Fisheries and Oceans Canada | Pêches et Océans Canada

FIELDNOTES
2021 – 2022

Pacific Science Field Operations

Canada

Cover illustration: Copper Rockfish (*Sebastes caurinus*) in an old growth kelp forest covered in Proliferating Anemones (*Epiactis prolifera*). Queen Charlotte Strait, BC.

Photo credit: Pauline Ridings, Fisheries and Oceans Canada.

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INTRODUCTION

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

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

Fieldnotes aims to:

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

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

COVID-19

One year into the global pandemic, DFO remains committed to delivering innovative science and services to Canadians.

Following the suspension of scientific field operations in the spring of 2020, DFO has since resumed much of its field programming.

All field activities that proceed continue to be guided by a prioritization assessment, adhere to guidance provided by public health authorities, and follow safe work procedures.

Regular monitoring and evaluation of safety protocols remain paramount to ensuring the health and safety of DFO employees and their families, as well as that of collaborators, Indigenous communities and the public.

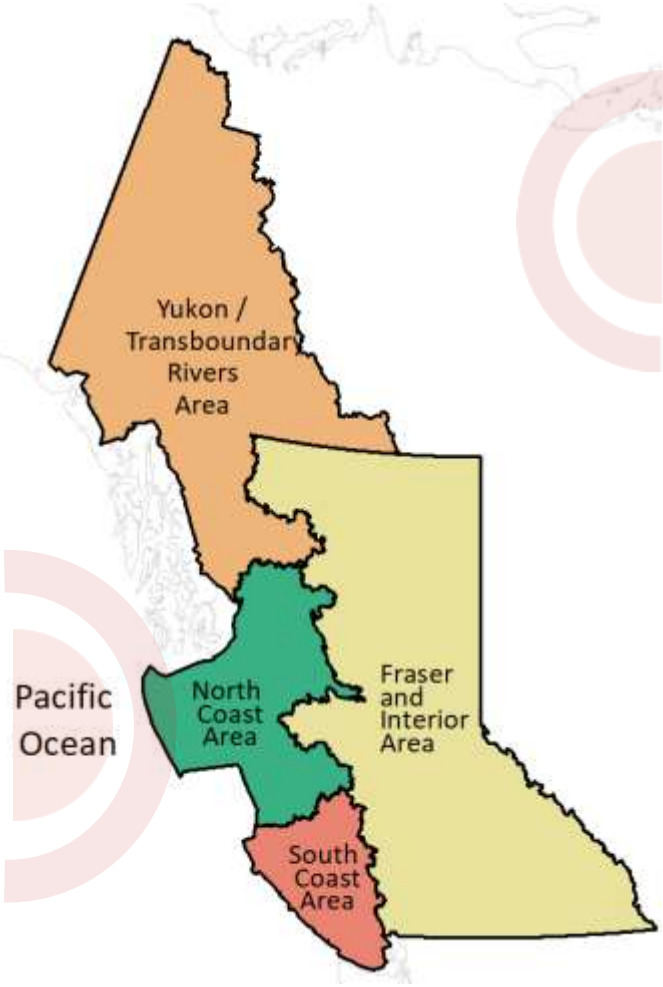
For up-to-date information on the status of field operations, please contact the Lead Scientists identified in Annex B, or visit DFO's website.

DFO PACIFIC SCIENCE

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

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

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



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

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

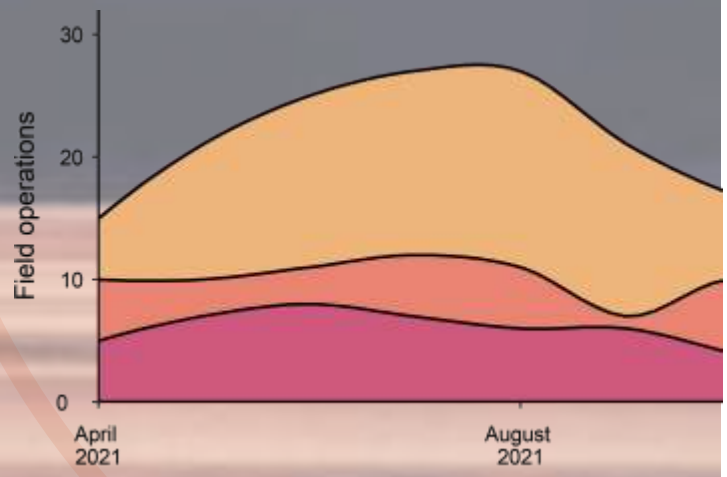
SCHEDULED FIELD OPERATIONS: 2021—2022

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

Fact sheets outlining details of this field programming are available in Annex B.

Fact sheet #82 references an additional 219 population, catch, and ecosystem monitoring projects in support of area-based salmon stock assessment in Pacific Region.

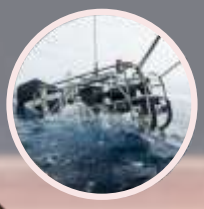
By the Numbers	Marine	Intertidal
Human Impacts and Research Monitoring	9	1
Hydrographic and Oceanographic Surveys	17	-
Population and Ecosystem Assessments	37	5

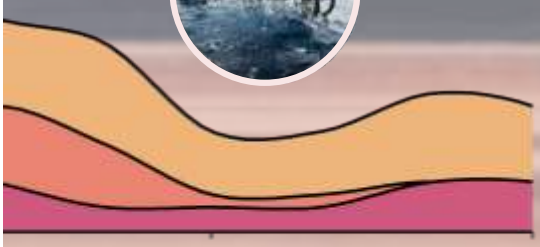


Yukon and Transboundary Rivers Area	6	-
North Coast Area	9	1
South Coast Area	31	3
Coast Wide - North and South Coast Areas	14	2
Fraser River and Interior Area	3	-

80 Field Operations

Freshwater	TOTAL
5	**15**
-	**17**
6	**48**





-	**6**
-	**10**
-	**34**
-	**16**
11	**14**

- Non-Indigenous collaborators in 37 field operations. — 79
- Women scientists leading 36 field operations. — 39
- First Nations and Indigenous organizations participating in 30 field operations. — 34 & 14
- Academic institutions participating in 26 field operations. — 29
- National and international governments participating in 27 field operations. — 15
- Stewardship organizations and research institutes participating in 19 field operations. — 17
- Businesses and industry associations & businesses participating in 9 field operations. — 10
- Port authorities participating in 3 field operations. — 3
- International commissions participating in 3 field operations. — 3
- Museums participating in 2 field operations. — 2

DID YOU KNOW?

Science staff conducting field research and monitoring collaborate with, support, and depend on colleagues in a wide range of disciplines and organizations in order to deliver innovative, high quality science in support of evidence-based decision-making.

Evidence Gathering
Consult Annex B for Field programming.

Tech for Success
Science staff develop, configure, maintain, and operate a range of technologies to support non-destructive biological monitoring including Remotely Operated Vehicles (ROVs), drop cameras and hydrophones, as well as non-destructive multi-beam echo sounders and Light Detection and Ranging (LIDAR) scanners for seabed mapping.

These technologies support the determination of species abundance & identification, the measurement of habitat characteristics and changes over time, in addition to return captivating images and sounds.

Modelling our World
Science staff combine observations from the field and laboratories studies to develop models and simulations that enable an improved understanding of fisheries stocks, oceanographic processes, ecosystems interactions, and future climate scenarios at the global and local scale.

LabWorks
Science staff working in DFO's ship- or land-based laboratories process and analyze data and samples collected by DFO or its collaborators.

- **Molecular Genetics Labs** staff provide genetic stock identification and genetic health information for the assessment and management of fish stocks.
- ***Aquatic Animal Health Labs*** staff provide aquatic animal diagnostic information and exploratory research on infections and diseases.
- **Sclerochronology Lab** staff assess the age of fish using scales, ear bones, and fin bones to better understand the life history of populations.
- Staff from the **Plankton Lab**, the **Nutrient Lab**, the **Chlorophyll Lab**, and the **Trace Metals Lab** contribute to a better understanding of the health of our ecosystems and resources.
- Science staff working in **Wet Labs** systematically investigate the effects of a stressor (e.g., high temperature) or variable (e.g., diet) on the performance or physiology of individual fish and invertebrates.

Up-to-date Information
Science staff provide vital products and information services that ensure the safety of Canadians and enable the protection of aquatic ecosystems. These include navigation charts, sailing directions, notices to mariners and shipping, and water level information.

Peer Excellence
DFO's Centre for Science Advice - Pacific leads **~ 25** peer review processes and publishes **~ 40** peer-reviewed scientific articles annually through the Canadian Science Advisory Secretariat.

Data Matters
Science staff provide data stewardship services in support of invertebrates, salmon, pelagic fish, groundfish, and marine mammal stock assessment, marine spatial planning and protected areas, oceanographic and ecosystem modelling, bathymetry and water level readings, the state of the Arctic and Pacific oceans, and emergency response.

They keep data holdings secure and promote best practices to support Findable, Accessible, Interoperable and Reusable (FAIR) data principles. They also respond to both internal and external requests for data to support analyses and they make data sets available through the Open Government Data Portal.

REPORTING RESULTS

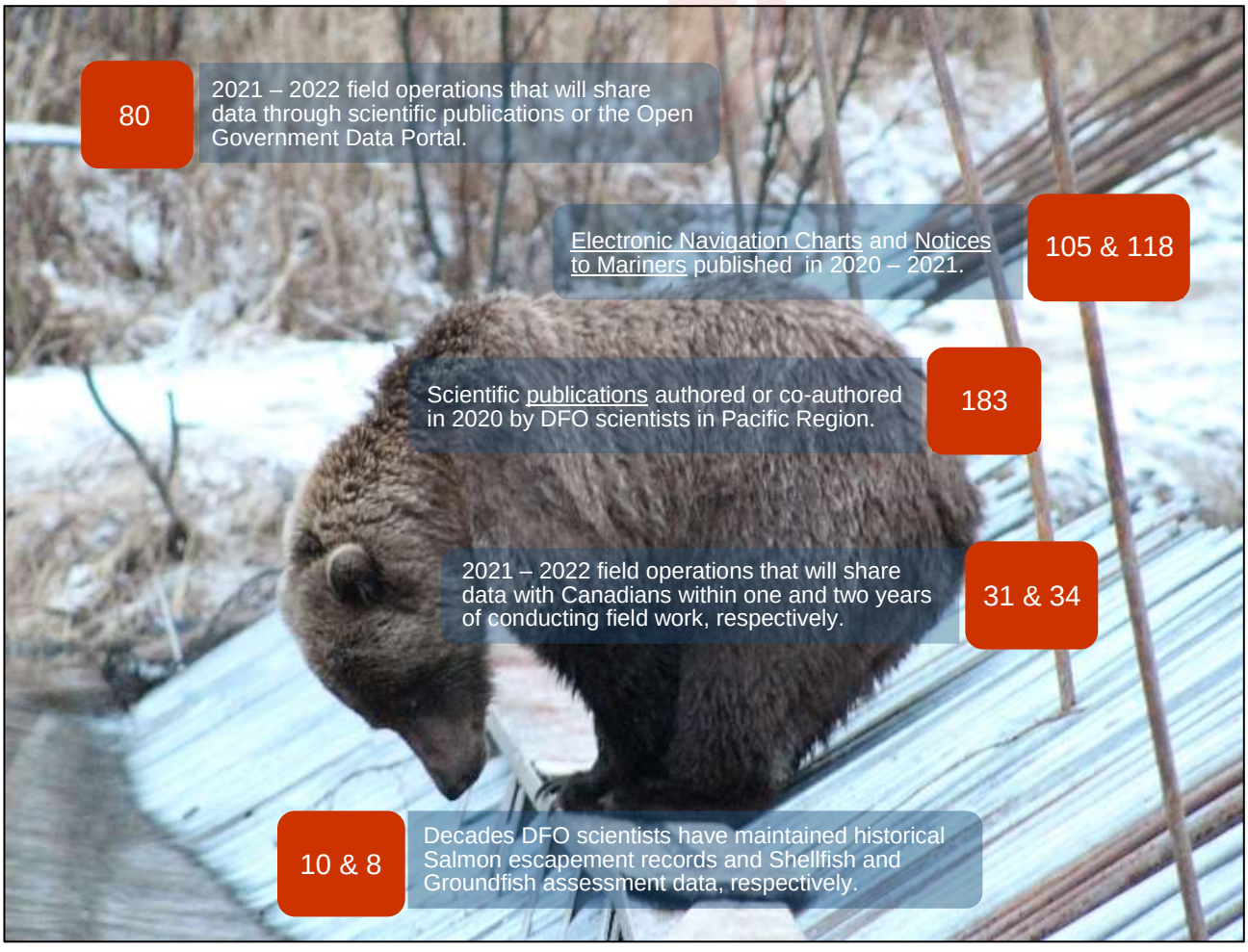
Ensuring that research and scientific information is produced and disseminated in an open, timely and transparent manner is essential to the successful fulfillment of DFOs' science mandate.

