since 1997  
**Locations:** Fraser River basin, including Stuart, Nechako, Quesnel, Chilcotin, Shuswap, Seton, Harrison, Chilliwack watersheds  
**Lead scientist:** David Patterson (604) 666-5671  
[David.Patterson@dfo-mpo.gc.ca](mailto:David.Patterson@dfo-mpo.gc.ca)



*Image 1. Testing adult salmon on the Fraser River near Chilliwack.*

## Description:

Environmental conditions impact salmon migratory and reproductive success. This research on the migration biology of Pacific salmon under variable environmental conditions informs the science advice provided to fisheries and habitat managers.

## Objectives

1. Assess biological condition of juvenile and adult sockeye salmon in relation to migration conditions in Fraser Basin;
2. Research the impact of migratory stress on salmon survival (e.g. water temperature, fishing interactions, high discharge);
3. Generate quantitative models to forecast in-season estimates of loss for Fraser sockeye; and,
4. Apply research on migratory stress and environmental conditions to describe post-season estimates of mortality and predict in-season estimates of loss for proactive fisheries management.

## Collaborators

- Pacific Salmon Commission
- University of British Columbia
- Simon Fraser University
- Lower Fraser Fisheries Alliance and Upper Fraser Fisheries Conservation Alliance



*Map 1. Study locations.*



*Image 2. Sockeye salmon (Oncorhynchus nerka) at the Adam's River.*

**FOR MORE INFORMATION** – Environmental Watch Program:

<https://www.pac.dfo-mpo.gc.ca/science/habitat/frw-rfo/index-eng.html>





**Dates:** July – November, 2020  
**Recurrence:** Varied, since 1974  
**Locations:** Cultus, Shuswap, Little Shuswap, Quesnel, and Kamloops lakes  
**Vessel:** DFO Vessel Night Echo  
**Lead scientist:** Daniel Selbie (604) 824-4702  
[Daniel.Selbie@dfo-mpo.gc.ca](mailto:Daniel.Selbie@dfo-mpo.gc.ca)



## Description

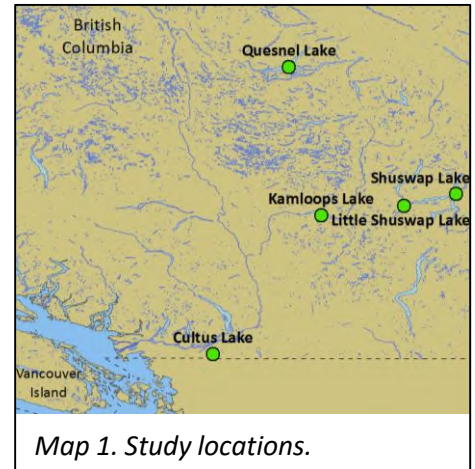
Rotational surveys of juvenile Sockeye Salmon (*Oncorhynchus nerka*) abundance, diet, and condition in Fraser River nursery lake ecosystems.

## Objectives

1. Estimate abundances and densities of juvenile Sockeye Salmon populations in key nursery lake ecosystems;
2. Evaluate growth and survival during lake rearing life stages;
3. Evaluate juvenile Sockeye Salmon diets in relation to lake food webs; and,
4. Evaluate juvenile Sockeye Salmon population condition and stock status.

## Collaborators

- Secwepemc Fisheries Commission



Map 1. Study locations.



Image 1. Hauling a catch of pelagic fish onboard.

## FOR MORE INFORMATION

Contact the Lead Scientist at [Dan.Selbie@dfo-mpo.gc.ca](mailto:Dan.Selbie@dfo-mpo.gc.ca)





**Dates:** August – September 2020  
**Recurrence:** Annually, since 2012  
**Locations:** Okanagan Lake, Okanagan River, Vaseux Lake  
**Lead scientist:** Sean MacConnachie (250) 756-7223  
[Sean.MacConachie@dfo-mpo.gc.ca](mailto:Sean.MacConachie@dfo-mpo.gc.ca)



