



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada

# FIELDNOTES

## 2019 – 2020

Pacific Science Field Operations



**Cover illustration:** Top view of a deep-sea sea urchin and brittle stars observed at a depth of 2,230 metres.

**Photo credit:** Ocean Networks Canada.

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## SECTION 1

### 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.

Critical to the Department's success in fulfilling its science mandate is a recognition that the trust in the research and scientific information it provides—and indeed the trust in the decision-making process that makes use of such information—depends upon the integrity of the process by which such information is produced, managed and communicated.

The pursuit of scientific integrity—the condition resulting from adherence to concepts of transparency, openness, high quality work, avoidance of conflict of interest and ensuring high standards of impartiality and research ethics—creates an opportunity for DFO to think about how it effectively informs and engages Canadians in the creation, management, and communication of high quality knowledge, products and scientific advice.

*Fieldnotes* is one way DFO Science in Pacific Region is proposing to further its commitment to scientific integrity and ensuring Canadians are informed and feel engaged in the delivery of DFO's science mandate.



### Scientific Integrity

The condition resulting from adherence to concepts of transparency, openness, high quality work, avoidance of conflict of interest and ensuring high standards of impartiality and research ethics.

Similar to the ways in which notes recorded by scientists or researchers are intended to be read as evidence that gives meaning and aids in the understanding of a phenomenon, *Fieldnotes* intends to:

- inform Canadians of the science field operations scheduled to occur between May 2019 and March 2020 in the waters of British Columbia and the Yukon;
- 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; and,
- foster conditions that facilitate the pooling of collective expertise, experience, and resources.

To sum up, *Fieldnotes* is a prelude to continuous improvement, stronger relationships, and a commitment to doing better together.

## SECTION 2

### DFO PACIFIC SCIENCE

On behalf of all Canadians, over 600 DFO Science employees in Pacific Region are committed to working towards 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 them.

Through impactful and collaborative initiatives aligned with the Department's [core priorities](#), Science Branch provides the foundation for the Department's management and conservation decisions, and plays a pivotal role to commitments under several international treaties.

[Pacific Region Science](#) staff deliver vibrant, high quality research, extensive monitoring, robust science advice, and innovative products and services in addition to valuable data and information management in support of evidence-based decision-making that benefits all current and future Canadians.



### *Pacific Region*

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

Science in the Pacific Region is delivered with the support of the [Centre for Science Advice Pacific](#) and the Strategic Planning Unit, through science staff housed in five divisions at four regional science centers, and through salmon stock assessment science staff located in four Area Offices. Refer to Annex A for more details.

Further, with a functional presence across the Region, Pacific Science staff is 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.



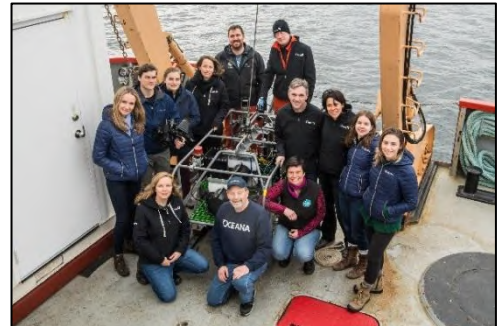
**FOR MORE INFORMATION** – Pacific Science website

<http://www.pac.dfo-mpo.gc.ca/science/index-eng.html>

**By the Numbers:**

**Science Workforce in Pacific Region**

- ~ **617** Science employees
- ~ **23** percent of all DFO employees in Pacific Region
- **4** main research stations
  - **> 200** support staff and scientists at the Pacific Biological Station in Nanaimo
  - **> 250** scientists and researchers at Sidney's Institute of Ocean Sciences
  - ~ **10** science staff at the Cultus Lake Salmon Research Laboratory
  - ~ **35** science staff at the Pacific Science Enterprise Centre located in West Vancouver
- **4** area offices with **> 83** stock assessment biologists
  - Yukon Transboundary Area Office in Whitehorse, YK.
  - North Coast Area Office in Prince Rupert, BC.
  - South Coast Area Office in Nanaimo, BC.
  - Fraser and Interior British Columbia Area offices in Delta and Kamloops,
- Together, this dedicated workforce annually conducts **> 50** separate field operations, spends countless hours performing salmon stock assessment activities, and publishes ~ **51** peer-reviewed scientific articles through the [Canadian Science Advisory Secretariat](#).



### SECTION 3

## SCHEDULED FIELD OPERATIONS: 2019—2020

Fifty-seven DFO Science field operations are currently scheduled to occur between April 2019 and March 2020 in the offshore, nearshore, and inland waters of British Columbia and the Yukon. Fact sheets outlining details of this field programming can be found in Annex B. Each fact sheet includes:

- an identification number, a primary field operations category, and a title;
- the dates, recurrence and locations of the work;
- a description of the programming and associated objectives;
- a list of collaborators when available; and,
- the name and contact information of the responsible DFO Lead Scientist.

To help the reader identify field operations of interest, an alphabetical and a geographic index are provided.

Note that in this edition of *Fieldnotes*, salmon stock assessment monitoring activities—population monitoring, catch monitoring and ecosystem monitoring—conducted out of the areas are condensed into one fact sheet (#57).



### Field Operations Category



Human Impacts  
Research and Monitoring



Hydrographic  
and Oceanographic Surveys



Population  
and Ecosystem Assessments

Future editions of *Fieldnotes* will endeavor to capture the breadth and diversity of this programming.

Should you have any questions or comments on the field programming, interest in collaborative science, or would like to offer suggestions to improve how DFO Science communicates, please contact the Lead Scientist identified for each field operation who will be pleased to discuss further.





## ■ SECTION 4

### REPORTING RESULTS

Ensuring that research and scientific information produced by Pacific Science is made available to the public in an open, timely and transparent manner is a key principle of scientific integrity.

Field programming findings 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](#).

Note that each June, Pacific Science publishes a [technical report](#) 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.

Efforts to improve reporting and make field data available continue.



### *Did you know?*

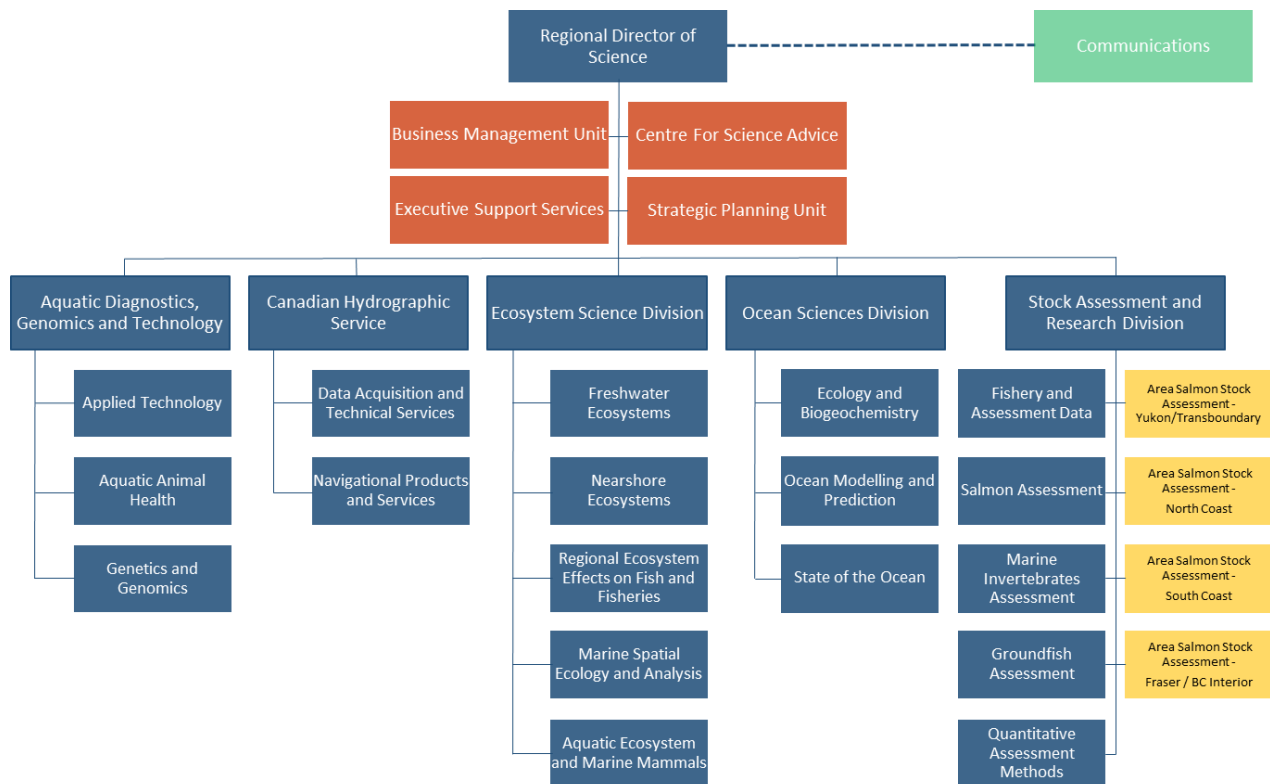
In 2019 - 2020, Pacific Science field program staff and their collaborators will:

- Monitor ~ **200** temperature loggers to track water quality in **> 100** Pacific Salmon streams in the Fraser River Basin.
- Research and monitor **12** species of commercially cultured invertebrates—including Pacific oysters, Manila clams, mussels, and Pacific scallops.
- Continue to search for and monitor geoduck beds; to date, **> 5,200** have been identified and assessed in British Columbia.
- Acquire scientific information and / or provide advice on **> 11** out of > 60 Pacific Region aquatic species at risk listed under the *Species at Risk Act*.
- Release the **1,000<sup>th</sup>** surface current tracker; data from these drifters—affectionately known as spongebobs—improve our understanding of surface currents and support oceanographic model development.
- Lead **2** deep-sea expeditions; previous missions led to the prediction and charting of extensive and previously unknown underwater mountain ranges, and the discovery of an untold number of new species.
- Undertake the **128<sup>th</sup>** year of hydrographic charting on the Pacific Coast.
- Survey the **1,700** km the length of *Line P*—the longest oceanographic transection in the north east Pacific, as well as the longest uninterrupted oceanographic surveys: **63** years.
- Conduct the **46<sup>th</sup>** Northern Resident Killer Whale annual census: one of the longest continuous time series of data for any marine mammal.
- Conduct the **79<sup>th</sup>** annual Butter Clam assessment survey on Seal Island: the longest DFO time-series on population trends for intertidal bivalves in British Columbia.



ANNEX A

PACIFIC SCIENCE ORGANIZATION



Science in the Pacific Region is delivered through a workforce housed in five divisions located at four research centres (blue) and four area offices (yellow); four management units (orange) provide support:

Supporting Management Units

**Executive Support Services:** Provides Administrative support to the Regional Director of Science.


**Business Management Unit:** Oversees corporate files related to finance, position classification, health and safety, business planning, site operations, storage and warehousing.