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

Nautical charts, navigational products and survey results can be accessed from the Canadian Hydrographic Service.

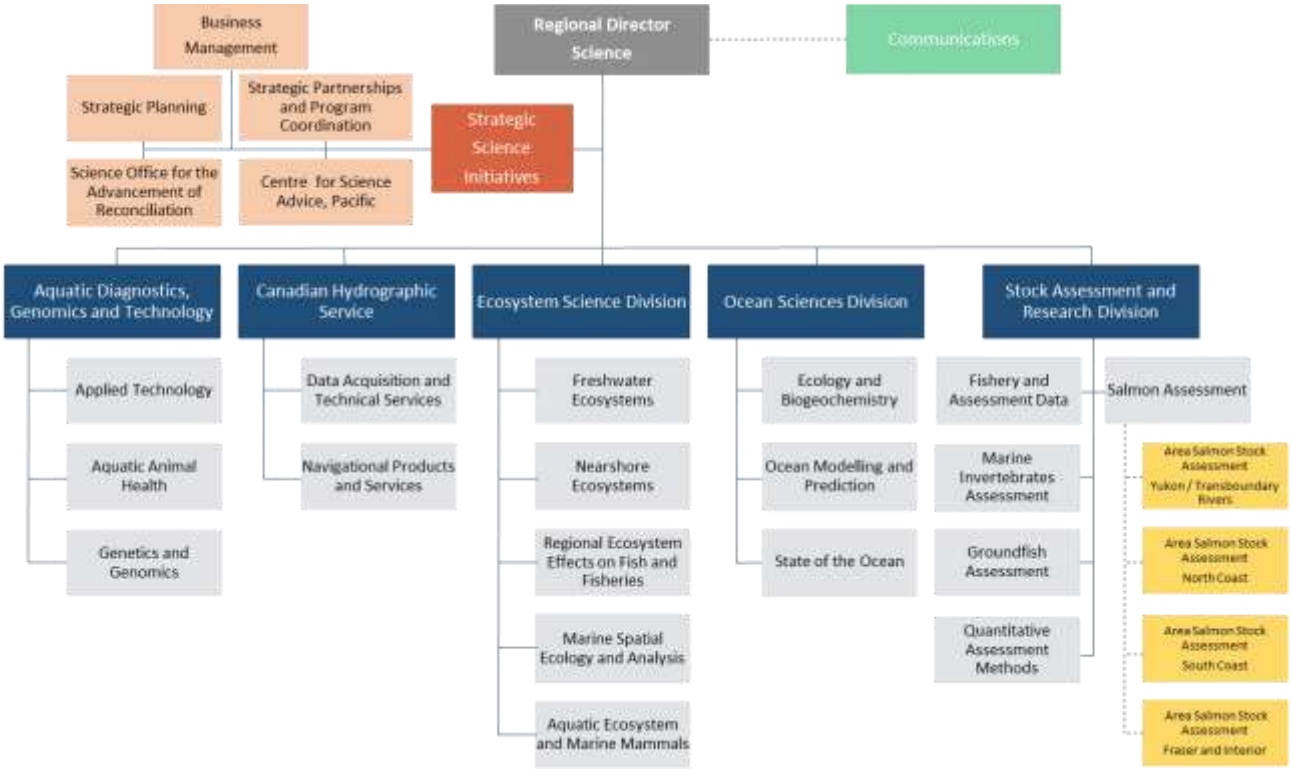
Additionally, each September, Pacific Science publishes a technical report on the State of the Pacific Ocean presenting results of the most recent year's monitoring information about the state of the physical, biological and selected fishery resources of Pacific Canadian marine ecosystems.

Refer to Annex C for a list of datasets published on the Open Government Portal in 2020 – 2021, and instructions on how to access them.



ANNEX A: PACIFIC SCIENCE ORGANIZATION

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

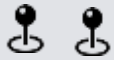


Strategic Science Initiatives (SSI)	
Business Management Unit: Provides financial management and human resource planning support for Science Branch, supports planning and reporting functions, and oversees health and safety, site operations, storage and warehousing.	
Strategic Planning Unit: Provides strategic science and planning oversight for horizontal files across Science Branch, and develops strategic solutions to facilitate the delivery of science programs.	
Strategic Partnerships and Program Coordination Unit: Establishes and nurtures strategic partnerships, supports planning, coordination and engagement on priority files.	
Science Office for the Advancement of Reconciliation: Leads corporate Science efforts to advance reconciliation with Indigenous Peoples.	
Centre for Science Advice – Pacific: Coordinates the scientific peer review and publication of science advice for Pacific region. CSAP provides a formal, transparent process for the delivery of science advice to the department's decision makers.	
	Approximately 26 employees are located at the Pacific Biological Station (PBS) in Nanaimo and at the Institute of Ocean Sciences (IOS) in Sidney.
Director	Brenda McCorquodale **Email:** Brenda.McCorquodale@dfo-mpo.gc.ca **Tel:** (250) 756-7120

Aquatic Diagnostics, Genomics, and Technology Division (ADGT)

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

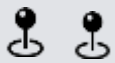
- Providing genetic research and advice on best practices for breeding programs, develops and applies molecular tools that are required for fishery enhancement management, regulation, and policy development within DFO;
- Contributing to the applied research and resource management mandates of other DFO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

Departmental Core Responsibility: Fisheries 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.	**2021–2022 Fact Sheet ID** 18 and 31
	Approximately 96 ADGT employees are located at the Pacific Biological Station (PBS) in Nanaimo, and at the Pacific Science Enterprise Centre (PSEC) located in West Vancouver.
Manager	Lesley MacDougall **Email**: Lesley.MacDougall@dfo-mpo.gc.ca **Tel:** (250) 756-7395

Canadian Hydrographic Service (CHS)

Provides products and services to aid safe navigation of vessels in Canada's marine waters. Work includes:

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

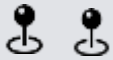
Departmental Core Responsibility: Marine Navigation We maintain waterways year round so they are safely navigable by mariners and all Canadians. (Provide information and services to facilitate navigation in Canadian waters.)	**2021–2022 Fact Sheet ID** 8 and 53
	Approximately 63 CHS employees are located at the Institute of Ocean Sciences (IOS) in Sidney.
Director	Mark Leblanc **Email:** Mark.Leblanc@dfo-mpo.gc.ca **Tel:** (250) 363-6347

Ecosystem Science Division (ESD)

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

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

Departmental Core Responsibility: Aquatic Ecosystems	**2021–2022 Fact Sheet ID**
We protect our oceans, freshwater and aquatic ecosystems and species from the negative impact of humans and invasive species through sound science and in collaboration with Indigenous communities.	14 - 17, 20 - 22, 29, 30, 32, 35, 36, 45 - 52, 56, 62 - 68, 70, 72 - 76, 79, 80

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

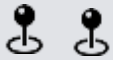
Director	Eddy Kennedy	**Email:** Eddy.Kennedy@dfo-mpo.gc.ca	**Tel:** (250) 756-3360

Ocean Sciences Divisions (OSD)

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

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

Departmental Core Responsibility: Aquatic Ecosystems	**2021–2022 Fact Sheet ID**
We protect our oceans, freshwater and aquatic ecosystems and species from the negative impact of humans and invasive species through sound science and in collaboration with Indigenous communities.	1 - 7, 9, 19, 23 - 28, 37, 44, 54, 55, 57, 69, 71

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

Manager	Kim Houston	**Email:** Kim.Houston@dfo-mpo.gc.ca	**Tel:** (250) 363-6378

Stock Assessment and Research Division (StAR) – Core

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

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

Departmental Core Responsibility: Fisheries We ensure Canada's fisheries, including aquaculture, are protected, managed sustainably and support Indigenous participation, and that our national network of harbours is open and in good repair.	**2021–2022 Fact Sheet ID** 10, 11, 12, 13, 33, 34, 38 – 43, 58 – 61, 77, 78, 81, 82

	Approximately 94 StAR employees are located at the Pacific Biological Station (PBS) in Nanaimo.		
Manager	John Holmes	**Email:** John.Holmes@dfo-mpo.gc.ca	**Tel**: (250) 756-7145

Stock Assessment and Research Division (StAR) – Areas

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

Departmental Core Responsibility: Fisheries

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

Yukon – Transboundary Rivers Area (YTRA)

	YTRA includes the geographic extent of the Yukon Territory (exclusive of north slope (Beaufort Sea) watersheds), as well as transboundary watersheds located in northwestern British Columbia (Chilkat, Taku, Whiting, Stikine, Unuk, Chickamin rivers). This area has approximately 590,000 km^2, of which 15,000km^2 is inland freshwaters.
	Approximately 33 StAR employees are located at the YTRA headquarters in Whitehorse.
Area Chief	Steve Smith (Yukon) **Email:** Steve.J.Smith@dfo-mpo.gc.ca **Tel:** (867) 393-6840 Bill Waugh (Transboundary) Bill.Waugh@dfo-mpo.gc.ca **Tel:** (867) 393-6764

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^2.
	Approximately 43 StAR employees are located at the NCA headquarters in Prince Rupert.
Area Chief	Shaun Davies **Email:** 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^2 and includes lakes, rivers, inlets, and estuaries.
	Approximately 46 StAR employees are located at the SCA headquarters in Nanaimo.
Area Chief	Wilf Luedke **Email:** Wilf.Luedke@dfo-mpo.gc.ca **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 120 StAR employees are located at the FIA headquarters in Delta, BC, and in Kamloops, BC.
Area Chief	Timber Whitehouse **Email:** Timber.Whitehouse@dfo-mpo.gc.ca **Tel:** (250) 851-4833

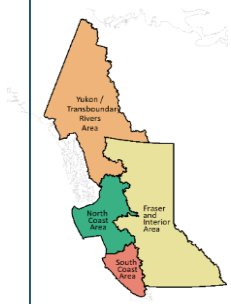
ANNEX B: FACT SHEET SERIES

Field Operations Category

- Human Impacts Research and Monitoring
- Hydrographic and Oceanographic Surveys
- Population and Ecosystem Assessments

Fact Sheet Identification number

Geographic area



Research Platform

Title of Field Operation

Dates
Recurrence
Locations
DFO lead scientist
Contact information

Description of the programming and associated objectives

Collaborators

For more information

Map of study area

An Observation Network Studying Marine Biogeochemistry (ArcticNET)

1

Yukon & Arctic

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

Description

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

Objectives

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

Map 1. Study area.