## Description

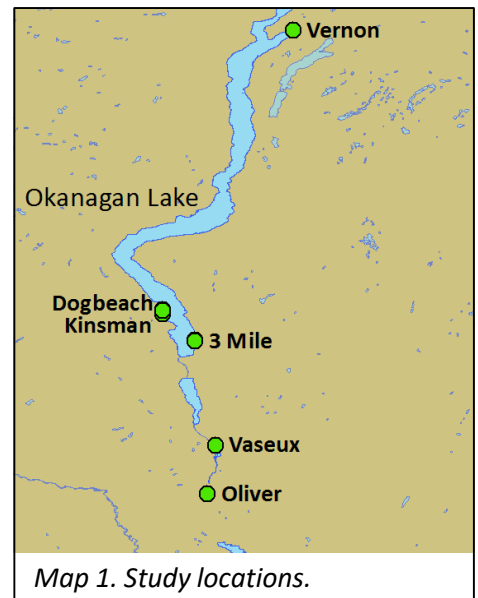
This annual snorkel survey is undertaken to assess the relative abundance of Rocky Mountain Ridged Mussel—a species listed under the *Species at Risk Act*—throughout the Okanagan Valley at index sites.

## Objectives

1. Undertake annual survey of key mussel beds;
2. Develop a long-term data series to inform future assessment by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) on abundance trends; and,
3. Explore the range of Rocky Mountain Ridged Mussel throughout the Okanagan valley lakes to find additional mussel beds.

## Collaborators

- Province of British Columbia
  - Forests, Lands, Natural Resource Operations and Rural Development



Map 1. Study locations.



Image 1. Rocky Mountain Ridged Mussel (*Gonidea angulata*).

**FOR MORE INFORMATION – Species at Risk:**

[https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails\\_e.cfm?sid=791](https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=791)







**Dates:** January – December, 2020  
**Recurrence:** Varied, since 1985  
**Locations:** Cultus Lake, Quesnel Lake  
**Vessels:** G.E. Hutchinson, K.R.S. Shortreed  
**Lead scientist:** Daniel Selbie (604) 824-4702  
[Daniel.Selbie@dfo-mpo.gc.ca](mailto:Daniel.Selbie@dfo-mpo.gc.ca)



## Description

Limnological assessments of juvenile Sockeye Salmon (*Oncorhynchus nerka*) nursery lake food webs and productive capacity modeling.

## Objectives

1. Evaluate sockeye salmon food webs in key nursery lake ecosystems;
2. Establish habitat and population-based ecosystem carrying capacities for juvenile sockeye salmon;
3. Define freshwater productive capacity limitations for Sockeye Salmon marine and freshwater fisheries;
4. Evaluate anthropogenic and natural habitat drivers on Sockeye Salmon important habitat and fisheries production; and,
5. Nursery lake ecosystem modeling in relation to climate change and variability.

## Collaborators

- Simon Fraser University
- University of British Columbia
- Queen's University



Map 1. Study locations.



Image 1. Limnological sampling for water chemistry and plankton.

## FOR MORE INFORMATION

Contact the Lead Scientist at [Dan.Selbie@dfo-mpo.gc.ca](mailto:Dan.Selbie@dfo-mpo.gc.ca)







**Dates:** April 1, 2020 – March 31, 2021  
**Recurrence:** Annually, since 1950  
**Locations:** Fraser River basin, including Upper Fraser, Stuart, Nechako, Quesnel, Chilcotin, Thompson, Seton, Harrison, and Chilliwack watersheds  
**Lead scientist:** David Patterson (604) 666-5671  
[David.Patterson@dfo-mpo.gc.ca](mailto:David.Patterson@dfo-mpo.gc.ca)



*Image 1. Chilcotin river, a salmon migration corridor monitored for temperature.*

## Description

Monitoring and forecasting of water temperatures in salmon migratory corridors of the Fraser River helps inform fisheries and habitat managers.

## Objectives

1. Provide water temperature information on migratory conditions for Pacific salmon in Fraser River watershed;
2. Monitoring water temperatures in select migratory corridors for Pacific salmon;
3. Analyze water temperature information in relation to changes associated climate and land-use activities; and,
4. Forecast water temperatures to predict likelihood of exposure of adult sockeye salmon to adverse migration conditions; and input data into mortality models.