**Strategic Planning Unit:** Supports the Regional Director of Science, coordinates the regional science management team, develops strategic solutions to facilitate the delivery of science programs, including advancing reconciliation.


**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. Advice might relate to the state of an ecosystem, the impacts of a human activity, the effectiveness of a mitigation strategy or many other areas under DFO’s mandate.




Approximately 21 employees are located at the Pacific Biological Station (PBS) in Nanaimo and at the Institute of Ocean Sciences (IOS) in Sidney.

Aquatic Diagnostics, Genomics, and Technology Division (ADGT)		Program Inventory: P9
<p><b>Develops, improves and applies new technologies to support fisheries and aquaculture management. Work includes:</b></p> <ul style="list-style-type: none"> <li>• 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;</li> <li>• 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;</li> <li>• 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,</li> <li>• Conducting risk assessments of novel organisms and pathogens.</li> </ul>		
<p><b>Departmental Core Responsibility:</b> Fisheries</p> <p>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.</p>		<p><b>2019–2020 Fact Sheet ID</b></p> <p>None scheduled</p>
	<p>Approximately 106 ADGT employees are located at the Pacific Biological Station (PBS) in Nanaimo, and at the Pacific Science Enterprise Centre (PSEC) located in West Vancouver.</p>	
<b>Manager</b>	Lesley MacDougall	<b>Email:</b> <a href="mailto:Lesley.MacDougall@dfo-mpo.gc.ca">Lesley.MacDougall@dfo-mpo.gc.ca</a> <b>Tel:</b> (250) 756-7395

Canadian Hydrographic Service (CHS)		Program Inventory: P25
<p><b>Provides products and services to aid safe navigation of vessels in Canada's marine waters. Work includes:</b></p> <ul style="list-style-type: none"> <li>• Providing up-to-date, authoritative, and standardized hydrosatial information in the form of bathymetric surveys, hydrographic charts, and water level information in real-time;</li> <li>• Maintaining a national network of tide gauges to measure and disseminate water level data;</li> <li>• 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.</li> </ul>		
<p><b>Departmental Core Responsibility:</b> Marine Navigation</p> <p>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.)</p>		<p><b>2019–2020 Fact Sheet ID</b></p> <p>8 and 9</p>
	<p>Approximately 77 CHS employees are located at the Institute of Ocean Sciences (IOS) in Sidney.</p>	
<b>Director</b>	Dave Prince	<b>Email:</b> <a href="mailto:Dave.Prince@dfo-mpo.gc.ca">Dave.Prince@dfo-mpo.gc.ca</a> <b>Tel:</b> (250) 363-6347

Ecosystem Science Division (ESD)		Program Inventory: 17
<p><b>Conducts research and monitoring activities to enhance understanding of aquatic ecosystems, and supports the integrated management of diverse human activities. Work includes:</b></p> <ul style="list-style-type: none"> <li>• Conducting research on marine mammals, species at risk and marine ecosystem characterization;</li> <li>• Conducting ecosystems research and monitoring for Pacific Region freshwater and anadromous species, especially salmon;</li> <li>• Conducting research on aquaculture including nutrition and invertebrates, monitoring aquatic invasive species and the effects of human activity on coastal marine and estuarine environments;</li> <li>• 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;</li> <li>• Executing surveys, completing analysis, supporting assessments and developing models of regional freshwater and marine ecosystem effects on fish and associated capture and culture fisheries.</li> </ul>		
<p><b>Departmental Core Responsibility:</b> Aquatic Ecosystems</p> <p>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.</p>		<p><b>2019–2020 Fact Sheet ID</b></p> <p>1, 3, 4, 5, 6, 10, 17, 18, 25, 26, 27, 28, 31, 34, 35, 37, 40, 41, 43, 50, 52, 53, 54, 55</p>
	<p>Approximately 147 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.</p>	
<b>Director</b>	Eddy Kennedy	<p><b>Email:</b> <a href="mailto:Eddy.Kennedy@dfo-mpo.gc.ca">Eddy.Kennedy@dfo-mpo.gc.ca</a></p> <p><b>Tel:</b> (250) 756-3360</p>

Ocean Sciences Divisions (OSD)		Program Inventory: P18
<p><b>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:</b></p> <ul style="list-style-type: none"> <li>• Conducting collaborative research and development on ocean and coastal models in support of enhanced environmental protection and improved safety for navigation;</li> <li>• 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,</li> <li>• Contributing data to cumulative effects assessment, harmful algal blooms, noise, and other stressors on the marine ecosystem.</li> </ul>		
<p><b>Departmental Core Responsibility:</b> Aquatic Ecosystems</p> <p>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.</p>		<p><b>2019–2020 Fact Sheet ID</b></p> <p>2, 7, 11, 12, 13, 14, 15, 51</p>
	<p>Approximately 87 OSD employees are located at the Pacific Biological Station (PBS) in Nanaimo and at the Institute of Ocean Sciences (IOS) in Sidney.</p>	
<b>Manager</b>	Kim Houston	<p><b>Email:</b> <a href="mailto:Kim.Houston@dfo-mpo.gc.ca">Kim.Houston@dfo-mpo.gc.ca</a></p> <p><b>Tel:</b> (250) 363-6378</p>

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

**Program Inventory: P11**

**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.

**2019–2020 Fact Sheet ID**

16, 19, 20, 21, 22, 23, 24, 29, 30, 32, 33, 36, 38, 39, 42, 44, 45, 46, 47, 48, 49, 56, 57



Approximately 84 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**

**Program Inventory: P11**

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 8 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 14 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 23 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 Kelowna, 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:  
2019—2020 DFO Pacific Science Field Operations**

▪ Alphabetical Index	1
▪ Geographic Index	4
▪ Fact Sheets: 1 to 57	7



**Human Impacts Research and Monitoring**

Field Operations	Fact Sheet ID
Aquaculture Monitoring and Modelling Program	4
Developing Cost Effective Tools to Assess Log Handling Areas	3
Juvenile Pacific Salmon: Acoustic Monitoring	2
Northern Resident Killer Whales: Rubbing Beach Study	1
Sockeye Salmon: Freshwater Migratory Stress	6
Southern Resident Killer Whales: Impacts of Underwater Noise	5

**Hydrographic and Oceanographic Surveys**

Field Operations	Fact Sheet ID
Bathymetry, Seabed Classification, and Tide Gauge Servicing	8-9
Biological Diversity and Ecosystem Dynamics: Explorer Seamount Range	10
Coastal Weather Stations Monitoring	13
Line P Monitoring Program	14
Marine Hazards Assessment: Canadian Polar Shelf	7
Oceanographic Survey: Southern Canadian Continental Shelf	12
Recovery and Deployment of Oceanographic Moorings	11
Water Properties Survey: Salish Sea	15



## Population and Ecosystem Assessments



Field Operations	Fact Sheet ID
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Assessment of Biological Communities in High and Low Current Rocky Habitat	35
Butter Clam Assessment Survey: Seal Island	36
Coastal Environmental Baseline: Port of Prince Rupert	18
Coastal Environmental Baseline: Port of Vancouver	37
Chinook and Coho Salmon: Coded Wire Tag Program	56
Crab Assessment Survey: Strait of Georgia	38
Dogfish Longline Hook Survey: Strait of Georgia	29
Green Sea Urchin Assessment Survey: Fulford Bay	39
Halibut, Lingcod, Rockfish: IPHC Fishery Independent Setline Survey	24
Harbour Seals Aerial Survey: Strait of Georgia and Gardner Canal	25
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Northern Abalone: Index Sites Survey	42
Northern Resident Killer Whale: Annual Census	27

## Population and Ecosystem Assessments

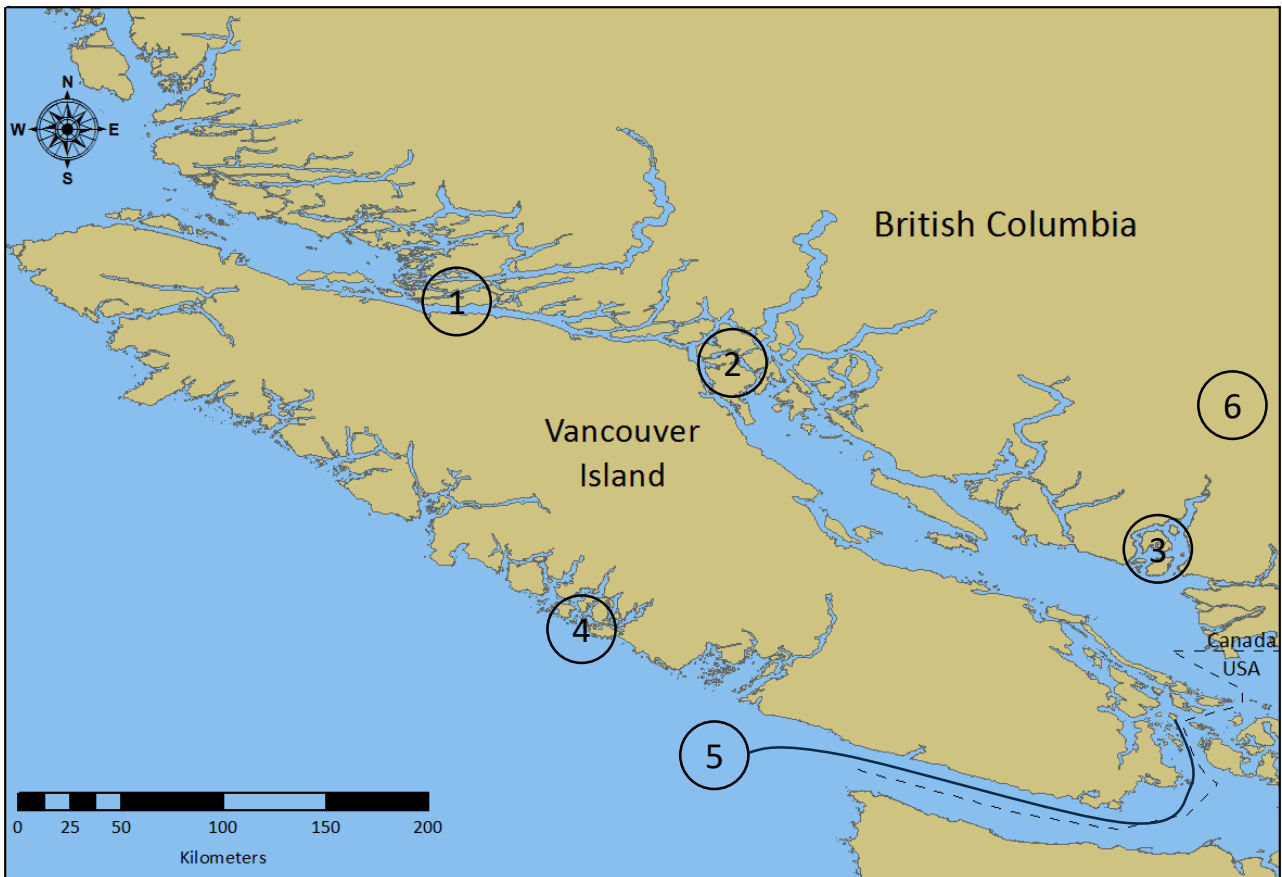


Field Operations	Fact Sheet ID
Northern Resident Killer Whale: DTAG Study	43
Olympia Oyster: Monitoring Surveys	44-45
Pacific Hake: Assessment Survey	20
Pacific Herring: Biological Sampling Surveys	21
Pacific Herring: Spawn Surveys	22
Pacific Oyster Seasonal Mortality: Baynes Sound	46
Pelagic Integrated Ecosystem Science Survey	34
Prawn Assessment Survey: Howe Sound	47
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Sablefish: Research and Assessment Survey	23
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Shrimp Assessment Survey: Strait of Georgia	48
Shrimp Assessment Survey: Chatham Sound and Queen Charlotte Strait	49
Southern Resident Killer Whale: Habitat Use Study	50
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Synoptic Bottom Trawl Survey: Queen Charlotte Sound	33
Synoptic Bottom Trawl Survey: Hecate Strait	16
Zooplankton Surveys: Strait of Georgia	51
Water Temperature Monitoring	55