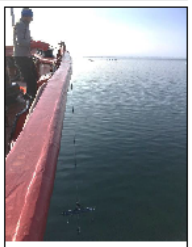


Image 1. Sampling surface waters.

Collaborators
- University of Calgary
- University of Manitoba

FOR MORE INFORMATION – ArcticNet:

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

Fisheries and Oceans Canada | Pêches et Océans Canada

Canada

COVID-19

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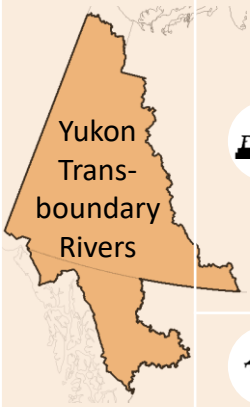		ArcticNET Observation Network: Marine Biogeochemistry	1
		Oceanographic Monitoring: Beaufort Gyre	2
		Marine Hazards Assessment: Canadian Polar Shelf	3
		Wintertime Ocean Sampling: Northwest Passage	4
		Oceanographic Exploration: Kitikmeot Sea	5
		Ocean and Clam Beds Monitoring: Bering and Chukchi Seas	6
		Chinook and Coho Salmon: Coded Wire Tag Program	81
		Salmon Stock Assessment	82

Area	Type	Field Operations	ID
		Sharing Science at Sea Expedition	7
		Bathymetry, Seabed Classification, and Tide Gauge Servicing	8
		Nutrient Sampling: Chatham Sound	9
		Hard Bottom Longline Hook Survey: Outside Area	10
		Synoptic Bottom Trawl Survey: Hecate Strait	11
		Synoptic Bottom Trawl Survey: Queen Charlotte Sound	12
		Northern Abalone: Index Sites Survey	13
		Northern Resident Killer Whale: Annual Census	14
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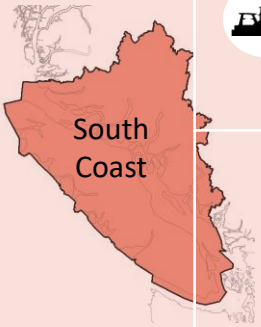
		Subtidal and Intertidal Biodiversity Survey	16
		Chinook and Coho Salmon: Coded Wire Tag Program	81
		Salmon Stock Assessment	82

Area	Type	Field Operations	ID
 South Coast		Aquaculture Monitoring and Modelling Program	17
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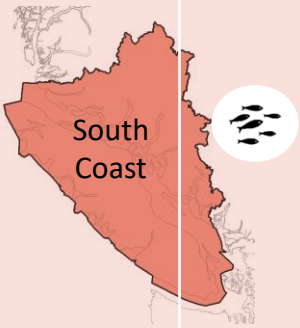
Area	Type	Field Operations	ID
		Green Sea Urchin: Assessment Survey	43
		Zooplankton Surveys: Strait of Georgia	44
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		Harbour Seal and Sea Lion: Diet Analysis	46
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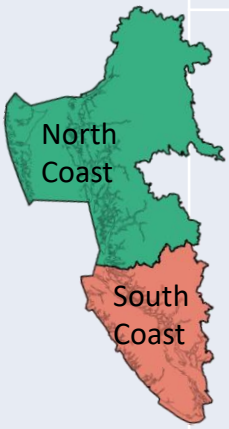
		Harmful Algal Bloom Mitigation: Jervis Inlet	50
		Chinook and Coho Salmon: Coded Wire Tag Program	81
		Salmon Stock Assessment	82

Area	Type	Field Operations	ID
		Aquatic Invasive Species: Settlement Plate Survey	51
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		Halibut, Lingcod, Rockfish: IPHC Fishery Independent Setline Survey	58
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		Pacific Herring: Biological Sampling Surveys	60
		Pacific Herring: Spawn Surveys	61
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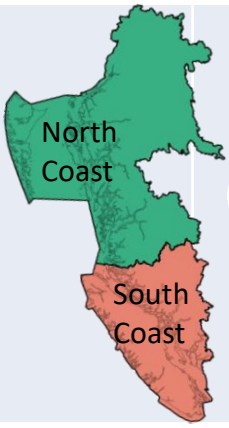
Area	Type	Field Operations	ID
		Sea Otter: Population Assessment	63
		Large Whales: Assessment Surveys	64
		Northern Resident Killer Whale: Physiology and Body Condition Study	65
		Deep Seamounts Exploration	66
		Chinook and Coho Salmon: Coded Wire Tag Program	81
		Salmon Stock Assessment	82

Area	Type	Field Operations	ID
		Long-Term Impacts of Forestry on Stream Temperature	67
		Assessment of Land Use Impacts on Interior Juvenile Coho Salmon Habitat	68
		Tailings Pond Monitoring: Quesnel Lake	69
		Sockeye Salmon: Freshwater Migratory Stress	70
		Juvenile Chinook Salmon: Contaminant Impacts	71
		Juvenile Coho Salmon: Habitat Productivity	72
		Juvenile Coho Salmon: Freshwater Habitat Use	73
		Juvenile Sockeye Salmon: Acoustic and Trawl Surveys	74
		Juvenile Sockeye Salmon: Nursery Lake Ecosystem Assessments	75
		Pacific Salmon: Water Temperature Monitoring	76
		Crab Assessment Survey: Strait of Georgia	77
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		Rocky Mountain Ridged Mussel: Annual Surveys	79
		Coastal Environmental Baseline: Port of Vancouver	80
		Chinook and Coho Salmon: Coded Wire Tag Program	81
		Salmon Stock Assessment	82

An Observation Network Studying Marine Biogeochemistry (ArcticNET)

Dates: Summer 2021
Recurrence: Annually, since 2003
Locations: Canadian Archipelago, Baffin Bay, Beaufort Sea, Hudson Bay
Vessel: CCGS Amundsen
Lead scientist: Lisa Miller (250) 363-6673
Lisa.Miller@dfo-mpo.gc.ca

Description

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

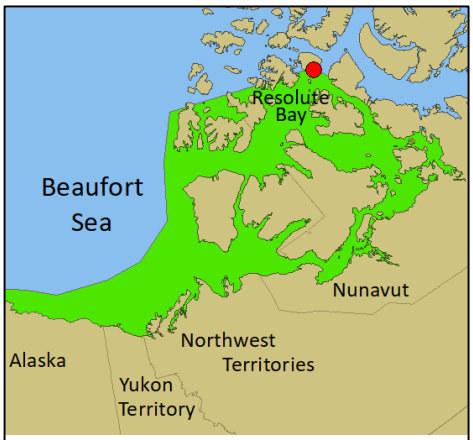
Objectives

1. Use a distributed network of research vessels, ocean observatories, and land-based instrument installations to measure marine biogeochemical processes across the Canadian Arctic to understand regional impacts on greenhouse gas cycling, primary production, and ocean acidification; and

2. Use expanded observational network to provide real-time environmental observations to Inuit communities, extend training and research opportunities to Northern residents, and connect with other potential stakeholders.

Collaborators

- University of Calgary
- University of Manitoba



Map 1. Study area.

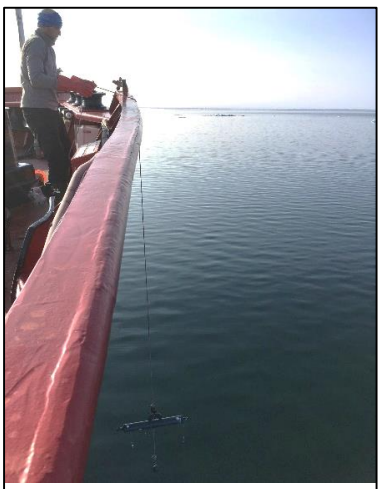


Image 1. Sampling surface waters.

FOR MORE INFORMATION

ArcticNet

Dates: August 31 – September 21, 2021
Recurrence: Annually, since 2003
Locations: Beaufort Gyre, Canada Basin in the Arctic
Vessels: CCGS Louis S. St-Laurent
Lead scientist: Bill Williams (250) 858-3699
Bill.Williams@dfo-mpo.gc.ca

Description

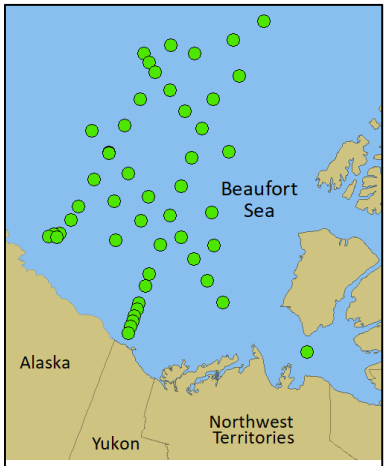
The Beaufort Gyre is one of the Arctic Ocean's primary circulation features, storing and transporting freshwater, sea ice, and heat across the Canadian Basin. The Joint Ocean Ice Studies program collects biogeochemical water samples and deploys moorings and ice buoys to monitor the response of the Beaufort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

Objectives

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

Collaborators

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



Map 1. Study locations.

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

FOR MORE INFORMATION

Beaufort Gyre Exploration Project

Dates: September 23 – October 6, 2021
Recurrence: Annually, since 1990
Locations: Canadian Polar Shelf—Beaufort and Chukchi Seas
Vessel: CCGS Sir Wilfrid Laurier
Lead scientist: Humfrey Melling (250) 363-6552
Humfrey.Melling@dfo-mpo.gc.ca

Description

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

Objectives

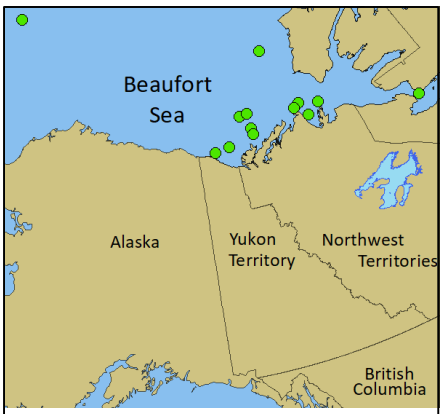
1. Recover and service recording instruments from 10 to 20 submerged moorings, retrieve data, and redeploy the observing array;

2. Collect marine mammal sound recordings, sea-surface temperature, salinity, fluorescence, water & airborne contaminants, and mapping of the seabed; and

3. Establish estimates of the recurrence intervals for rare extreme marine hazards of high severity, & reliable projections of the future state of the marine Arctic under the influence of climate change.

Collaborators

- Environment and Climate Change Canada
- National Oceanographic and Atmospheric Administration
- Inuit communities via the Inuvialuit Environmental Impact Screening Committee



Map 1. Study locations.

Image 1. Crew retrieves ocean mooring among ice floes.

FOR MORE INFORMATION

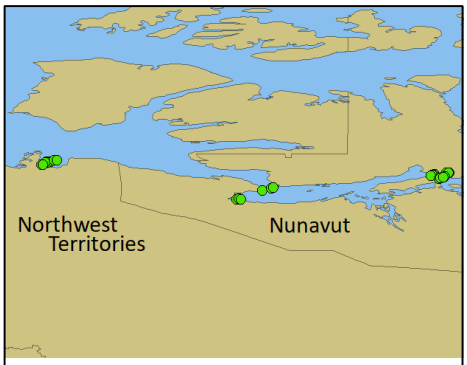
Contact the Lead Scientist at Humfrey.Melling@dfo-mpo.gc.ca

Dates: April 2021 and February 2022
Recurrence: Annually, since 2009
Locations: Northwest Passage (Cambridge Bay, Kugluktuk, Paulatuk, Gjoa Haven).
Lead scientist: Mike Dempsey (250) 363-6452
Mike.Dempsey@dfo-mpo.gc.ca

Image 1.Ranger snowmobile patrol.