## Collaborators

- Province of British Columbia
- Environment Climate Change Canada
- Simon Fraser University



*Map 1. Study locations.*



*Image 2. Real time water temperature logger installation on Stuart River.*

**FOR MORE INFORMATION – Environmental Watch Program:**

<https://www.pac.dfo-mpo.gc.ca/science/habitat/frw-rfo/index-eng.html>





**Dates:** April 1, 2020 – March 31, 2021  
**Recurrence:** Ongoing, since 1975  
**Locations:** British Columbia and Yukon  
**Lead scientist:** Kathryn Fraser (250) 756-7371  
[Kathryn.Fraser@dfo-mpo.gc.ca](mailto:Kathryn.Fraser@dfo-mpo.gc.ca)

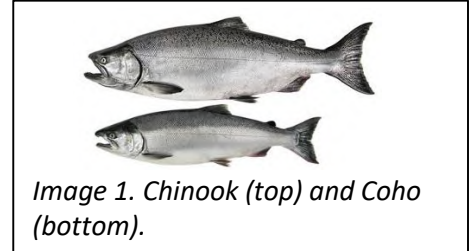


Image 1. Chinook (top) and Coho (bottom).

Coded Wire Tag (CWT) Fisheries Sampling provides fundamental information to:

- Understand how Chinook and Coho stocks migrate in the ocean;
- Estimate marine survival rates, exploitation rates, abundance, and productivity;
- Support different management decisions affecting long term viability of Chinook and Coho stocks and fisheries; and
- Evaluate hatchery strategies and contributions to fisheries.

A CWT is a microscopic fish tag that contains a unique code. CWTs are injected into snouts of juvenile salmon prior to ocean migration. The numeric code on a CWT can be precisely matched to a variety of information about the fish, such as hatchery, stock and stream origin, age, and other attributes. Most CWT projects tag juvenile salmon at hatchery facilities.

In Canada there are 14 Chinook CWT indicator stocks and 12 Coho CWT indicator stocks. The use of CWT indicator stocks allows for the tracking of stocks that represent naturally spawning wild populations through the life cycle of the fish, as they migrate to the ocean, distribute through the marine environment, are caught in fisheries, and return to spawn.



Map 1. CWT areas.

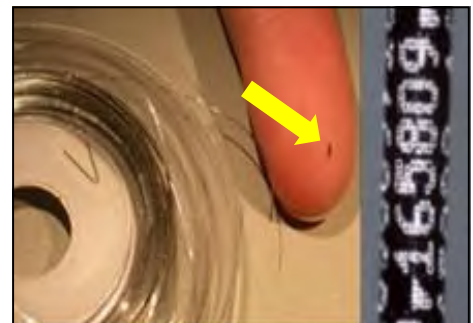


Image 2. Individual tags are cut from a spool of wire and are 1.1 mm long.

## FOR MORE INFORMATION – CWT Program:

<http://www.pac.dfo-mpo.gc.ca/pacific-smon-pacifique/science/research-recherche/cwt-mmc-eng.html>





The CWT Program is a coordinated and standardized set of tagging and sampling projects at Canadian and U.S. hatcheries, in fisheries, and on spawning grounds. It is relied upon for Canadian stock and fishery assessments as well as by the Pacific Salmon Commission Technical Committees for bi-lateral modelling because salmon swim across international borders.



*Image 3. CWT Tagging of Juvenile Salmon.*

### Objectives

- Sample 20% of the Chinook and Coho salmon caught in British Columbia and Yukon commercial, recreational, and Indigenous fisheries; and,
- Collect heads or snouts from fish that may contain CWTs, and collect associated catch monitoring data such as where, when, size, and how the fish was caught.



*Image 4. CWT Sampling is a Dockside Monitoring Program.*

### Collaborators

- First Nations, Commercial and Recreational Stakeholders.
- Marinas, tackle stores, fishing lodges, hatcheries, and First Nations communities who host Salmon Head Recovery Depots.