**Human Impacts Research and Monitoring**



Map Marker	Fact Sheet ID
1	1
2	2
3	3
4	4
5	5
6	6



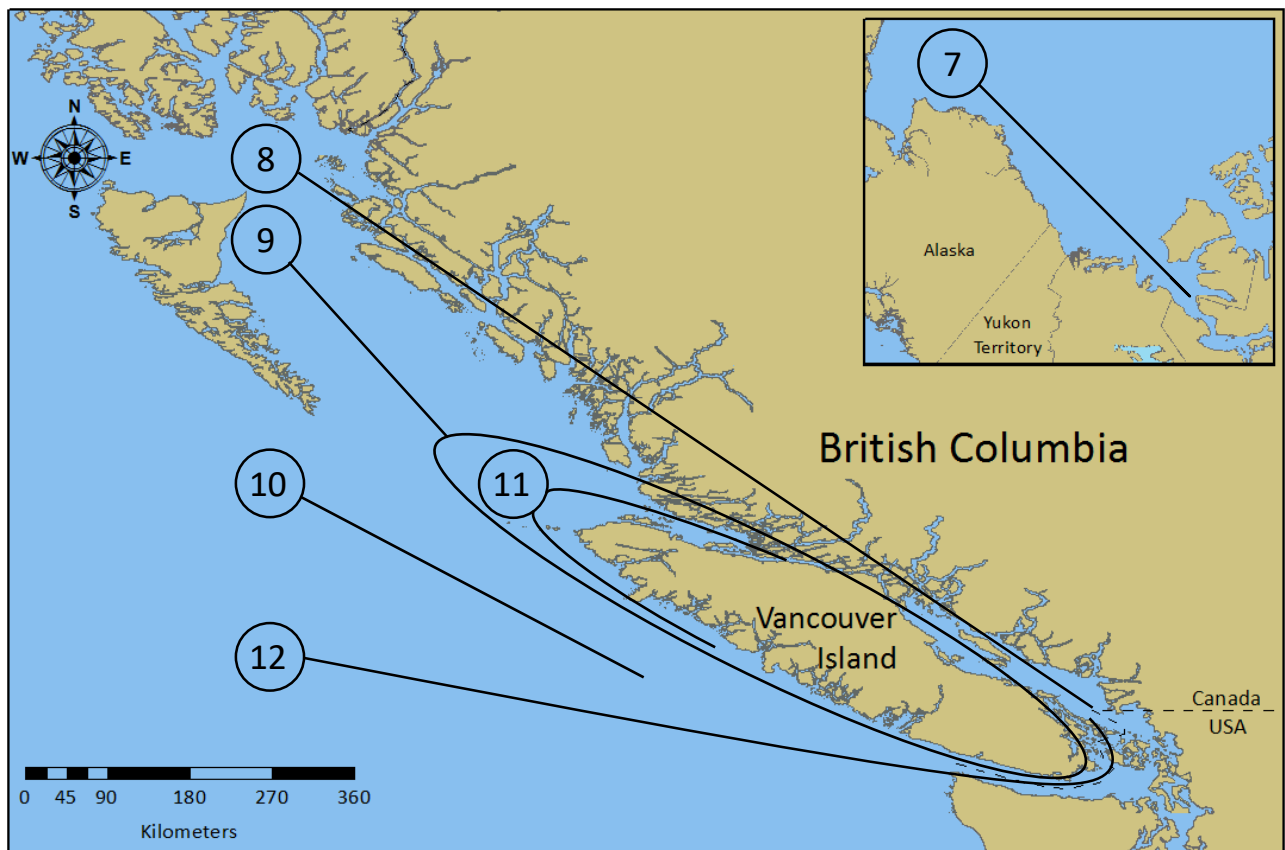
**NOTE**

Map markers are for illustrative purposes only and do not reflect the exact locations of the field operations scheduled for 2019-2020. They are intended to orient and direct the reader to their associated fact sheets where additional information is available.

**Hydrographic and Oceanographic Surveys**



Map Marker	Fact Sheet ID
7	7
8	8, 9
9	11, 12
10	10
11	13
12	14, 15



**NOTE**

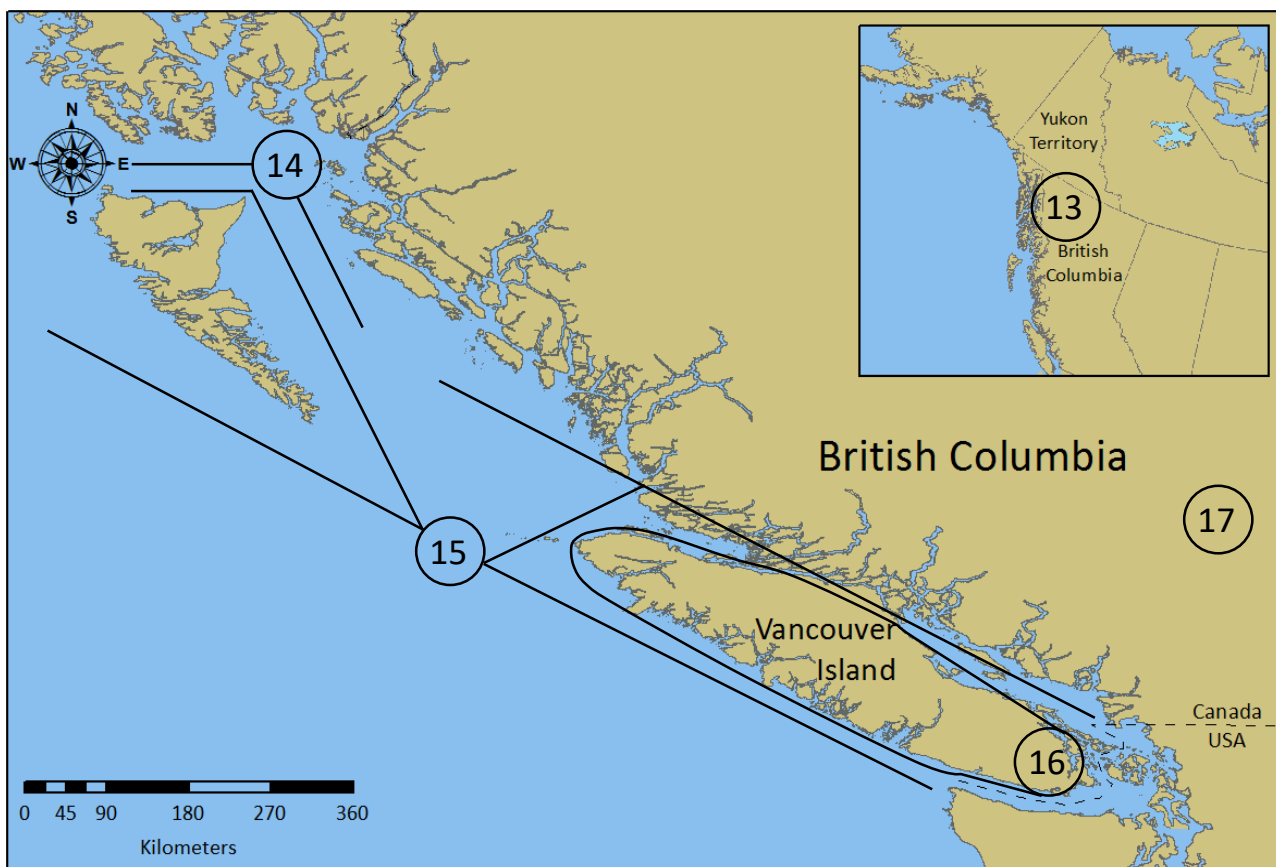
Map markers are for illustrative purposes only and do not reflect the exact locations of the field operations scheduled for 2019-2020. They are intended to orient and direct the reader to their associated fact sheets where additional information is available.



**Population and Ecosystem Assessments**



Map Marker	Fact Sheet ID
13	56, 57
14	16, 17, 18
15	19 to 28
16	29 to 51
17	52 to 55



**NOTE**

Map markers are for illustrative purposes only and do not reflect the exact locations of the field operations scheduled for 2019-2020. They are intended to orient and direct the reader to their associated fact sheets where additional information is available.



# Northern Resident Killer Whale Rubbing Beach Study

1

**Dates:** July 1 – August 31, 2019  
**Recurrence:** Annually, year one of four (2019-2022)  
**2019 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;
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

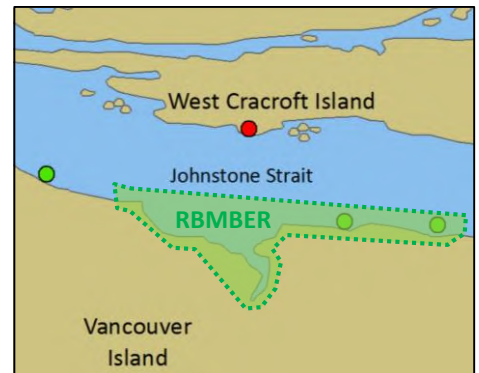


Figure 1. RBMBER study area with observation station (red circle) and hydrophone locations (green circles).



Figure 2. 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)



Fisheries and Oceans Canada  
Pêches et Océans Canada

Canada



**Dates:** April 1 – July 31, 2019  
**Recurrence:** Annually, year five of five (2015-2019)  
**2019 Locations:** 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

- Marine Harvest Canada
- Cermaq Canada



*Figure 1. Map of survey areas in Okisollo channel, between Quadra and Sonora Islands.*



*Figure 2. 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 1, 2019 – March 31, 2020  
**Recurrence:** Annually, since 2018  
**2019-2020 Location:** Gambier Island (Howe Sound)  
**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.