Description:

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



Map 1. Study locations.

Objectives

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

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

Collaborators

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

FOR MORE INFORMATION

Contact the Lead Scientist at Mike.Dempsey@dfo-mpo.gc.ca

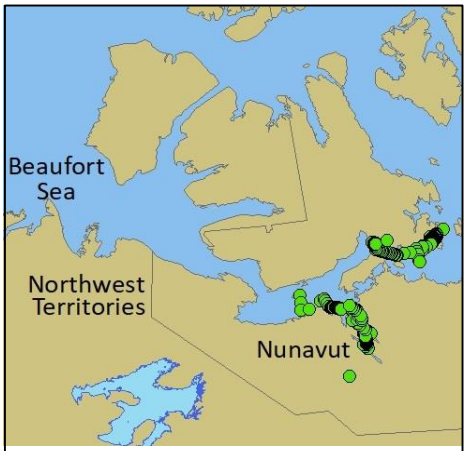
Dates: August 15 – 28, 2021
Recurrence: Annually, since 2014
Locations: Kitikmeot Sea
Vessel: R/V Martin Bergmann
Lead scientist: Kristina Brown (250) 363-6559
Kristina.Brown@dfo-mpo.gc.ca

Description:

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

Objectives

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



Map 1. Study locations.

Collaborators

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

Image 1. Benthic sampling.

FOR MORE INFORMATION

Contact the Lead Scientist at Kristina.Brown@dfo-mpo.gc.ca

Dates: July 3 – 23, 2021
Recurrence: Annually, since 1998
Locations: Bering Sea and Chukchi Sea
Vessels: CCGS Sir Wilfrid Laurier
Lead scientist: John Nelson (250) 363-6584
John.Nelson@dfo-mpo.gc.ca

Description

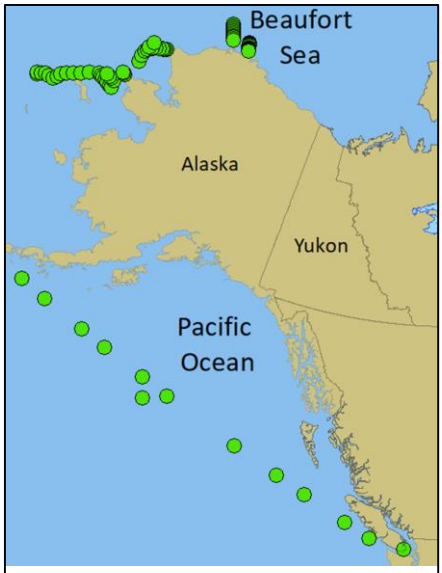
Canada's Three Oceans West program collects hydrographic, biogeochemical and biological data to monitor ocean and clam bed conditions. These data support the international Distributed Biological Observatory program.

Objectives

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

Collaborators

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



Map 1. Study locations.

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

FOR MORE INFORMATION

Contact the Lead Scientist at John.Nelson@dfo-mpo.gc.ca

Dates: September 26 – October 9, 2021
Recurrence: Annually, Year 1 of 2 (2021-2022)
Locations: Douglas Channel (Hartley Bay, Kitimat), Finlayson Channel (Klemtu), Burke Channel (Bella Coola), Queen Charlotte Sound (Bella Bella), Port Hardy
Vessel: CCGS Franklin
Lead scientist: Stephen Page (250) 363-6377
Stephen.Page@dfo-mpo.gc.ca

Description

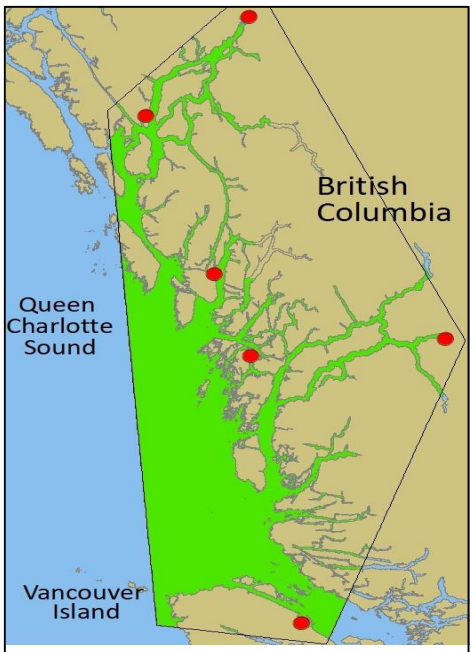
The Sharing Science-at-Sea Expedition will bring a floating Science Centre to Indigenous communities of the Pacific Central Coast in an effort to promote relationships building and collaborative science.

Objectives

1. Engage First Nations communities to work alongside DFO scientists to conduct locally relevant ocean sampling 'in their own backyard;'
2. Invite First Nation youth and other community members onboard to tour DFO's newest Science vessel, the CCGS Sir John Franklin;
3. Showcase CCG search and rescue and environmental response capabilities; and
4. Inspire First Nations youth to pursue scientific careers with DFO Science and the Canadian Coast Guard.

Collaborators

- Central Coast First Nations



Map 1. Study area.

Image 1. DFO Science in School Project, June 2019.

FOR MORE INFORMATION

Contact the Lead Scientist at Stephen.Page@dfo-mpo.gc.ca

Dates: June 21 – August 9, 2021
Recurrence: Annually, since 1891
Locations: Scott Islands, Queen Charlotte Sound, Queen Charlotte Strait
Vessel: CCGS Vector
Lead scientist: Stacey Verrin (250) 363-6377
Stacey.Verrin@dfo-mpo.gc.ca

Description

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

Objectives

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

Map 1. Study areas.

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

Collaborators

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

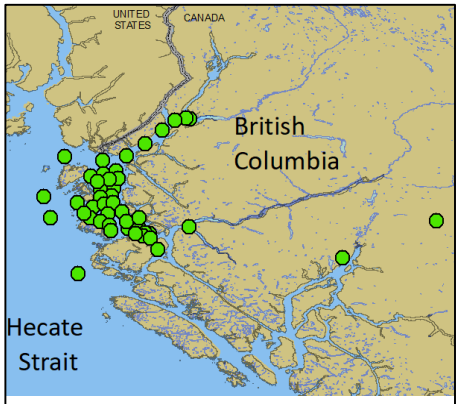
FOR MORE INFORMATION

Canadian Hydrographic Service ***New*** – 10 m resolution non-navigational bathymetric data

Dates: May 12 – May 16, 2021
Recurrence: Annually, year four of four (2018-2021)
Locations: Chatham Sound, Portland Inlet, Lower Skeena River
Vessel: CCGS John P Tully
Lead scientist: Sophia Johannessen (250) 363-6616
Sophia.Johannessen@dfo-mpo.gc.ca

Description

Nutrients from wastewater or other land-based discharges can cause problems for marine life, including fish. This project will measure the natural sources and burial of nutrients in Chatham Sound to provide context for evaluation of future development proposals. This sampling will occur at the end of the Line P cruise (fact sheet #27).



Map 1. Study locations.

Objectives

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

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

Collaborators

- Skeena Fisheries Commission

FOR MORE INFORMATION

Contact the Lead Scientist at Sophia.Johannessen@dfo-mpo.gc.ca

Dates: July 15 – September 15, 2021
Recurrence: Annually–south in even years, north in odd years–since 2006
Locations: West Coast of Vancouver Island (Queen Charlotte Sound, Hecate Strait, Dixon Entrance, Haida Gwaii)
Vessels: Chartered commercial longline vessels
Lead scientists: Malcolm Wyeth, Dana Haggarty
Malcolm.Wyeth@dfo-mpo.gc.ca (778) 268-1184

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

Description

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

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

Objectives

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

Image 2. A Yelloweye Rockfish hiding behind anemones.

Collaborators

- Pacific Halibut Management Association of BC

FOR MORE INFORMATION

Contact the Lead Scientist at Malcolm.Wyeth@dfo-mpo.gc.ca

Dates: May 18 – June 14, 2021
Recurrence: Every 2 years, since 2005
Locations: Hecate Strait, Eastern Dixon Entrance
Vessel: CCGS Sir John Franklin
Lead Scientists: Malcolm Wyeth, Norm Olsen
Malcolm.Wyeth@dfo-mpo.gc.ca (778) 268-1184

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.

Map 1. Survey area.

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.

Image 1. A Tope Shark (Galeorhinus galeus).

FOR MORE INFORMATION

Contact the Lead Scientist at Malcolm.Wyeth@dfo-mpo.gc.ca

Dates: July 1 – August 14, 2021
Recurrence: Every 2 years, since 2003
Location: Queen Charlotte Sound
Vessel: F/V Nordic Pearl
Lead Scientists: Malcolm Wyeth, Norm Olsen
Malcolm.Wyeth@dfo-mpo.gc.ca (778) 268-1184

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

Map 1. Survey area.

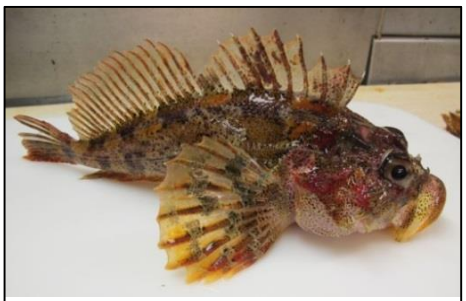


Image 1 Red Irish Lord (Hemilepidotus hemilepidotus)*, a type of sculpin.*

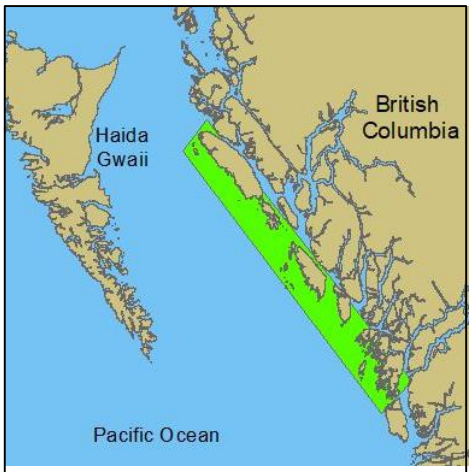
FOR MORE INFORMATION

Contact the Lead Scientist at Malcolm.Wyeth@dfo-mpo.gc.ca

Dates: May 8 – 17, May 19 – 28, 2021
Recurrence: Every 5 years, since 1978
Location: Hecate Strait and Queen Charlotte Sound
Vessel: CCGS Vector
Lead Scientist: Dominique Bureau (250) 756-7114
Dominique.Bureau@dfo-mpo.gc.ca

Description

Northern Abalone Index Sites Survey in Hecate Strait and Queen Charlotte Sound. 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.



Map 1. Survey area.

Objectives

1. SCUBA dive survey of Northern Abalone index sites to collect information on density, size, recruitment, genetics, and habitat.

Collaborators (to be confirmed)

- Heiltsuk
- Kitasoo
- Gitga'at
- Kitkatla / Gitxaala
- Central Coast Indigenous Resource Alliance

Image 1. Northern Abalone (Haliotis kamtschatkana).

FOR MORE INFORMATION

Canadian Manuscript Report of Fisheries and Aquatic Sciences 3162

Dates: May 1 – August 31, 2021
Recurrence: Annually, since 1973
Locations: Johnstone Strait and Sound, Hecate Strait, Dixon Entrance, Chatham Sound
Vessel: M/V Roller Bay
Lead scientist: Thomas Doniol-Valcroze (250) 729-8375
Thomas.Doniol-Valcroze@dfo-mpo.gc.ca

Description

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

Map 1. Study area.

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.