*Image 5. Salmon Head Recovery Depot.*

### FOR MORE INFORMATION – Chinook and Coho Indicator Stocks:

Yukon River	Steve Smith	(867) 393-6724	<a href="mailto:Steve.J.Smith@dfo-mpo.gc.ca">Steve.J.Smith@dfo-mpo.gc.ca</a>
Transboundary	Bill Waugh	(867) 393-6764	<a href="mailto:Bill.Waugh@dfo-mpo.gc.ca">Bill.Waugh@dfo-mpo.gc.ca</a>
North Coast	Shaun Davies	(250) 627-3472	<a href="mailto:Shaun.Davies@dfo-mpo.gc.ca">Shaun.Davies@dfo-mpo.gc.ca</a>
South Coast	Wilf Luedke	(250) 756-7222	<a href="mailto:Wilf.Luedke@dfo-mpo.gc.ca">Wilf.Luedke@dfo-mpo.gc.ca</a>
Fraser and Interior	Timber Whitehouse	(250) 851-4833	<a href="mailto:Timber.Whitehouse@dfo-mpo.gc.ca">Timber.Whitehouse@dfo-mpo.gc.ca</a>







**Dates:** April 2020 – March 2021  
**Recurrence:** Annually, since ~1905  
**Locations:** Pacific Region wide  
  
**Lead scientist:** Diana Dobson (250) 756-7186  
[Diana.Dobson@dfo-mpo.gc.ca](mailto:Diana.Dobson@dfo-mpo.gc.ca)



Map 1. DFO administrative areas.

## Description

DFO Science and Fisheries Management staff, often in collaboration with partners, deliver three area-based types of monitoring programs to support salmon stock assessment in Pacific region:

- 1. Population monitoring** programs collect information to estimate the abundance and/or condition of individuals within a population. Methods and techniques used range from basic visual surveys to application intensive mark-recapture or passage enumeration and associated biological sampling.
- 2. Catch monitoring** programs collect information to estimate the number of salmon caught, the number released, fishing effort, and the stock and age composition of the catch in order to evaluate harvest impacts on stocks. Catch, releases and fishing effort are estimated through a combination of harvester reporting and survey methods. Age and stock composition is estimated by sampling catch for scales, DNA, coded-wire tags and other unique stock identifiers, such as thermally marked otoliths.



Image 1. Tagging Coho Salmon held in mesh holding pens.



Image 2. Chinook Salmon mark recapture population study.

**FOR MORE INFORMATION** – Pacific Salmon Stock Assessment and Research:

<http://www.pac.dfo-mpo.gc.ca/pacific-smon-pacifique/science/research-recherche/index-eng.html>







Description (cont'd)

3. **Ecosystem monitoring** programs collect information to monitor changes in the habitats salmon depend on and understand the effect of these changes on salmon populations. From basic water quality monitoring to comprehensive hydrology or food-web studies, the information generated by these programs is compiled annually to provide advice on the management of salmon populations.

Collaborators

Collaborators participate by implementing basic monitoring programs, and by conducting or sponsoring more comprehensive stock or habitat assessments and evaluations.

- First Nations and Indigenous organizations
- Stewardship groups and watershed boards
- Harvest groups
- Universities
- Municipalities, province of British Columbia and Yukon territory.



Image 3. Nass River fish wheel operated by Nisga'a Fisheries.

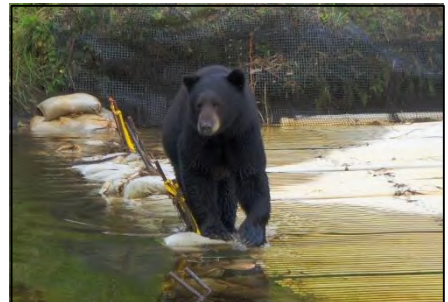


Image 4. Black bear walking across counting fence.



Image 5. Chinook Salmon float counts to generate population estimate.