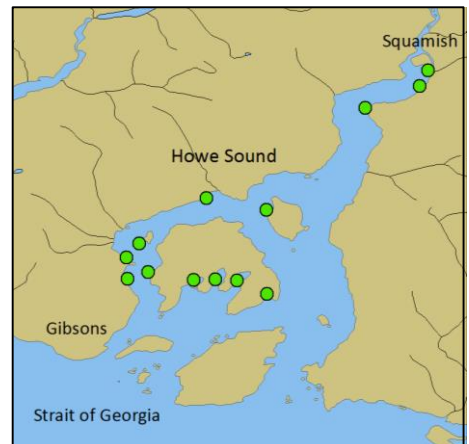


Figure 1. Map of survey areas.

## Collaborators

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

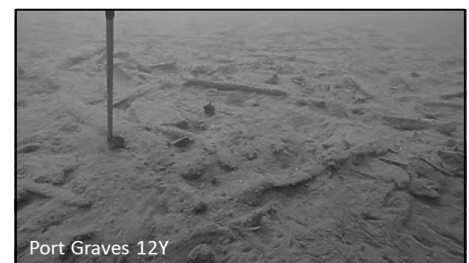


Figure 2. Benthic substrate of a log storage area 12 years following decommission.

## FOR MORE INFORMATION

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







**Dates:** June 2019, Oct 2019, Feb 2020  
**Recurrence:** Annually, since 2017  
**2019-2020 Location:** Clayoquot Sound  
**Vessel:** AMD Sturgeon Bay  
**Lead Scientist:** Theraesa Coyle (604) 666-8666  
[Theraesa.Coyle@dfo-mpo.gc.ca](mailto:Theraesa.Coyle@dfo-mpo.gc.ca)



## Description

This national program aims to detect, monitor and model inputs from aquaculture activities in the far-field marine environment.

## 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. Publish raw data for public use and produce annual summary reports; and,
5. Inform oceanographic model development.

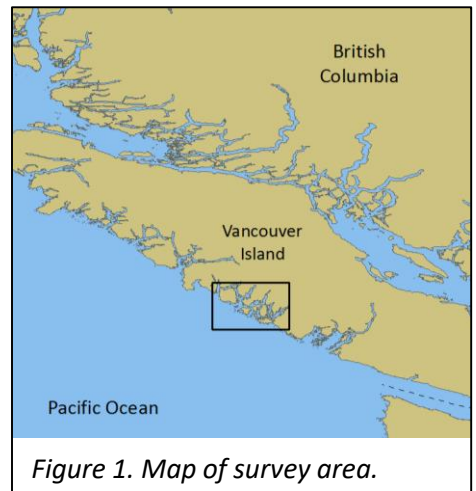


Figure 1. Map of survey area.



Figure 2. Deploying a Van Veen Grab for benthic sampling.

## FOR MORE INFORMATION

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





**Dates:** May, August, Nov 2019; March 2020  
**Recurrence:** Annually, year two of five (2018-2022)  
**2019-2020 Locations:** Swiftsure Bank, Juan de Fuca Strait, Haro Strait, Boundary Pass  
**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 (Figure 2);
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



Figure 1. Map of survey locations.



Figure 2. Mooring being recovered from the Vector.

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

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





# Sockeye Salmon Freshwater Migratory Stress

6

**Dates:** April – November 2019  
**Recurrence:** Annually, since 1997  
**2019 Locations:** Fraser River basin, including Stuart, Nechako, Quesnel, Chilcotin, Schushwap, Seton, Harrison, Chilliwack watersheds  
**Lead Scientist:** David Patterson (604) 666-5671  
[David.Patterson@dfo-mpo.gc.ca](mailto:David.Patterson@dfo-mpo.gc.ca)



Figure 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



Figure 2. Map of survey locations.



Figure 3. 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>



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada

Canada



**Dates:** September 25 – October 10, 2019  
**Recurrence:** Annually, since 1990  
**2019 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 22 submerged moorings, retrieve data, and redeploy the observing array for another year;
2. With collaborators, collect marine mammal sound recordings, sea-surface temperature, salinity, fluorescence, water and airborne contaminants, and seabed mapping; and,
3. Establish reliable 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

- Natural Resources Canada
- Environment and Climate Change Canada
- ArcticNet Inc. (Integrated Beaufort Observatory)
- USA Bureau of Ocean Energy Management
- National Oceanographic and Atmospheric Administration

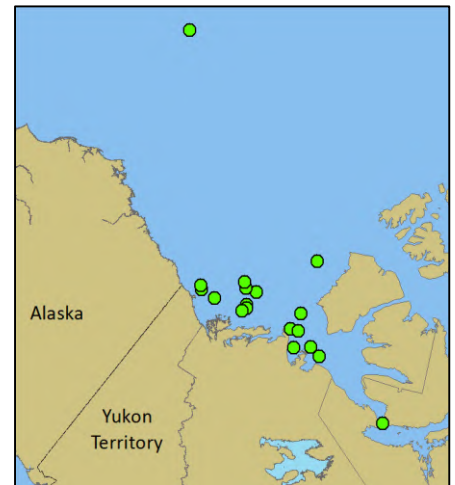


Figure 1. Map of study locations.



Figure 2. 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 1 – October 9, 2019  
**Recurrence:** Annually, since 1891  
**2019 Locations:** Stuart Channel, Desolation Sound,  
McNaughton Group, Gwaii Haanas  
**Vessel:** CCGS Otter Bay  
**Lead Scientist:** Gwil Roberts (250) 363-6356  
[Gwil.Roberts@dfo-mpo.gc.ca](mailto:Gwil.Roberts@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
  - Geological Survey of Canada
- Parks Canada
- Canadian Coast Guard
  - Real Property and Security Services



Figure 1. Map of survey areas: Vancouver Island to Hecate Strait.

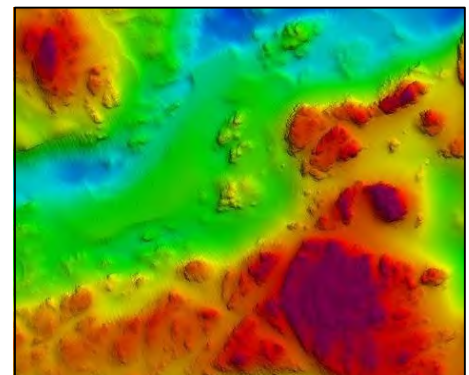


Figure 2. Sample of multibeam bathymetric data.

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

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





**Dates:** June 19 – August 14, 2019  
**Recurrence:** Annually, since 1891  
**2019 Locations:** Scott Islands, Queen Charlotte Sound, Queen Charlotte Strait, central BC coast.  
**Vessel:** CCGS Vector  
**Lead Scientist:** Gwil Roberts (250) 363-6356  
[Gwil.Roberts@dfo-mpo.gc.ca](mailto:Gwil.Roberts@dfo-mpo.gc.ca)



CCGS Vector

### Description

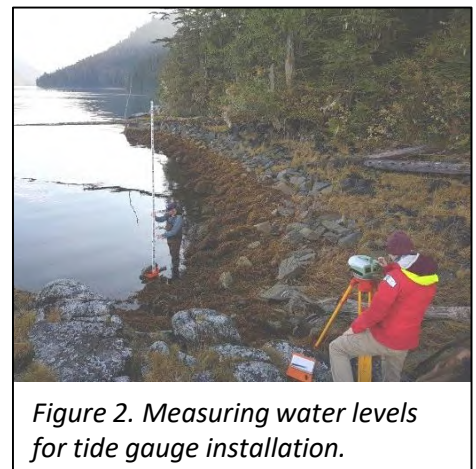
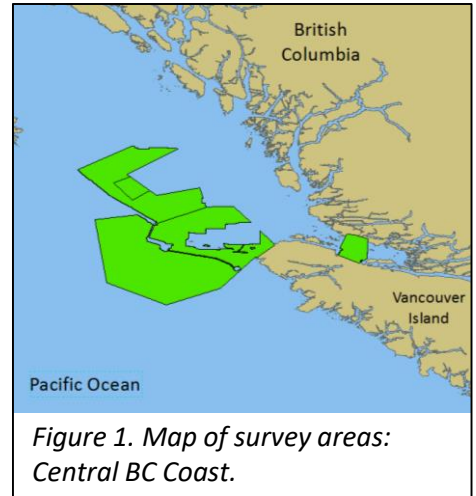
Mapping of the seabed and collection of bathymetry to enhance navigation safety with periodic tide gauge servicing.

### Objectives

1. Collect multibeam bathymetry to improve navigational charts and 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. Deploy Autonomous Hydrographic Surface Vehicle for additional inshore bathymetry data capture.

### Collaborators

- Natural Resources Canada
  - Geological Survey of Canada
- Environment and Climate Change Canada
  - Canadian Wildlife Service
  - Environmental Stewardship Branch



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

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





**Dates:** July 16 – 29, 2019  
**Recurrence:** 2019 only  
**2019 Location:** Offshore Pacific Area of Interest  
**Vessel:** CCGS J. P. Tully  
**Lead Scientist:** Tammy Norgard (250) 756-7005  
[Tammy.Norgard@dfo-mpo.gc.ca](mailto:Tammy.Norgard@dfo-mpo.gc.ca)



### Description

Survey of the Explorer Seamount Range within the Offshore Pacific Area of Interest. This visual, oceanographic, and bathymetric survey will focus on Explorer Seamounts and the surrounding submarine mountains.

### Objectives

1. Survey the deep seafloor of seamounts using high-resolution video and still imagery to collect novel data on species and habitats of interest;
2. Survey the biological & physical oceanography to improve understanding of the large-scale effects of seamounts on surrounding areas;
3. Test and potentially initiate effective methods for monitoring marine areas, including environmental DNA sampling;
4. Collect acoustic bathymetry to enable habitat modeling, mapping and verification of seamount locations and depths; and,
5. Livestream real-time deep-sea video and at-sea science communication to local and global audiences.

### Collaborators

- Ocean Networks Canada
- Nuu-chah-nulth and Haida First Nations



Figure 1. Map of survey location: Explorer Seamount Range.

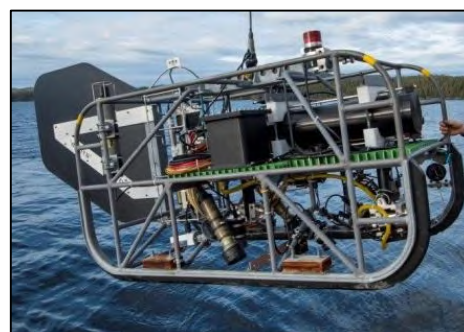


Figure 2. The DFO Pacific deep-sea camera and sensor system that can dive to 2 km depth.

**FOR MORE INFORMATION – 2017 Union and Dellwood Seamounts Survey:**

<http://dfo-mpo.gc.ca/science/atsea-enmer/missions/2017/offshoreaoi-sihauturiere-eng.html>





**Dates:** July 28 – August 13, 2019  
**Recurrence:** Annually, since 1976  
**2019 Locations:** Strait of Georgia and Inlets; Johnstone Strait; Haida Gwaii; Hecate Strait; Queen Charlotte Strait; West Coast Vancouver Is  
**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 and phytoplankton samples;
4. Collect sediment samples;
5. Collect environmental DNA samples; and,
6. Deploy surface current tracking drifters.