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

Collaborators

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

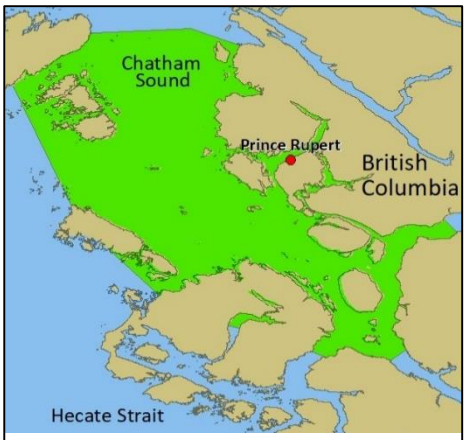
FOR MORE INFORMATION

Science Response 2020/040

Dates: April 1, 2021 – March 31, 2022
Recurrence: Annually, since 2017
Locations: Port of Prince Rupert, Chatham Sound, Skeena River Estuary
Vessels: CCGS Vector, Tully, Tanu and Neocaligus
Lead scientists: Paul Covert (250) 363-6765
Paul.Covert2@dfo-mpo.gc.ca

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.



Map 1. Study area.

Objectives

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

Image 1. Water sampling in Chatham Sound.

Collaborators

- Local First Nations
- Environment Climate Change Canada
- Prince Rupert Port Authority
- Coastal and Ocean Resources (ShoreZone)
- Ocean Wise
  - North Coast Cetacean Research Institute
  - *PollutionTracker*

FOR MORE INFORMATION

Coastal Environmental Baseline Program and Port of Prince Rupert pilot site

Dates: April 16 – May 7, 2021
Recurrence: Annually, since 2016
Locations: Queen Charlotte Sound and Saanich Inlet
Vessel: CCGS Vector
Lead scientists: Tammy Norgard, Sarah Dudas

Tammy.Norgard@dfo-mpo.gc.ca (250) 616-9278
Sarah.Dudas@dfo-mpo.gc.ca (250) 327-3501

Description

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

Objectives

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

Collaborators

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

Map 1. Study area.

Image 1. Beach Seine.

FOR MORE INFORMATION

Contact Lead Scientists Tammy.Norgard@dfo-mpo.gc.ca or Sarah.Dudas@dfo-po.gc.ca

Dates: April, May, August, October, November 2021; February 2022
Recurrence: Annually, since 2017
Location: Clayoquot Sound
Vessel: AMD Sturgeon Bay
Lead scientist: David Gaspard (236) 334-2532
David.Gaspard@dfo-mpo.gc.ca

AMD Sturgeon Bay

Description

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

Map 1. Study areas.

Objectives

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


Image 1. Deploying a Van Veen Grab for benthic sampling.

Collaborators

- Uu-a-thluk Fisheries

FOR MORE INFORMATION

Contact the Lead Scientist at David.Gaspard@dfo-mpo.gc.ca

Dates: April 1, 2021 – March 31, 2022
Recurrence: Year one of one (2021)
Location: Broughton Archipelago
Vessels: Small inshore boats
Lead Scientist: Kristi Miller-Saunders (250) 756-7155
Kristi.Saunders@dfo-mpo.gc.ca

Description

Monthly water and fish sampling from Broughton Archipelago fish farms to assess the associations between pathogens in fish on farms and in the surrounding water column. First Nations trainees working at the DFO genomics laboratory will employ molecular profiling of the samples. This project is in support of the establishment of the first Indigenous genomics laboratory in Canada at the Okanagan Nations Alliance hatchery in Penticton.

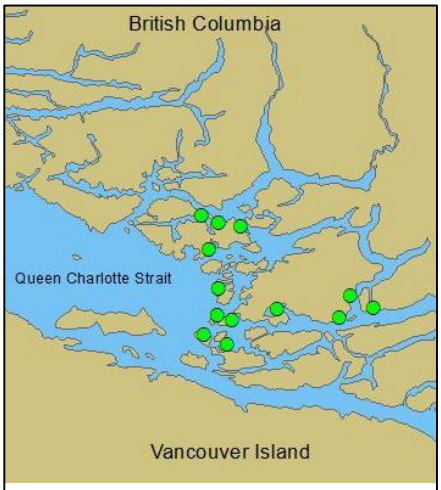
Objectives

1. Provide genomics training for technology transfer of infectious agent profiling technologies to First Nations;
2. Determine whether non-invasive environmental (e)DNA profiling can detect shifting infectious agents associated with disease development on farms, and
3. Provide scientific data to support First Nations decision making pertaining to risks to wild salmon posed by Broughton tenures.

Collaborators

- 'Namgis, Mamalilikulla, and Kwikwasut'inuxw Haxwa'mis First Nations
- Okanagan Nation Alliance
- Mowi ASA and Cermaq Canada

Image 1. Atlantic Salmon on ice prior to dissection.



Map 1. Study locations.

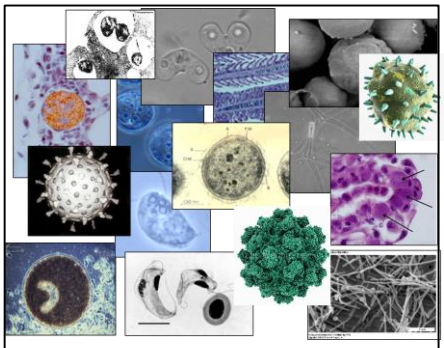


Image 2. Multi-agent profiles of viruses, bacteria and fungal pathogens will be monitored in water and fish tissue samples.

FOR MORE INFORMATION

Contact the Lead Scientist at Kristi.Saunders@dfo-mpo.gc.ca

Dates: April 1 – July 31, 2021
Recurrence: Annually, year seven of seven (2015-2021)
Location: Discovery passage, Okisollo channel
Vessels: Small inshore boat, rigid inflatable boats
Lead scientist: Stéphane Gauthier (250) 363-6587
Stephane.Gauthier@dfo-mpo.gc.ca

Description

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

Objectives

1. Monitor wild juvenile salmon migration through the area using moored inverted echosounders mounted on the bottom of the channel;

2. Monitor activity of wild fish in the direct vicinity of aquaculture sites using high resolution imaging sonar (DIDSON) mounted on aquaculture facilities; and

3. Inspect sites and instruments on a regular basis to ensure proper data collection, and collect visual information on presence and status of wild juvenile salmon in the area.

Collaborators

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

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

Image 1. Acoustic mooring before deployment.

FOR MORE INFORMATION

State of the Pacific Ocean

Dates: April 1, 2021 – March 31, 2022
Recurrence: Year one of one
Locations: Clayoquot Sound (Warne Island and Dawley Pass)
Vessel: Local work boat
Lead scientists: Chris Pearce, Emaline Montgomery
Chris.Pearce@dfo-mpo.gc.ca (250) 756-3352
Emaline.Montgomery@dfo-mpo.gc.ca


Industry skiff

Description

Field trials will assess if Giant Red Sea Cucumbers can effectively remove biofouling from commercial salmon aquaculture net pens by their grazing activities.

Objectives

1. Determine the effectiveness of the Giant Red Sea Cucumber as a biological means to control biofouling in Pacific salmon farms;
2. Determine the survival and health of Giant Red Sea Cucumbers and salmon when co-cultured. This is essential to ensuring there are no risks to the fish, or to wild populations in the surrounding area, resulting from any co-culture with Giant Red Sea Cucumbers; and
3. Calculate growth rates and market quality of Giant Red Sea cucumbers raised within salmon farms in order to assess the viability of selling Giant Red Sea Cucumbers raised in salmon net pens as a secondary cash crop.

Map 1. Study locations.


Image 1. Giant red sea cucumber (Parastichopus californicus).

Collaborators

- Creative Salmon Company Ltd.

FOR MORE INFORMATION

Contact the Lead Scientist at Chris.Pearce@dfo-mpo.gc.ca

Pacific Oyster Breeding Program Field Trials

Dates: April 1, 2021 – March 31, 2022
Recurrence: Year one of one
Locations: Strait of Georgia (Deep Bay and Read Is.), Barkley Sound (Bamfield)
Vessel: VIU R/V Atrevida, local work boats
Lead scientists: Chris Pearce, Clara Mackenzie

Chris.Pearce@dfo-mpo.gc.ca (250) 756-3352
Clara.Mackenzie@dfo-mpo.gc.ca (250) 756-7095

Description

Field trials to assess the performance of different families of Pacific oysters at multiple oyster farm sites. Findings will support the development of a breeding program for improved resilience of Pacific oysters to summer mortality.

Map 1. Study locations.

Objectives

1. Track growth and survival of tagged Pacific oyster spat from 18 wild families deployed at east (Deep Bay) and west (Bamfield) farm sites;
2. Track growth and survival of tagged Pacific oyster spat from 25 commercial families deployed at north (Read Island) and south (Deep Bay) farm sites; and
3. Rank families according to field performance to inform breeding program.

Collaborators

- Vancouver Island University
  - Centre for Shellfish Research
  - Deep Bay Marine Field Station
- British Columbia Shellfish Growers Association
- Nova Harvest Ltd. and Sawmill Bay Shellfish

Image 1. Tagged oyster spat ready for field deployment.

FOR MORE INFORMATION

Aquaculture Collaborative Research and Development Program

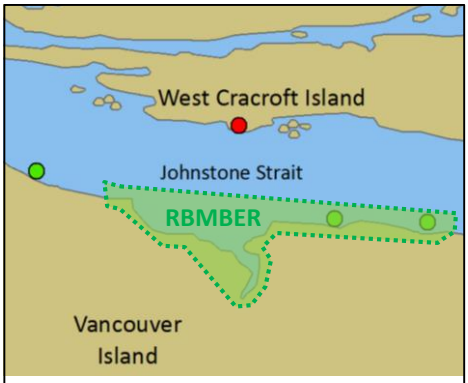
Dates: July 1 – August 31, 2021
Recurrence: Annually, year three of four (2019-2022)
Location: Johnstone Strait
Vessels: S/V Nahwitti Ranger (BC Parks); Zodiac to access to RBMBER rubbing beaches
Lead scientist: Sheila J Thornton (604) 364-5917
Sheila.Thornton@dfo-mpo.gc.ca


S/V Nahwitti Ranger

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.



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

Objectives

1. Quantify rubbing beach use and bout length on beaches inside and outside the reserve; and

2. Assess vessel presence, distance from the beach, and the ambient acoustic environment on the beaches to evaluate the level of protection provided by the ecological reserve.

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

Collaborators

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

FOR MORE INFORMATION

Contact the Lead Scientist at Sheila.Thornton@dfo-mpo.gc.ca

Dates: April 11 – 15, June 11 – 14, Oct 11 – 19, '21
Recurrence: Annually, year four of six (2018-2023)
Locations: Swiftsure Bank, Juan de Fuca Strait, Haro Strait, Boundary Pass, Strait of Georgia
Vessel: CCGS Vector and charter vessel
Lead scientist: Svein Vagle (250) 363-6339
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 eight hydrophone moorings;
2. Collect water property data;
3. Perform sound propagation studies;
4. Collect bird information; and
5. Monitor marine mammals.

Collaborators

- Dalhousie University

Map 1. Study locations.

Image 1. Recovering a mooring from the Vector.