FOR MORE INFORMATION

Yukon River	Steve Smith	(867) 393-6724	<a href="mailto:Steve.J.Smith@dfo-mpo.gc.ca">Steve.J.Smith@dfo-mpo.gc.ca</a>
Transboundary	Bill Waugh	(867) 393-6764	<a href="mailto:Bill.Waugh@dfo-mpo.gc.ca">Bill.Waugh@dfo-mpo.gc.ca</a>
North Coast	Shaun Davies	(250) 627-3472	<a href="mailto:Shaun.Davies@dfo-mpo.gc.ca">Shaun.Davies@dfo-mpo.gc.ca</a>
South Coast	Wilf Luedke	(250) 756-7222	<a href="mailto:Wilf.Luedke@dfo-mpo.gc.ca">Wilf.Luedke@dfo-mpo.gc.ca</a>
Fraser and Interior	Timber Whitehouse	(250) 851-4833	<a href="mailto:Timber.Whitehouse@dfo-mpo.gc.ca">Timber.Whitehouse@dfo-mpo.gc.ca</a>



## ANNEX C: Datasets published in 2019 – 2020

In 2019-2020, Pacific Science published nine new datasets on the [Open Government Portal](#), and updated datasets to reflect new data collected during the year.

### Access these datasets by:

1. Visiting the [Open Government Portal](#)
2. Copying and pasting the name of the dataset in the search box
3. Clicking the “Find” button

**Table 1:** Datasets published by Pacific Science on Open Government Data (2019 – 2020)

Subject	Dataset Name
Aquatic Invasive Species monitoring	<ul style="list-style-type: none"> <li>• Aquatic Invasive Species European Green Crab (<i>Carcinus maenas</i>) Monitoring, British Columbia (<i>new</i>)</li> </ul>
Marine mammal conservation	<ul style="list-style-type: none"> <li>• Sea otter (<i>Enhydra lutris</i>) Population Counts, British Columbia, 1977-2013 (<i>new</i>)</li> </ul>
Oceanography monitoring	<ul style="list-style-type: none"> <li>• Standard Oceanographic Sampling Stations (<i>new</i>)</li> <li>• British Columbia Lightstation Sea-Surface Temperature and Salinity Data (Pacific), 1914-present (<i>updated</i>)</li> </ul>
Pacific Salmon conservation	<ul style="list-style-type: none"> <li>• Pacific Salmon Conservation Units, Sites &amp; Status (<i>new</i>)</li> <li>• Ocean Salmon Program – Barkley Sound Juvenile Salmon Study from 1987 to 1994 (<i>new</i>)</li> <li>• Chum Salmon Conservation Units, Sites &amp; Status (<i>updated</i>)</li> <li>• Southern BC Chinook Salmon Conservation Units, Sites &amp; Status (<i>updated</i>)</li> <li>• River Type Sockeye Salmon Conservation Units, Sites &amp; Status (<i>updated</i>)</li> <li>• Lake Type Sockeye Salmon Conservation Units, Sites &amp; Status (<i>updated</i>)</li> <li>• Even Year Pink Salmon Conservation Units, Sites &amp; Status (<i>updated</i>)</li> <li>• Odd Year Pink Salmon Conservation Units, Sites &amp; Status (<i>updated</i>)</li> <li>• Chinook Salmon Conservation Units, Sites &amp; Status (<i>updated</i>)</li> <li>• Coho Salmon Conservation Units, Sites &amp; Status (<i>updated</i>)</li> <li>• Pacific Region Commercial Salmon Fishery In-season Catch Estimates (<i>updated</i>)</li> <li>• NuSEDS-New Salmon Escapement Database System (non-spatial) (<i>updated</i>)</li> <li>• Pacific recreational Fishery Salmon Head Depots (<i>updated</i>)</li> </ul>
Plankton monitoring	<ul style="list-style-type: none"> <li>• Ocean Station “Papa” Detailed Zooplankton Data: 1956-1980 (<i>new</i>)</li> <li>• The Strait of Georgia Ichthyoplankton Survey, 1979-1981 (<i>new</i>)</li> </ul>
Stock assessment	<ul style="list-style-type: none"> <li>• Groundfish Synoptic Bottom Trawl Surveys (<i>new</i>)</li> <li>• Herring biosample database (<i>new</i>)</li> <li>• Herring Permanent Spawn Transects (<i>updated</i>)</li> </ul>