## Collaborators

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



Figure 1. Map of survey locations.



Figure 2. Mooring preparations.

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

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







**Dates:** May 21 – June 2, Aug 29 – Sept 10, 2019  
**Recurrence:** Annually, since 1979  
**2019 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)

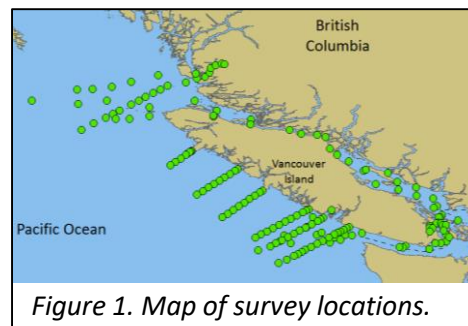


## Description

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.



## 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  
**2019 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)



Figure 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.



Figure 2. Weather station installed at fish farm.

### 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

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



Figure 3. Map of weather station locations.

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

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





**Dates:** June 2 – 18, Aug 13 – 29, 2019; and Feb 7 – 25, 2020  
**Recurrence:** Annually, since 1956  
**2019 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

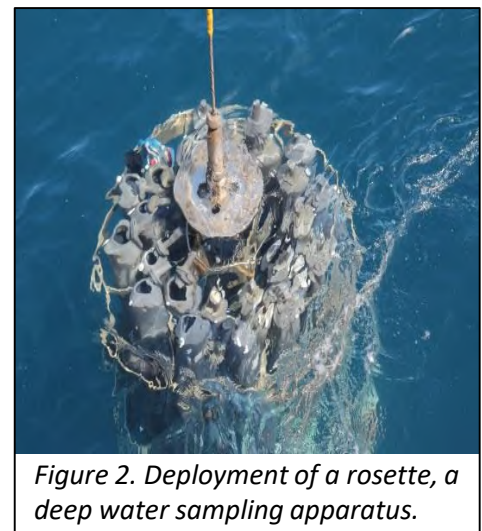
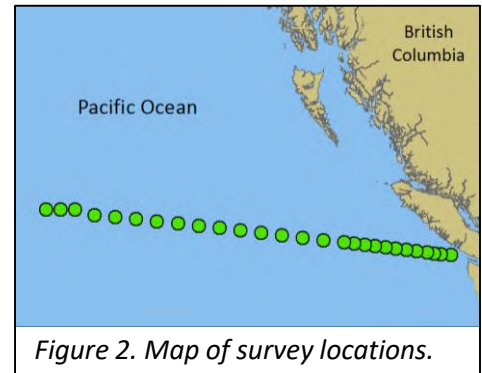
Long standing program surveys a 1,700 km long section three times per year. Data collected since 1956 shows evidence of the impact of climate variability on ocean productivity. Line P has been collecting data since 1956.

## 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 6–13, June 2–8, Sept 29–Oct 7, 2019  
**Recurrence:** Annually, since 1999  
**2019 Locations:** Juan de Fuca Strait, Strait of Georgia  
**Vessel:** 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.



Figure 1. Map of survey 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.



Figure 2. 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:** May 16 – June 12, 2019  
**Recurrence:** Every 2 years, since 2005  
**2019 Locations:** Hecate Strait, Eastern Dixon Entrance  
**Vessel:** F/V 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 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.

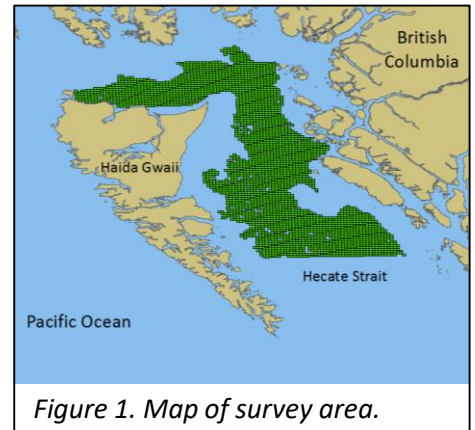


Figure 1. Map of survey area.



Figure 2. A Tope Shark (Galeorhinus galeus).

## FOR MORE INFORMATION

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





Dates: August 31 – September 28, 2019  
Recurrence: Annually, since 2013  
2019 Locations: North Coast, north of Banks Island  
Vessel: CCGS Vector  
Lead Scientists: Joanne Lessard, Janet Lockhead  
[joanne.lessard@dfo-mpo.gc.ca](mailto:joanne.lessard@dfo-mpo.gc.ca) (250) 714-3799



### 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 survey are planned:

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



Figure 1. Map of survey area.

### 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.



Figure 2. Divers collecting invertebrate, algae, and substrate data along a transect line.

### FOR MORE INFORMATION

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:** April 1, 2019 – March 31, 2020  
**Recurrence:** Annually, year three of five (2017-2022)  
**2019-2020 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. 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

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

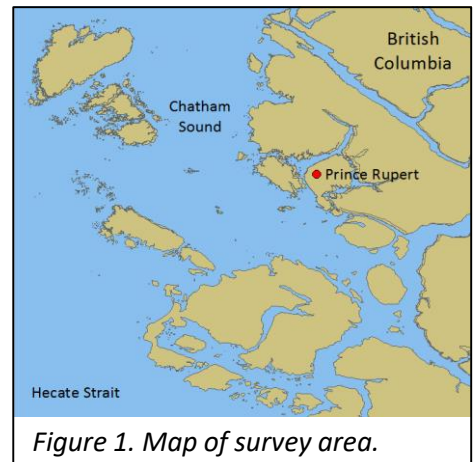


Figure 1. Map of survey area.



Figure 2. Water sampling in Chatham Sound.

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

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





**Dates:** August 1 – September 15, 2019  
**Recurrence:** Annually—south in odd years, north in even years—since 2006  
**2019 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



Figure 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.



Figure 2. Map of survey 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.



Figure 3. 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 19 – September 20, 2019  
**Recurrence:** Every 1 to 2 years, since 1995  
**2019 Location:** West Coast continental slope  
**Vessel:** F/V Nordic Pearl  
**Lead Scientist:** Stéphane Gauthier (250) 363-6587  
[Stephane.Gauthier@dfo-mpo.gc.ca](mailto:Stephane.Gauthier@dfo-mpo.gc.ca)



Description

Fisheries acoustics survey of Pacific Hake and associated fauna along the West Coast of Canada and the U.S.

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



Figure 1. Map of survey locations.

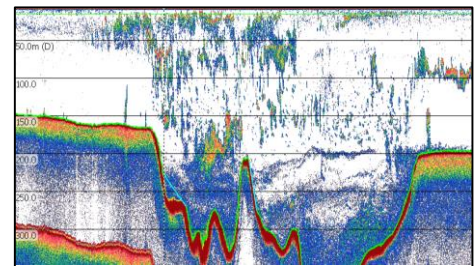


Figure 2. Echogram of detected fish schools in the water column

**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:** March 1 – April 30, 2019  
**Recurrence:** Annually, since 1972  
**2019 Locations:** Strait of Georgia, West Coast Vancouver Is, Central & North coasts, Haida Gwaii  
**Vessel:** 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

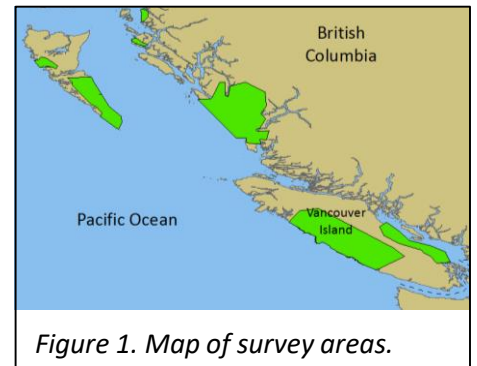


Figure 1. Map of survey areas.



Figure 2. 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, 2019  
**Recurrence:** Annually, since 1951  
**2019 Locations:** Strait of Georgia, West Coast Vancouver Is, Central and North coasts, Haida Gwaii  
**Vessels/planes:** Seine vessels, dive skiffs, and float planes.  
**Lead Scientist:** Jaclyn Cleary (250) 756-7321  
[Jaclyn.Cleary@dfo-mpo.gc.ca](mailto:Jaclyn.Cleary@dfo-mpo.gc.ca)

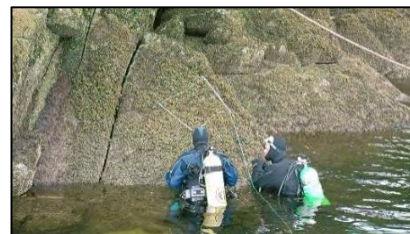


Figure 1. SCUBA divers measuring herring spawn.

## 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



Figure 2. Map of survey areas.



Figure 3. Herring spawn (eggs).

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

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





**Dates:** October 10 – November 21, 2019  
**Recurrence:** Annually, since 2003  
**2019 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, Brendan Connors  
[Malcolm.Wyeth@dfo-mpo.gc.ca](mailto:Malcolm.Wyeth@dfo-mpo.gc.ca) (250) 756-7300

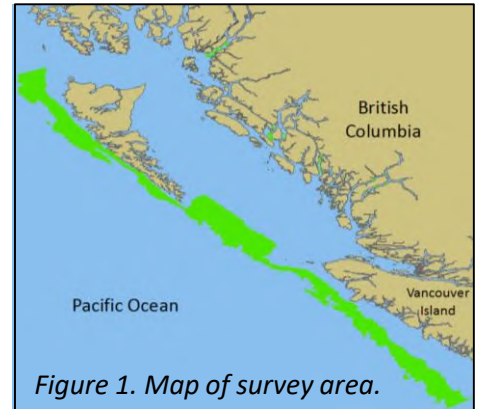


Figure 1. Map of survey area.

### 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.

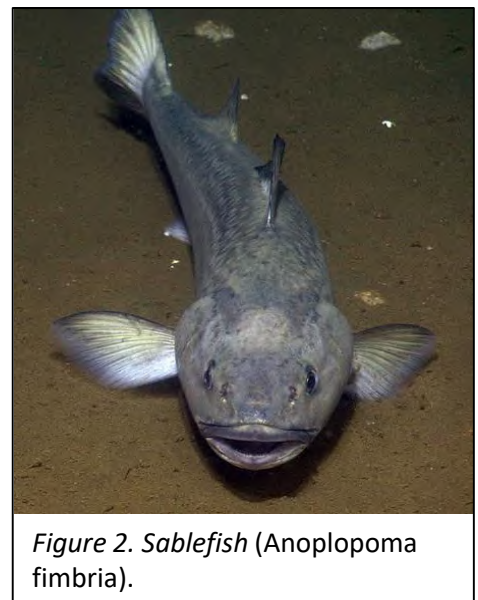


Figure 2. Sablefish (*Anoplopoma fimbria*).

### Collaborators

- Wild Canadian Sablefish Ltd.