FOR MORE INFORMATION

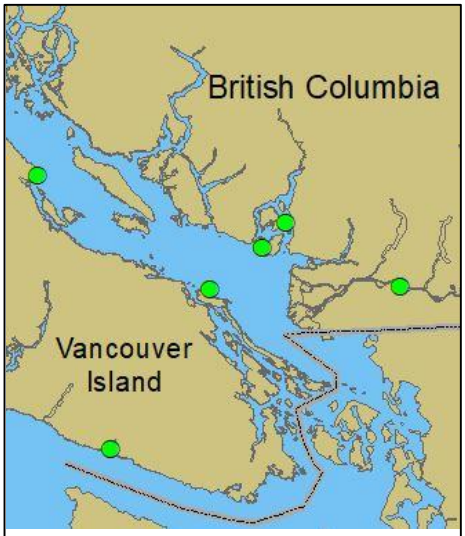
Canadian Technical Report of Hydrography and Ocean Sciences 332 – 2019 and 2020

Southern Resident Killer Whale Contaminant Impacts

Dates: June 1 – August 31, 2021
Recurrence: Annually, year two of three (2019-2021)
Location: Swiftsure Bank, Juan de Fuca Strait, Strait of Georgia
Vessels: Guide vessels, DFO rigid inflatable boats
Lead scientist: Tanya Brown (250) 353-9211
Tanya.Brown@dfo-mpo.gc.ca

Description

Southern Resident Killer Whale (SRKW) face significant anthropogenic threats, including from high levels of endocrine disrupting contaminants. This study will support the recovery of this species at risk by evaluating contaminants found in SRKWs, their diet, and their habitat; by developing and applying new tools to prioritize contaminants of concern; and by delivering refined guidance.



Map 1. Prey, sediment, and SRKW whale sample locations.

Objectives

1. Determine which prey species and/or Chinook Salmon stocks are accumulating contaminants of concern in SRKW;

2. Use food web biomagnification models to report on current and future exposure and risk for the priority contaminant classes of concern; and

3. Determine priority contaminants and their associated health effects in SRKW.

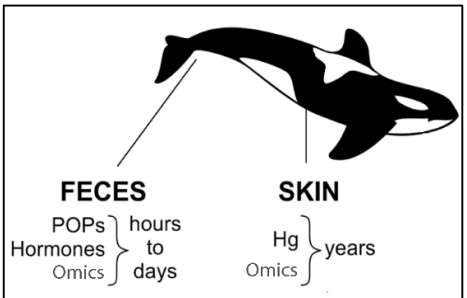


Image 1. Samples obtained from SRKW.

Collaborators

- Pacheedaht First Nation
- Environment & Climate Change Canada - DAS
- Ocean Wise Conservation Association
- Simon Fraser University

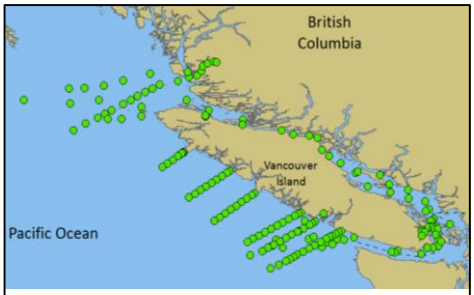
FOR MORE INFORMATION

Contact the Lead Scientist at Tanya.Brown@@dfo-mpo.gc.ca

Dates: May 18 – 31, Sept 10 – 21, 2021
Recurrence: Annually, since 1979
Locations: West Coast Vancouver Island, Southern Queen Charlotte Sound, Strait of Georgia
Vessel: CCGS John P. Tully
Lead scientist: Akash Sastri (250) 756-7137
Akash.Sastri@dfo-mpo.gc.ca

Description

This oceanographic survey—sometimes referred to as La Perouse—examines water properties and plankton to identify changing ocean conditions, and to inform understanding of abundance and survival of fish populations.



Map 1. Study locations.

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; and
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.

Image 1. “Bongo” nets used to sample the zooplankton.

Collaborators

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

FOR MORE INFORMATION

State of the Pacific Ocean

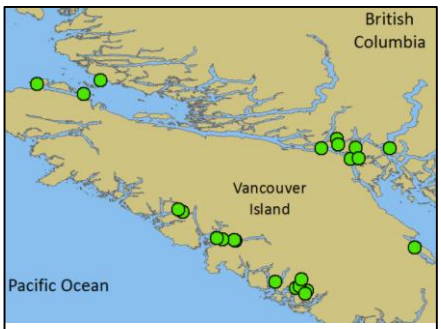
Dates: April 1, 2021 – March 31, 2022
Recurrence: Varied, since 2009
Locations: Queen Charlotte Strait, Discovery Islands, West Coast Vancouver Island
Vessels: Local work boats
Lead scientist: Peter Chandler (236) 464-3338
Peter.Chandler@dfo-mpo.gc.ca

Image 1. Weather station installed at remote site.

Description

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

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



Map 1. Study locations.

Objectives

1. Maintain the weather stations installed at remote locations that require manual downloading of stored data; and

2. Maintain the weather stations installed on fish farms that provide data via the internet.

Image 2. Weather station installed at fish farm.

Collaborators

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

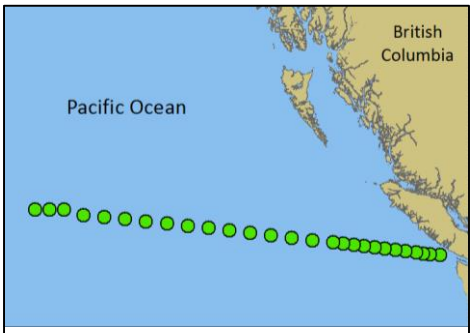
FOR MORE INFORMATION

Canadian Aquaculture R&D Review 2017

Dates: May 2 – 17, August 24 – September 6, 2021; Feb 22 – March 12, 2022
Recurrence: Annually, since 1956
Locations: Northeast Pacific
Vessel: CCGS John P. Tully
Lead scientist: Marie Robert (236) 464-2074
Marie.Robert@dfo-mpo.gc.ca

Description

Line P—a long standing program that surveys a 1,700 km long section three times per year—is the longest time series of oceanographic data in the Northeast Pacific and Fisheries and Oceans Canada's furthest offshore reaching program on the west coast. Data collected since 1956 shows evidence of the impact of climate variability on ocean productivity.



Map 1. Study locations.

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.

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

Collaborators

- University of Washington, Victoria, British Columbia, and Memorial University of Newfoundland
- National Oceanographic and Atmospheric Administration

FOR MORE INFORMATION

State of the Pacific Ocean

Dates: April 1 –6, June 16 – 20, Oct 6–10, 2021
Recurrence: Annually, since 1999
Locations: Strait of Georgia, Juan de Fuca Strait
Vessels: CCGS John P. Tully and CCGS Vector
Lead scientist: Peter Chandler (236) 464-3338
Peter.Chandler@dfo-mpo.gc.ca

Description

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

Map 1. Study locations.

Objectives

1. Continue the time series of observations at over 80 stations monitoring the physical, chemical and biological characteristics of the region; and

2. Extend the survey into Burrard Inlet and Indian Arm and compare observations with previous surveys.

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

Collaborators

- Tsleil-Waututh First Nation

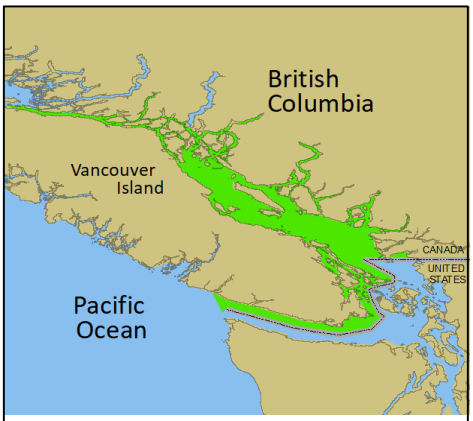
FOR MORE INFORMATION

State of the Pacific Ocean and Salish Sea Water Quality

Dates: June 15 – July 3, September 7 – 25, 2021
Recurrence: Annually, since 1998
Locations: Johnstone Strait, Strait of Georgia, Juan de Fuca Strait, mainland inlets
Vessel: CCGS Sir John Franklin
Lead scientist: Chrys Neville (250) 756-7185
Chrys.Neville@dfo-mpo.gc.ca

Description

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



Map 1. Study area.

Objectives

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

Image 1. Crew shaking down a modified trawl net.

FOR MORE INFORMATION

State of the Pacific Ocean

Dates: October 10 – 23, 2021
Recurrence: Annually, since 1998
Locations: West Coast Vancouver Island
Vessel: CCGS Franklin
Lead scientists: Jackie King, Erika Anderson

Jackie.King@dfo-mpo.gc.ca (250) 756-7176
Erika.Anderson@dfo-mpo.gc.ca (250) 756-7067

Description

This survey will be used to estimate the condition and stock composition of Pacific salmon on the West Coast of Vancouver Island. Oceanographic sampling will allow us to relate salmon abundance and condition to physical sea conditions, and presence and quality of prey (zooplankton). This survey will align with First Nations microtrolling for juvenile Chinook within West Coast Vancouver Island inlets (fact sheet 31).

Map 1. Potential study locations.

Objectives

1. Determine the fall abundance, condition, distribution, and genetic stock composition of juvenile salmon, especially Chinook;

2. Collect physical oceanographic and zooplankton data to relate back to salmon ecology; and

3. Record biological information from all species caught, including other fish species, sharks (live release) and invertebrates (e.g. Jellyfish).

*Image 1. Sorting juvenile Salmon, juvenile Sablefish (*Anoplopoma fimbria*), and Jellyfish.*

Collaborators

- Huu-ay-aht, Ka:'yu:'k't'h'/Che:k'tles7et'h', and Quatsino First Nations
- Uu-a-thluk Fisheries
- Ha'oom Fisheries Society

FOR MORE INFORMATION

Canadian Data Report of Fisheries and Aquatic Sciences 1331

Dates: April 1, 2021 – March 31, 2022
Recurrence: Annually, year two of three (2020-2022)
Locations: Barkley, Clayoquot, Nootka, Kayuquot, Quatsino Sounds
Vessel: Small inshore boats
Lead Scientist: Kristi Miller-Saunders (250) 756-7155
Kristi.Saunders@dfo-mpo.gc.ca

Image 1. Clayoquot Sound Inlet.

Description

Monthly micro-trolling for juvenile Pacific salmon during fall/winter in sounds off the West Coast of Vancouver Islands to study resident and non-resident salmon habitat utilization, assess molecular indices of health and condition, and risk of disease transmission.

Map 1. Study areas.

Objectives

1. Improve understanding of salmon usage of early marine habitats along the West Coast Vancouver Island within all five major sounds via genetic stock identification (GSI); and

2. Assess infectious burden, stressors, health and condition using salmon Fit-Chips in order to identify habitats where fish are most compromised.

Image 2. Micro-trolling gear prepared for sampling.

Collaborators

- Ehattesaht / Chinehkint First Nation
- Ha'oom Fisheries Society
- Huu-ay-aht First Nation
- Kyuquot / Checleseht First Nations
- Maaqutusiis Hahoulthee Stewardship Society (MHSS)
- Quatsino First Nation
- Uu-a-thluk Fisheries
- British Columbia Conservation Foundation (BCCF)
- Cedar Coast Field Station (CCFS)

FOR MORE INFORMATION

Contact the Lead Scientist at Kristi.Saunders@dfo-mpo.gc.ca

Dates: June 1 – August 25, 2021
Recurrence: Annually, year one of two (2021-2022)
Locations: West Coast Vancouver Island (San Juan River and Estuary)
Vessel: N/A
Lead scientists: Paul Grant (250) 217-5376
Paul.Grant@dfo-mpo.gc.ca

Map 1. Study area.

Description

This survey will address knowledge gaps regarding the seasonal abundance, distribution and behaviour of Green Sturgeon (*Acipenser medirostris*) within the San Juan River and Estuary.

Findings will support conservation initiatives and contribute to long-term monitoring of Green Sturgeon, a Species of Special Concern under the *Species at Risk Act*.