### FOR MORE INFORMATION

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





**Dates:** May 26 – August 31, 2019  
**Recurrence:** Annually, since 1963  
**2019 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**

*Figure 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



*Figure 2. Map of IPHC survey stations in BC waters.*



*Figure 3. Banner that is displayed on chartered fishing vessels.*

**FOR MORE INFORMATION – IPHC:**

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





**Dates:** May 15 – September 15, 2019  
**Recurrence:** Every 5 to 10 years, since 1973  
**2019 Locations:** Strait of Georgia, Inlets; Gardner Canal and Inlets  
**Airplane:** West Coast Wild Cessna 180  
**Lead Scientist:** Strahan Tucker (250) 756-7092  
[Strahan.Tucker@dfo-mpo.gc.ca](mailto:Strahan.Tucker@dfo-mpo.gc.ca)



### Description

DFO has been conducting aerial surveys since the early 1970's to determine the abundance of harbour seals and monitor population trends. This aerial photographic survey will estimate the number of harbour seals currently in the Strait of Georgia and additional areas in order to complete an updated coast wide assessment.

### Objectives

1. Conduct the survey two hours either side of low tides toward the end of pupping season;
2. Fly the aircraft at 500-650 ft @ 125 km/hr to follow shorelines and circumnavigate all islands/outcroppings;
3. Photograph individuals and groups of seals with a hand held 35 mm SLR camera;
4. Count seals from the photographs and compile a final total estimate of abundance.



Figure 1. Map of survey area.



Figure 2. Harbour seal haulout.

**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:** July 2 – 16, and August 19 – 31, 2019  
**Recurrence:** Annually, since 2002  
**2019 Locations:** West Coast Vancouver Island offshore,  
Western Queen Charlotte Sound  
**Vessels:** CCGS J.P. Tully, 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) 729-8374



CCGS John P. Tully

### 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



Figure 1. Map of survey area: offshore waters up to Queen Charlotte Sound.



Figure 2. Fin whale 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:** May 1 – August 31, 2019  
**Recurrence:** Annually, since 1973  
**2019 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 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 crucial 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



Figure 1. Map of survey area.



Figure 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:** May 9 – 29, 2019  
**Recurrence:** 2019 only  
**2019 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 remotely operated vehicle (ROV) surveys of habitat and species including coral, sponges and rockfish;
2. Conduct intertidal fish and invertebrate surveys including aquatic invasive species using standard and novel technologies such as environmental DNA and passive acoustics; and,
3. Conduct community outreach activities during and/or after the survey.

## Collaborators

- Central Coast Indigenous Resource Alliance
- Heiltsuk Nation
- Kitasoo/Xai'Xais Nation
- Ocean Networks Canada
- Gitga'at Nation
- Wuikinuxv Nation
- Royal BC Museum



Figure 1. Map of survey area.



Figure 2. Phantom ROV.

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

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





Dates: October 1 – 14, 2019  
Recurrence: Every 3 years, since 2005  
2019 Locations: Strait of Georgia  
Vessel: CCGS Neocaligus  
Lead Scientist: Malcolm Wyeth (250) 756-7300  
[Malcolm.Wyeth@dfo-mpo.gc.ca](mailto:Malcolm.Wyeth@dfo-mpo.gc.ca)



### Description

This fishing survey uses standardized longline hook gear at selected locations in the Strait of Georgia to provide a relative abundance index for North Pacific Spiny Dogfish. In addition, detailed biological data are collected for North Pacific Spiny Dogfish and selected inshore groundfish species. These data are incorporated into stock assessments, status reports, and research publications.

### Objectives

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

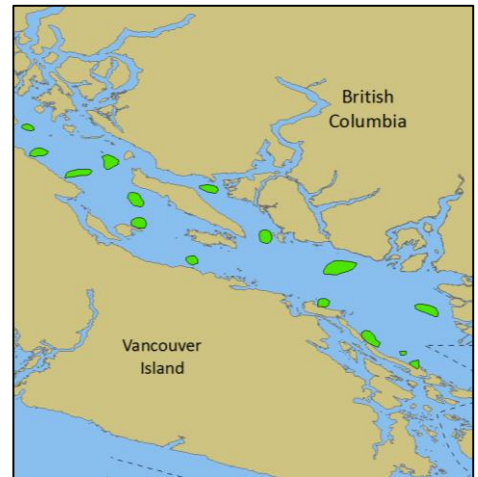


Figure 1. Map of survey areas.



Figure 2. North Pacific Spiny Dogfish (*Squalus acanthias*).

### FOR MORE INFORMATION

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





**Dates:** July 26 – August 26, 2019  
**Recurrence:** Annually—north in odd years, south in even years—since 2003  
**2019 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.



Figure 1. Map of survey 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.

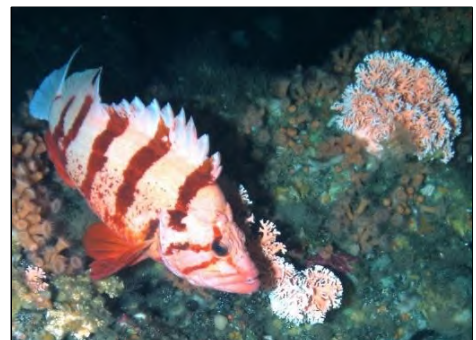


Figure 2. A Tiger Rockfish (*Sebastes nigrocinctus*), one of the nearshore groundfish species caught on this survey.

## FOR MORE INFORMATION

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





**Dates:** September 30 – October 9, 2019  
**Recurrence:** Annually, since 1998  
**2019 Locations:** Discovery Passage, Johnstone Strait,  
Queen Charlotte Strait, southern Queen  
Charlotte Sound  
**Vessel:** F/V Sea Crest  
**Lead Scientist:** Jackie King (250) 756-7176  
[Jackie.King@dfo-mpo.gc.ca](mailto:Jackie.King@dfo-mpo.gc.ca)



### Description

This survey is part of a long-time series investigating the growth and marine survival of juvenile Pacific salmon as they migrate out of the Strait of Georgia, through Johnstone Strait.

In recent years, this survey has expanded to include all components of the pelagic ecosystem and to focus on additional estimates of salmon condition in relation to prey availability, predator consumption, utilizing diet, stable isotopes, and energy density analyses.

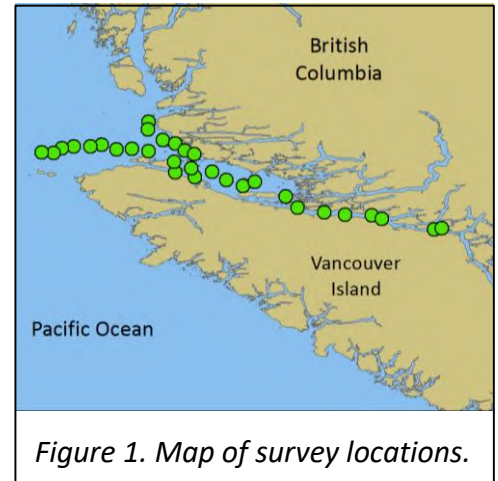


Figure 1. Map of survey locations.

### Objectives

1. Provide estimates of juvenile Pacific salmon, and determine their diet, relative growth and energy density at different locations of their migration to open ocean through Johnstone Strait;
2. Collect data on the associated physical oceanography; and,
3. Assess the distribution and biomass of zooplankton.

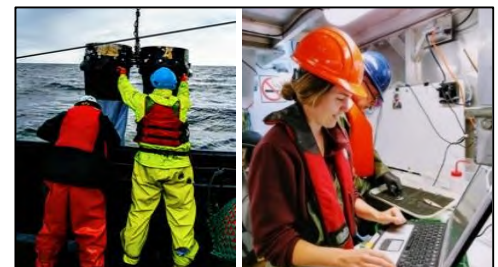


Figure 2. Collecting zooplankton with bongo tows (left); measuring juvenile salmon (right).

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

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





Dates: April 30 – May 15, 2019  
Recurrence: Annually, since 1973  
2019 Location: West Coast Vancouver Island  
Vessel: F/V Nordic Pearl  
Lead Scientist: Ken Fong (250) 756-7368  
[Ken.Fong@dfo-mpo.gc.ca](mailto:Ken.Fong@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.

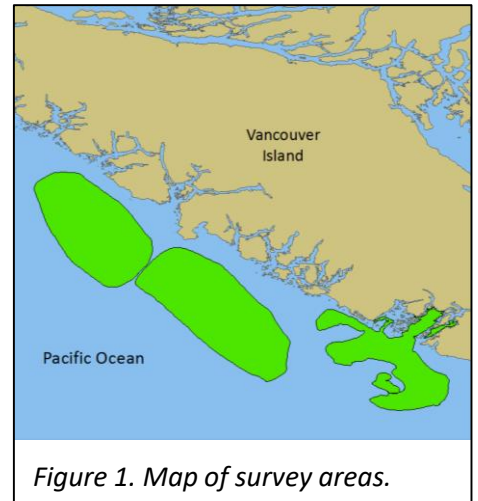


Figure 1. Map of survey areas.

### 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.

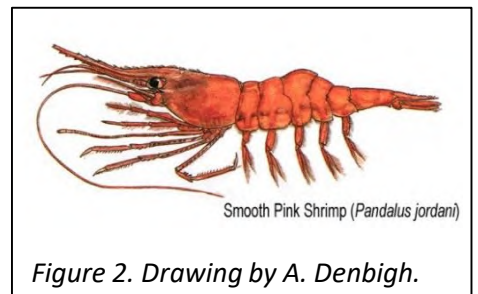


Figure 2. Drawing by A. Denbigh.

### 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: July 16 – August 18, 2019  
Recurrence: Every 2 years, since 2003  
2019 Location: Queen Charlotte Sound  
Vessel: F/V 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 240 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



Figure 1. Map of survey area.



Figure 2. Red Irish Lord (*Hemilepidotus hemilepidotus*), a type of sculpin.

### FOR MORE INFORMATION

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





**Dates:** June 14 – July 15, 2019  
**Recurrence:** Annually, since 1998  
**2019 Locations:** West Coast Vancouver Island,  
North West Coast of Vancouver Island  
**Vessel:** Charter vessel  
**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 (*Figure 1*) will be sampled with a midwater trawl net towed at the surface or 15 m depth during daylight and night time hours.

### 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).



*Figure 1. Map of survey areas. Coloured areas are depth and ecosystem strata.*



*Figure 2. 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:** Three weeks; mid June – mid Aug, 2019  
**Recurrence:** Annually, year one of two (2019-2020)  
**2019 Location:** Southern Strait of Georgia  
**Vessels:** Palmira and / or Manyberries  
**Lead Scientist:** Sarah Dudas (250) 756-3365  
[Sarah.Dudas@dfo-mpo.gc.ca](mailto:Sarah.Dudas@dfo-mpo.gc.ca)



## Description

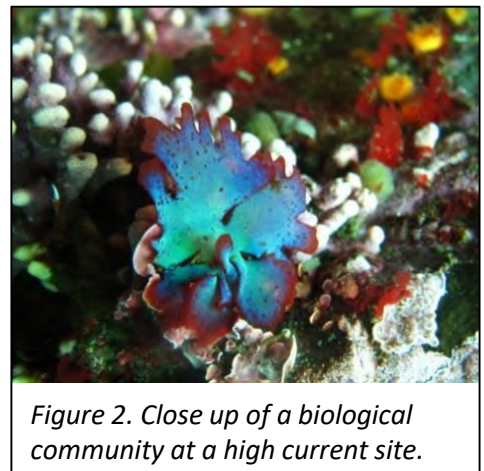
Conservation of biological diversity is crucial for the sustainability of Canada's oceans and a priority for DFO. The goal of this pilot project is to determine if and how biodiversity, species abundance and community composition vary among rocky habitats at high and low current sites. This will be investigated using SCUBA at paired sites in both high and low current locations. This information can be used to inform marine spatial planning in British Columbia.

## Objectives

1. Conduct SCUBA surveys of biological communities (flora and fauna) at paired high current and low current sites; and,
2. Assess current strength, temperature and salinity at study sites.

## Collaborators

- In the process of identifying and establishing interest from potential collaborators.



## FOR MORE INFORMATION

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







Dates: June 1 – 5, 2019  
Recurrence: Every 3 years, since 1940  
2019 Location: Seal Island, near Comox  
Lead Scientist: Ken Fong (250) 756-7368  
[Ken.Fong@dfo-mpo.gc.ca](mailto:Ken.Fong@dfo-mpo.gc.ca)



Figure 1. Butter clam sampling.

## Description

The Seal Island survey is a triennial population survey of an intertidal gravel bar located northwest of Denman Island in the Strait of Georgia. The surveys have been taking place since 1940 and forms the longest DFO time-series on population trends for intertidal bivalves in British Columbia.

Estimates of Butter Clam biomass are used to set quotas for the commercial Butter Clam on Seal Island.



Figure 2. Map of survey area.

## Objectives

1. Estimate the biomass, abundance, density, length, weight, and age of Butter Clams on Seal Island; and,
2. Index the abundance of other intertidal clam species on Seal Island.

## Collaborators

- K'ómoks First Nations



Figure 3. Butter Clam (*Saxidomus gigantean*).

**FOR MORE INFORMATION** – Pacific Region intertidal clams:

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





**Dates:** April 1, 2019 – March 31, 2020  
**Recurrence:** Annually, year three of five (2017-2022)  
**2019-2020 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

- Local First Nations
- Vancouver Port Authority
- Coastal environmental organizations



Figure 1. Map of survey areas.



Figure 2. Conducting beach surveys

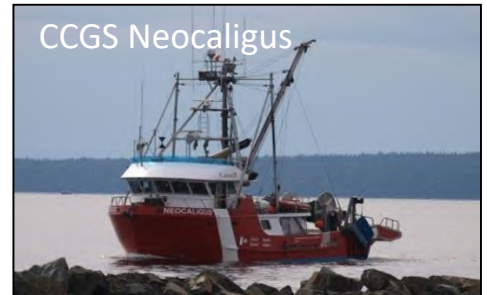
**FOR MORE INFORMATION – Coastal Environmental Baseline Program:**

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





**Dates:** May 20 – May 31, October 15 – 26, 2019  
**Recurrence:** Biennially—spring since 1991, fall since 1988.  
**2019 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)



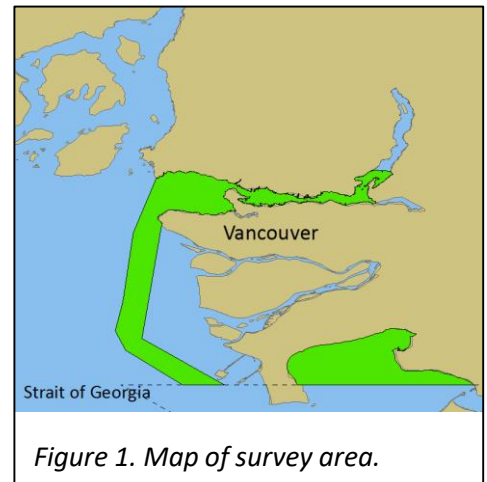
## Description

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.



## 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:** March 18 – 20, 2020  
**Recurrence:** Every 1 to 3 years, since 2008  
**2019 Location:** Juan de Fuca Strait (Fulford Reef east of Victoria)  
**Vessels:** Red Ape, Palmira (24' DFO dive boats)  
**Lead Scientist:** Dan Leus (250) 756-7147  
[Dan.Leus@dfo-mpo.gc.ca](mailto:Dan.Leus@dfo-mpo.gc.ca)



### Description

Collaboration between DFO and the Pacific Urchin Harvester Association (PUHA) to gather data at a Green Sea Urchin (*Strongylocentrotus droebachiensis*) Index Site in order to update the assessment models used to inform the Integrated Fishery Management Plan.

### Objectives

1. Collect size distribution and abundance data for green sea urchins for provision of quota options for the commercial fishery;
2. Gather quantitative description of habitat characteristics including substrate and algae;
3. Opportunistically gather abundance data for other commercially harvested invertebrate species including red sea urchins, sea cucumbers and geoduck; and,
4. Opportunistically gather size and abundance data for Northern Abalone, a species listed under the *Species at Risk Act*.

### Collaborators

- Pacific Urchin Harvester Association (PUHA)

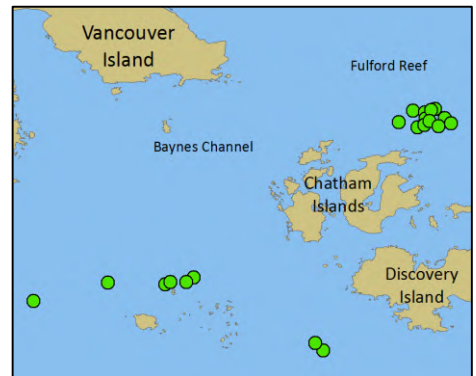


Figure 1. Map of survey locations, east of Oak Bay (Victoria, BC).



Figure 2. DFO Biologist surveying quadrat for green sea urchins.

### FOR MORE INFORMATION – Species at Risk:

<http://www.dfo-mpo.gc.ca/species-especes/profiles-profils/green-sea-urchin-oursin-vert-eng.html>





**Dates:** March 1 – June 30, 2019  
**Recurrence:** Annually, since 2019  
**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.



Figure 1. Haulout locations for seal captures.



Figure 2. 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:** May 1 – November 30, 2019  
**Recurrence:** Annually, since 2015 (varying areas)  
**2019 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.



Figure 1. Haulout sites for scat sampling.

## 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.



Figure 2. 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:** April 16 – May 8, 2019  
**Recurrence:** Every 5 years, since 1978  
**2019 Location:** Queen Charlotte Strait; Northern Strait of Georgia; Strait of Juan de Fuca (Sooke area)  
**Vessel:** CCGS Vector  
**Lead Scientist:** Seaton Taylor (250) 756-7258  
[Seaton.Taylor@dfo-mpo.gc.ca](mailto:Seaton.Taylor@dfo-mpo.gc.ca)



## Description

Northern Abalone Index Sites Survey in the waters inside of Vancouver Island, specifically within Queen Charlotte Strait, the Northern Strait of Georgia, and the Sooke area of the Strait of Juan de Fuca. Northern Abalone (*Haliotis kamtschatkana*) are listed as Endangered under the *Species at Risk Act* and the survey results will be used in the assessment of Northern Abalone in British Columbia.



Figure 1. Map of survey areas.

## Objectives

1. SCUBA dive survey of Northern Abalone index sites to collect information on density, size, recruitment, genetics, and habitat; and,
2. Drop camera work (between 90' and 150' depths) to provide additional data for habitat bottom patches model.



Figure 2. Northern Abalone (*Haliotis kamtschatkana*).

## Collaborators

- Indigenous communities and organizations

## FOR MORE INFORMATION

Northern Abalone: <http://www.dfo-mpo.gc.ca/species-especes/profiles-profils/northernabalone-ormeaunordique-eng.html>

Index Sites Survey: [http://publications.gc.ca/collections/collection\\_2018/mpo-dfo/Fs97-4-3162-eng.pdf](http://publications.gc.ca/collections/collection_2018/mpo-dfo/Fs97-4-3162-eng.pdf)





**Dates:** August 1 – August 31, 2019  
**Recurrence:** Annually, year two of five (2018-2022)  
**2019 Locations:** Johnstone Strait, Queen Charlotte Strait  
**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.



Figure 1. Map of study area.

### 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).



Figure 2. Killer Whale (*Orcinus orca*) with suction-cup tag.

### Collaborators

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

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

<https://movementecologyjournal.biomedcentral.com>







**Dates:** July 2019  
**Recurrence:** Every few years, since 2010  
**2019 Locations:** Transfer Beach (Ladysmith), Swy-a-lana Lagoon (Nanaimo)  
**Lead Scientist:** Ken Fong (250) 756-7368  
[Ken.Fong@dfo-mpo.gc.ca](mailto:Ken.Fong@dfo-mpo.gc.ca)

### 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.

### Objectives

1. Index the relative abundance of Olympia Oysters at Transfer Beach in Ladysmith and Swy-a-lana Lagoon, Nanaimo, using a standardized survey protocol.



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



Figure 2. Map of survey locations.



Figure 3. Measuring an Olympia Oyster.

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

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





**Dates:** July to August 2019  
**Recurrence:** Every few years, since 2010  
**2019 Locations:** Hillier Island, Harris Point, Joes Bay, Barkley Sound  
**Lead Scientist:** Ken Fong (250) 756-7368  
[Ken.Fong@dfo-mpo.gc.ca](mailto:Ken.Fong@dfo-mpo.gc.ca)



Figure 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.



Figure 2. Map of survey locations.

### Objectives

1. Index the relative abundance of Olympia Oysters at Harris Point, Hillier Island, and Joes Bay in Barkey Sound using a standardized survey protocol.

### Collaborators

- Parks Canada
- Toquaht Nation



Figure 3. Measuring an Olympia Oyster.

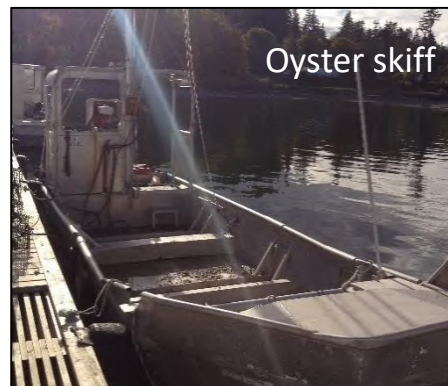
**FOR MORE INFORMATION – Species at Risk:**

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





**Dates:** May to September 2019  
**Recurrence:** Annually, year three of three (May 2017 – Mar. 2020)  
**2019 Location:** Strait of Georgia  
**Vessels:** Small industry vessels  
**Lead Scientist:** Chris Pearce (250) 756-3352  
[Chris.Pearce@dfo-mpo.gc.ca](mailto:Chris.Pearce@dfo-mpo.gc.ca)



### Description

Pacific oyster (*Crassostrea gigas*) summer mass mortalities have been observed in British Columbia over the last five years. These may be due to environmental variables, pathogens, and/or reproductive condition. This study aims to determine the various factors involved in these mass mortality events.