Objectives

1. Conduct seasonal surveys within the San Juan River; and
2. Conduct intertidal fish and invertebrate surveys including aquatic invasive species using standard and novel technologies such as environmental DNA.

*Image 1. Green Sturgeon (*Acipenser medirostris*).*

Collaborators

- Pacheedaht First Nations

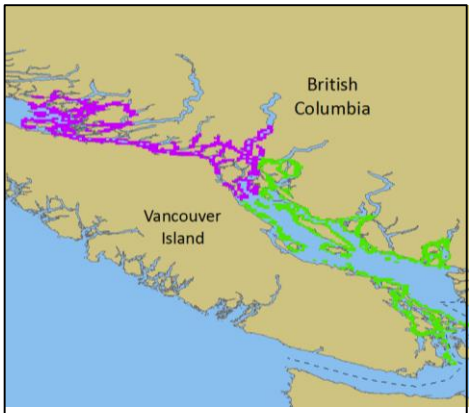
FOR MORE INFORMATION

Contact the Lead Scientist at Paul.Grant@dfo-mpo.gc.ca

Dates: August 6 to September 27, 2021
Recurrence: Annually – north in odd years, south in even years – since 2003
Locations: Johnstone Strait, Strait of Georgia
Vessel: CCGS Neocaligus
Lead scientists: Malcolm Wyeth, Dana Haggarty
Malcolm.Wyeth@dfo-mpo.gc.ca (778) 268-1184

Description

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



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

Objectives

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

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

FOR MORE INFORMATION

Contact the Lead Scientist at Malcolm.Wyeth@dfo-mpo.gc.ca

Dates: May 18 – June 30, 2021
Recurrence: Every 2 years, since 2004
Location: West Coast Vancouver Island
Vessel: Charter F/V Nordic Pearl
Lead scientists: Malcolm Wyeth, Norm Olsen
Malcolm.Wyeth@dfo-mpo.gc.ca (778) 268-1184

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.

Map 1. Study area.

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.

Image 1. Green Sturgeon (Acipenser medirostris).

FOR MORE INFORMATION

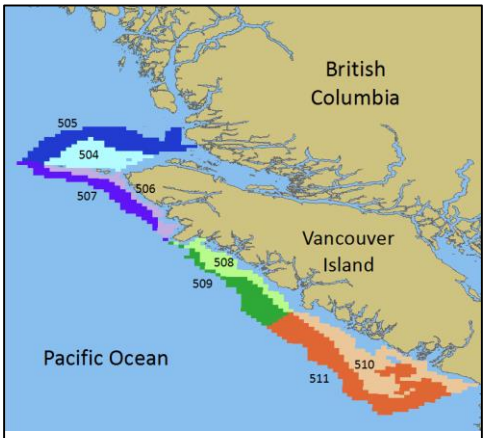
Contact the Lead Scientist at Malcolm.Wyeth@dfo-mpo.gc.ca

Dates: July 4 – 31, 2021
Recurrence: Annually, since 1998
Locations: West Coast Vancouver Island, North West Coast of Vancouver Island
Vessel: CCGS Sir John Franklin
Lead scientists: Jackie King and Jennifer Boldt

Jackie.King@dfo-mpo.gc.ca (250) 756-7176
Jennifer.Boldt@dfo-mpo.gc.ca (250) 756-7110

Description

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



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

Objectives

1. Examine species distribution, composition, and abundance;

2. Collect biological and diet data, as well as biological samples; and

3. Examine the prey environment by sampling zooplankton (vertical bongo net hauls) and conducting oceanographic monitoring (temperature, salinity, fluorescence).

Image 1. Survey participants collecting biological data from fish.

FOR MORE INFORMATION

Canadian Technical Report of Fisheries and Aquatic Sciences 3318

Dates: September 1 – 30, 2021
Recurrence: Annually, since 1992
Locations: Strait of Georgia
Vessel: DFO F/V Walker Rock
Lead scientists: Jennifer Boldt and Matt Thompson

Jennifer.Boldt@dfo-mpo.gc.ca (250) 756-7110
Matthew.Thompson@dfo-mpo.gc.ca (250) 756-7082

Description

This annual survey is designed to improve understanding of Pacific Herring recruitment by estimating an index of relative biomass of age-0 herring (*Clupea pallasii*) as a potential predictor of the abundance of age-3 herring recruits. To accomplish this goal, samples will be collected at stations along ten transects (total 48 stations), distributed around the Strait of Georgia. Sampling will be conducted after dusk, when herring are near the surface, with a small purse seine.

Map 1. Study locations.

Objectives

1. Estimate relative biomass of juvenile herring;

2. Collect biological data, and estimate the relative condition of juvenile herring; and

3. Examine the prey environment by sampling zooplankton (bongo net hauls) and conducting oceanographic monitoring (temperature, salinity).

Image 1. Skipper alongside the purse seine net.

Collaborators

- Pacific Salmon Foundation
  - Salish Sea Marine Survival Project
- Environment and Climate Change Canada

FOR MORE INFORMATION

State of the Pacific Ocean

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

Description

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

Map 1. Study area.

Objectives

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

Image 1. Acoustic mooring before deployment.

Collaborators

- Environment and Climate Change Canada

FOR MORE INFORMATION

State of the Pacific Ocean

Dates: September 8 – 27, 2021
Recurrence: Annually, since 2013
Locations: West Coast Vancouver Island
Vessel: CCGS Vector
Lead scientists: Janet Lochead
Janet.Lochead@dfo-mpo.gc.ca (250) 756-7139

Description

These multispecies benthic invertebrate SCUBA surveys collect size and abundance data on sea urchins, sea cucumbers, pycnopodia sea stars and northern abalone (a species at risk), as well as benthic habitat data on algae and substrate.

The data are used for invertebrate stock assessments, habitat mapping, species distribution modeling, emergency response planning and marine protected area monitoring.

Objectives

1. Collect the data necessary to evaluate stock status relative to reference points for selected benthic invertebrate species to achieve the requirements of the new Fish Stock Provisions of the revised *Fisheries Act*.

Collaborators

- Nuu-chah-nulth Tribal Council

Map 1. Study area.

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

FOR MORE INFORMATION

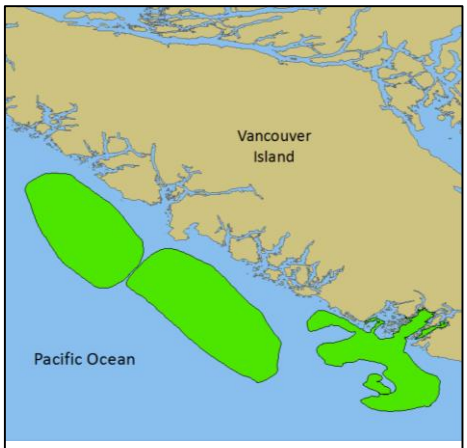
Giant Red Sea Cucumber, Red Sea Urchin and Northern Abalone

Dates: April 26 – May 17, 2021
Recurrence: Annually, since 1973
Location: West Coast Vancouver Island
Vessel: CCGS Sir John Franklin
Lead scientist: Rick Ferguson (250) 756-7195
Rick.Ferguson@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 Pink shrimp stock status for management of the commercial shrimp trawl fishery; informs the annual State of the Oceans report, as well as informs stock assessments for groundfish and pelagic fish species.



Map 1. Study areas.

Objectives

1. Index the abundance of Pink shrimp off WCVI using a fishery-independent trawl survey; and

2. Multi-species indexing of other invertebrates, pelagic fish, and groundfish species.

Image 1. Drawing by A. Denbigh.

FOR MORE INFORMATION

State of the Pacific Ocean

Dates: June 7 – 21, 2021; July 5 – 21, 2021
Recurrence: Annually, since 1998
Locations: Strait of Georgia
Vessel: CCGS Neocaligus
Lead scientist: Rick Ferguson (250) 756-7195
Rick.Ferguson@dfo-mpo.gc.ca

Description

Shrimp assessment surveys estimate the abundance of shrimp stocks (Smooth and Spiny Pink shrimp, and Sidestripe shrimp) in select 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.

Map 1. Study areas.

Objectives

1. Conduct fishery independent surveys of shrimp grounds using bottom trawl gear to determine stock status of Pink and Sidestripe shrimp in Shrimp Management Areas Fraser, Comox, GSTE and Statistical Areas 16, 18, and 19;

2. Maintain Pink shrimp and Sidestripe shrimp abundance index time series for monitoring trends in abundance; and

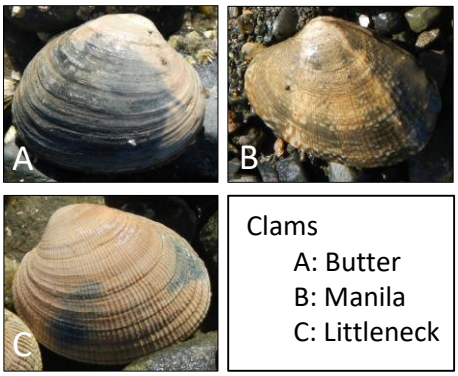
3. Collect species distribution and abundance information on other fish and invertebrate species.

*Image 1. Sidestripe Shrimp (*Pandalopsis Dispar*).*

FOR MORE INFORMATION

Pacific Region Shrimp Trawl Fishery

Dates: April 1, 2020 – March 31, 2021
Recurrence: Annually, since 2021
Locations: West Coast Vancouver Island, Queen Charlotte Sound and Strait, Johnstone Strait, Strait of Georgia, Juan de Fuca Strait
Vessel: Various small craft vessels
Lead scientist: Dominique Bureau (250) 756-7114
Dominique.Bureau@dfo-mpo.gc.ca



Clams
A: Butter
B: Manila
C: Littleneck

Description

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

Map 1. Study areas.

Objectives

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

Collaborators (to be confirmed)

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

Image 1. Digging for clams in a quadrat.

FOR MORE INFORMATION

Pacific Region Intertidal Clam

Dates: May to August 2021
Recurrence: Every few years, since 2010 / annually since 2017
Locations: Transfer Beach (Ladysmith), Swy-a-lana Lagoon (Nanaimo); Hillier Island, Harris Point, and Joes Bay in Barkley Sound
Lead scientist: Dominique Bureau (250) 756-7114
Dominique.Bureau@dfo-mpo.gc.ca

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

Description

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

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

Map 1. Study locations.

Objectives

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

Collaborators

- Parks Canada

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

FOR MORE INFORMATION

Contact the Lead Scientist at Dominique.Bureau@dfo-mpo.gc.ca

Dates: September 24 – 26, 2021
Recurrence: Every 1 to 3 years, since 1995
Location: Queen Charlotte Strait (Telegraph Cove)
Vessels: CCGS Vector
Lead Scientist: Lyanne Curtis (250) 756-7211
Lyanne.Curtis@dfo-mpo.gc.ca

Description

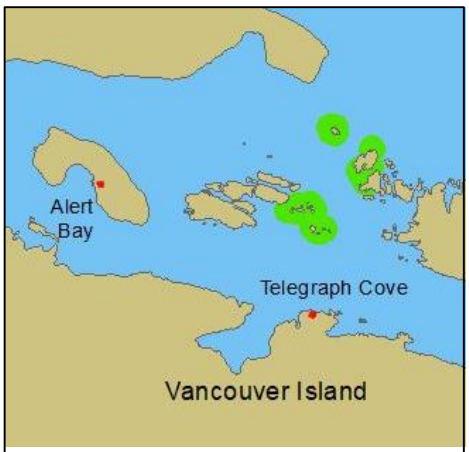
This assessment survey aims to gather data at Green Sea Urchin (*Strongylocentrotus droebachiensis)* Index Sites in order to update the assessment models and stock status, and also to inform the Integrated Fishery Management Plan.