### Objectives

1. Identify *Vibrio* spp. and other potentially harmful bacteria in oysters;
2. Quantify the relative and absolute amounts of the *Vibrio* spp. and other potentially harmful bacteria;
3. Monitor the reproductive state of the oysters throughout the summer months;
4. Track survival of the oysters at multiple locations over the summer months;
5. Monitor key environmental parameters; and,
6. Identify correlations of the various factors with mortality rates.

### Collaborators

- University of Victoria
- Mac's Oysters Ltd.

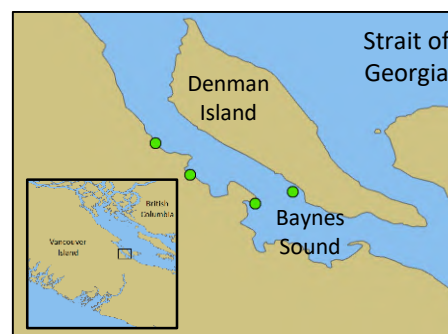


Figure 1. Map of survey locations.



Figure 2. Monitoring intertidal Pacific oyster mortality.

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

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





**Dates:** Nov 4 – 13, 2019; Feb 5 – 14, 2020  
**Recurrence:** Annually, since 2001  
**2019-2020 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.



Figure 1. Map of survey area. Howe Sound.

### Objectives

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



Figure 2. 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 10 –24, 2019  
Recurrence: Annually, since 1998  
2019 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.



Figure 1. Map of survey areas, Strait of Georgia



Figure 2. Trawl collection bin.

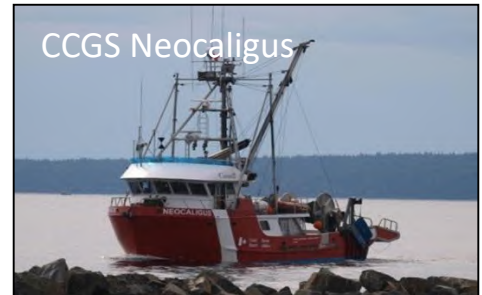
**FOR MORE INFORMATION – Pacific Region Shrimp Trawl Fishery:**

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





**Dates:** September 4 – 22, 2019  
**Recurrence:** Annually, since 1998  
**2019 Locations:** Chatham Sound and Queen Charlotte Strait (Clio Channel)  
**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) and 12IN (PFMA 12-26 – Queen Charlotte Strait, Clio Channel);
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.

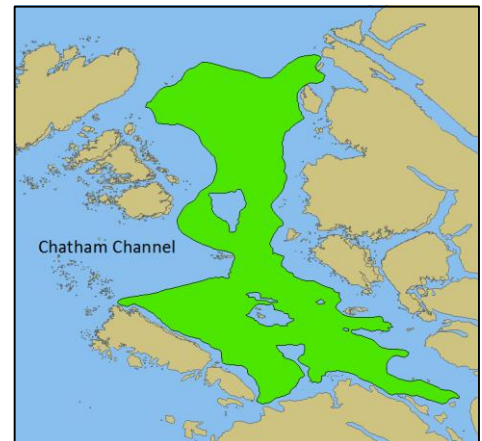


Figure 1. Map of survey area, Chatham Sound.

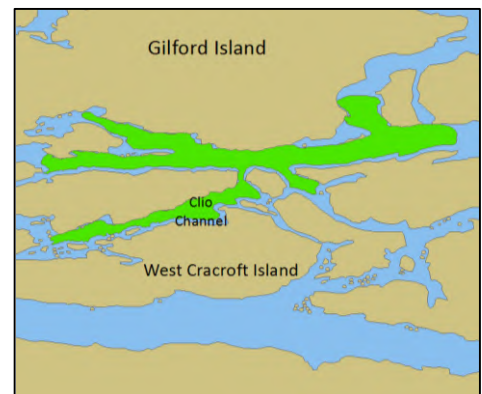


Figure 2. Map of survey area, Clio Channel.

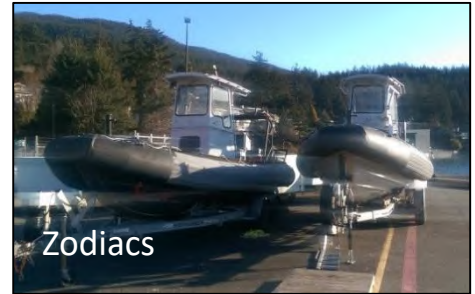
**FOR MORE INFORMATION – Pacific Region Shrimp Trawl Fishery:**

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





**Dates:** June 15 – August 15, 2019  
**Recurrence:** Annually, year two of five (2019-2022)  
**2019 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)



## 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 black line; 2020 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 killer whales.

## Collaborators

- Transport Canada
- National Oceanic and Atmospheric Association
- University of British Columbia
- OceanWise - Coastal Ocean Research Institute

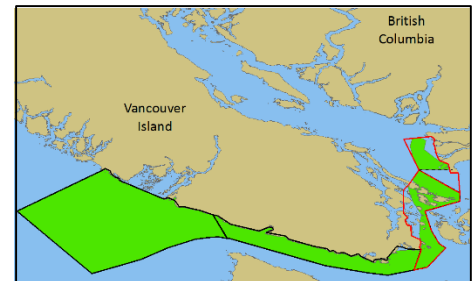


Figure 1. SRKW habitat use (green)



Figure 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 29 – May 4, July 2 – 7, 2019; and February 17 – 22, March 16 – 21, 2020  
**Recurrence:** Annually, since 2015  
**2019-2020 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. Full depth CTD (Conductivity, Temperature, and Depth) profile including oxygen and fluorometer;
2. 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



Figure 1. Map of survey locations.



Figure 2. 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:** July – November, 2019  
**Recurrence:** Varied, since 1974  
**2019 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.

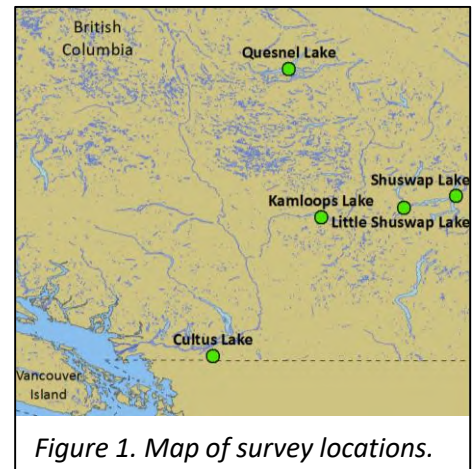


Figure 1. Map of survey locations.



Figure 2. 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:** January – December, 2019  
**Recurrence:** Varied, since 1985  
**2019 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

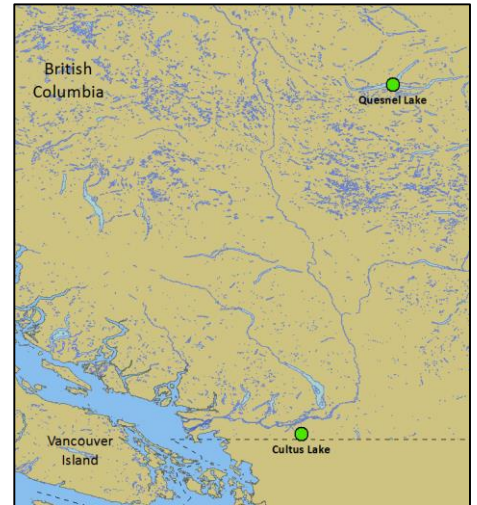


Figure 1. Map of survey locations.



Figure 2. 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:** August 2019  
**Recurrence:** Annually, since 2012.  
**2019 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 COSEWIC assessment 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



Figure 1. Map of survey locations.



Figure 2. 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:** April 2019 – March 2020  
**Recurrence:** Annually, since 1950  
**2019 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)



Figure 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



Figure 2. Map of survey locations.



Figure 3. 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:** January to December 2019  
**Recurrence:** Ongoing, since 1975  
**2019 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)



Figure 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.



Figure 2. CWT areas.

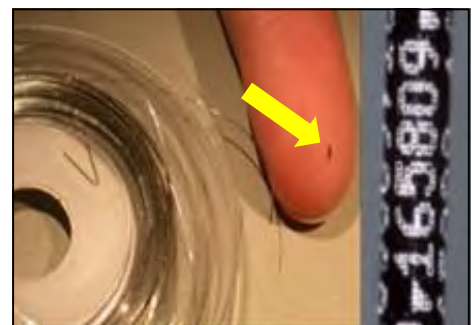


Figure 3. Individual tags are cut from a spool of wire and are 1.1 mm long.

**FOR MORE INFORMATION** – Pacific Salmon Commission Technical Report 18 and 35:

<https://www.psc.org/publications/technical-reports/technical-report-series/>





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.

### 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.

### Collaborators

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



*Figure 4. CWT Tagging of Juvenile Salmon.*



*Figure 5. CWT Sampling is a Dockside Monitoring Program.*



*Figure 6. 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:** January – December 2019  
**Recurrence:** Annually, since ~1905  
**2019 Locations:** Pacific Region wide

**Lead Scientist:** Diana Dobson (250) 756-7186  
[Diana.Dobson@dfo-mpo.gc.ca](mailto:Diana.Dobson@dfo-mpo.gc.ca)

## 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:

- 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



Figure 1. Migrating Sockeye Salmon.



Figure 2. Tagging Coho Salmon held in mesh holding pens.



Figure 3. Chinook Salmon mark recapture population study.

## FOR MORE INFORMATION – Stock Assessment:

Overview: <http://www.pac.dfo-mpo.gc.ca/pacific-smon-pacifique/science-eng.html>  
Yukon River / Transboundary: <http://www.pac.dfo-mpo.gc.ca/yukon/index-eng.html>  
North Coast: <http://www.pac.dfo-mpo.gc.ca/fm-gp/northcoast-cotenord/index-eng.html>  
Fraser and Interior: <http://www.pac.dfo-mpo.gc.ca/fm-gp/fraser/new-fraser-index-eng.html>





Description (cont'd)

- 2. tags and other unique stock identifiers, such as thermally marked otoliths.
  
- 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.



Figure 4. Nass River fish wheel operated by Nisga'a Fisheries.

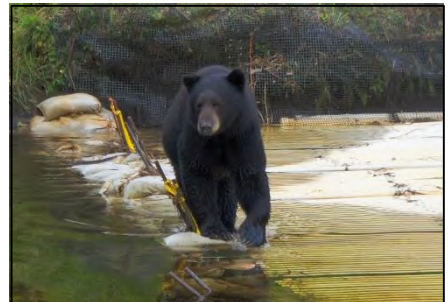


Figure 5. Black bear walking across counting fence.



Figure 6. Chinook Salmon float counts to generate population estimate.

FOR MORE INFORMATION

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