Objectives

1. Collect size distribution and abundance data for green sea urchins to assess stock status and to provide harvest options for the commercial fishery;
2. Gather quantitative description of habitat characteristics including substrate and algae;
3. Gather abundance data for other commercially harvested invertebrate species including Red Sea Urchins, Sea Cucumbers and Geoduck; and
4. Gather size and abundance data for Northern Abalone, a species listed under the *Species at Risk Act*.

Collaborators

- 'Namgis First Nation
- A-Tlegay Fisheries Society
- Pacific Urchin Harvester Association (PUHA)



Map 1. Survey locations.

Image 1. DFO Biologist surveying quadrat for green sea urchins.

FOR MORE INFORMATION

Contact the Lead Scientist at Lyanne.Curtis@dfo-mpo.gc.ca

Dates: May 3 – 8, July 22 – 27, 2021;
Feb 14 – 19, March 14 – 19, 2022
Recurrence: Annually, since 2015
Location: Strait of Georgia
Vessel: CCGS Neocaligus
Lead scientist: Kelly Young (250) 363-6321
Kelly.Young@dfo-mpo.gc.ca

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.

Map 1. Survey locations.

Objectives

1. Conduct full depth Conductivity, Temperature, and Depth (CTD) profile including oxygen and fluorometer;

2. Conduct full depth (10m off bottom to surface) zooplankton net tow (one side preserved in 10% buffered formalin for taxonomy, the other size-fractionated for biochemical analysis); and

3. At selected stations, collect water samples for salinity, nutrients, and phytoplankton biomass and composition.

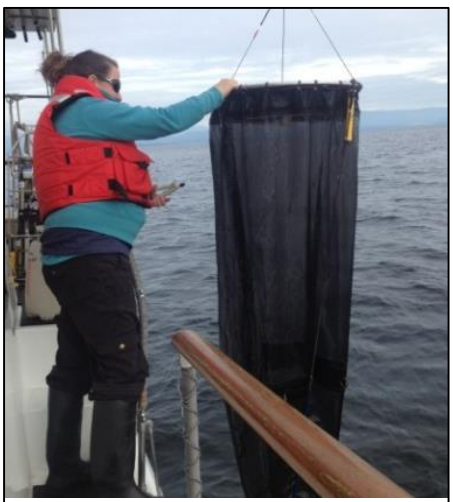


Image 1. Washing down a zooplankton net.

Collaborators

- University of British Columbia
- University of Victoria

FOR MORE INFORMATION

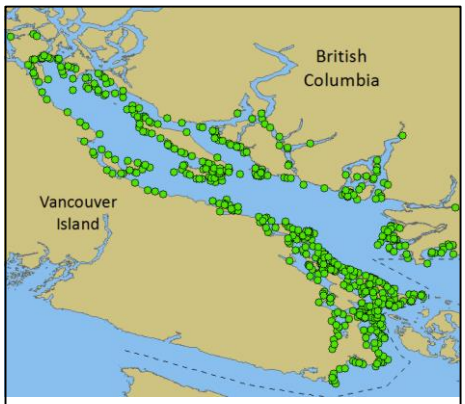
State of the Pacific Ocean

Harbour Seal
Deployment of Satellite Telemetry Tags

Dates: March 1 – July 31, 2021
Recurrence: Annually, since 2019
Locations: Strait of Georgia
Vessel: Small DFO vessel
Lead scientist: Strahan Tucker (250) 756-7188
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.



Map 1. Study locations.

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.

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

FOR MORE INFORMATION

Science Advisory Report

Dates: April 1 – November 30, 2021
Recurrence: Annually, since 2015 (varying areas)
Locations: Queen Charlotte Strait, Strait of Georgia, southern West Coast of Vancouver Island
Vessels: Small DFO vessels
Lead scientist: Strahan Tucker (250) 756-7188
Strahan.Tucker@dfo-mpo.gc.ca

Description

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

Map 1. Study locations.

Objectives

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

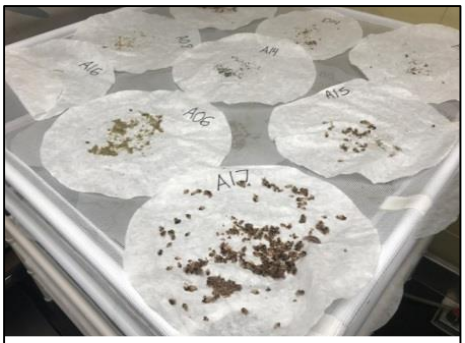


Image 1. Preparation of scat for hard part analysis.

FOR MORE INFORMATION

Contact the Lead Scientist at Strahan.Tucker@dfo-mpo.gc.ca

Dates: April 1, 2021 – March 31, 2022
Recurrence: Annually, year two of two (2020 – 2021)
Locations: Strait of Georgia, Juan de Fuca Strait, Swiftsure Bank
Vessel: M/V Manyberries
Lead scientists: Christie McMillan, Thomas D.-Valcroze
Christie.McMillan@dfo-mpo.gc.ca (236) 330-1435
Thomas.Doniol-Valcroze@dfo-mpo.gc.ca (250) 729-8375

Description

This project will address data gaps on the seasonal abundance, distribution, and behaviour of whales, dolphins, and porpoises in the southern Salish Sea and Swiftsure Bank. Data will lead to an improved understanding of vessel strike risk to these populations.

Map 1. Study area.

Objectives

1. Collect abundance and distribution data through monthly boat-based cetacean surveys;
2. Deploy and recover data-logging tags on humpback whales to gain insight into dive behaviour and habitat use;
3. Deploy and recover passive acoustic recorders to supplement visual survey efforts and inform porpoise distribution and habitat use; and
4. Obtain photo-identification data and genetic samples from humpback whales.

*Image 1. Humpback whale (*Megaptera novaeangliae*) with data-logging tag.*

Collaborators

- Cascadia Research Collective
- SR^3 Sealife Response Rehabilitation and Research
- University of Victoria

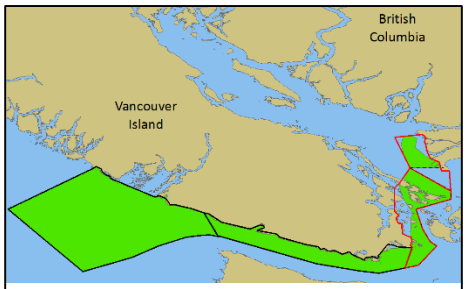
FOR MORE INFORMATION

Contact Christie.McMillan@dfo-mpo.gc.ca or Thomas.Doniol-Valcroze@dfo-mpo.gc.ca

Dates: June 15 – August 15, 2021
Recurrence: Annually, year four of five (2018-2022)
Locations: Gulf Islands, Fraser River mouth, Juan de Fuca Strait, Swiftsure / La Perouse Bank
Vessels: Zodiac Hurricanes (7 m)
Lead scientist: Sheila J Thornton (604) 364-5917
Sheila.Thornton@dfo-mpo.gc.ca

Description

Behavioural assessment of Southern Resident Killer Whales (SRKW) individuals is undertaken to improve understanding of habitat use patterns and identify key foraging areas. Prey sampling, fecal sampling, breath sampling, and drone imaging will inform foraging efficiency, prey selection and physiological parameters.



Map 1. SRKW habitat use (green)

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;
4. Collect fecal and breath samples from SRKW; and
5. Collect overhead images of the whales using drones.

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

Collaborators

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

FOR MORE INFORMATION

SRKW habitat identification

Dates: April 1 – September 1, 2021
Recurrence: Annually, year two of three (2020-2022)
Locations: Juan de Fuca Strait, Swiftsure Bank
Vessels: CCGS Franklin and charter vessel
Lead scientist: Cameron Freshwater (250) 756-7092
Cameron.Freshwater@dfo-mpo.gc.ca

Description

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

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

Map 1. Study area.

Objectives

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

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

Collaborators

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

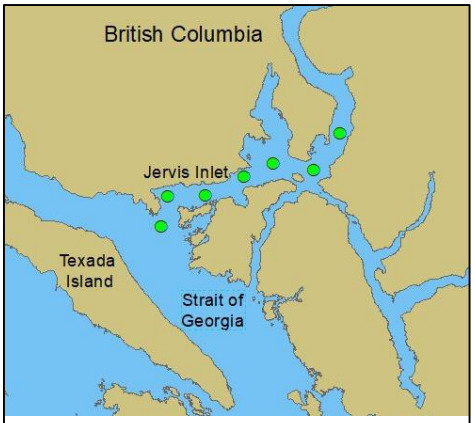
FOR MORE INFORMATION

Contact the Lead Scientist at Cameron.Freshwater@dfo-mpo.gc.ca

Dates: April 7 – 10; August 31 – September 6, 2021
Recurrence: Annually, since 2020
Locations: Jervis Inlet
Vessels: CCGS Vector
Lead scientist: Terri Sutherland (604) 666-8537
Terri.Sutherland@dfo-mpo.gc.ca

Description

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



Map 1. Study area.

Objectives

1. Characterize the water-column surrounding aquaculture operations to support a high-technology early-warning HAB detection system and a mitigation system to prevent the mortality of cultured fish in the environment.

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

Collaborators

- Grieg Seafood Inc.

FOR MORE INFORMATION

Contact the Lead Scientist at Terri.Sutherland@dfo-mpo.gc.ca

Dates: May 1 – October 31, 2021
Recurrence: Annually, since 2007
Locations: Strait of Georgia, Juan de Fuca Strait, West Coast Vancouver Is., Queen Charlotte Sound & Queen Charlotte Strait, Haida Gwaii
Lead scientist: Thomas Therriault (250) 713-5484
Thomas.Therriault@dfo-mpo.gc.ca

Image 1. Settlement plate with native and invasive species.

Description

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

Map 1. Study locations.

Objectives

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

Image 2. Identifying AIS specimens on a settlement plate.

Collaborators

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

FOR MORE INFORMATION

State of the Pacific Ocean

Invasive European Green Crab Monitoring

Dates: March 1 – November 30, 2021
Recurrence: Annually, since 2005 (rotational)
Locations: Straits of Georgia & Juan de Fuca, West Coast Vancouver Is, Queen Charlotte Sd. & Strait, Hecate Strait, Haida Gwaii
Vessel: R/V Styela
Lead scientist: Thomas Therriault (250) 713-5484
Thomas.Therriault@dfo-mpo.gc.ca

Description

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

Map 1. Study areas.

Objectives

1. Use knowledge of green crab habitat preferences to improve early detection in the Salish Sea and the Central and North coasts;

2. Advise management/partners about the spread and potential impacts of European green crab.

Collaborators

- Council of Haida Nation, Lax Kw'alaams Band, and Metlakatla First Nation
- Parks Canada
- Washington Department of Fish & Wildlife
- Puget Sound Partnership
- University of Washington
- Washington Sea Grant Crab Team
- Coast Mountain College
- Prince Rupert Port Authority

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

FOR MORE INFORMATION

State of the Pacific Ocean

Dates: April 1 – October 8, 2021
Recurrence: Annually, since 1891
Locations: Gwaii Haanas, Chatham Sound, Douglas Channel, McNaughton Group, Desolation Sound, Strait of Georgia
Vessel: CCGS Otter Bay, CSL Shoalseeker, CSL Kalman L. Czotter
Lead scientist: Stacey Verrin (250) 363-6377
Stacey.Verrin@dfo-mpo.gc.ca

Description

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

Objectives

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

Collaborators

- W̱SÁNEĆ Leadership Council
- Natural Resources Canada (NRCAN)
  - Geological Survey of Canada
- Parks Canada
- Environment and Climate Change Canada

Map 1. Study areas.

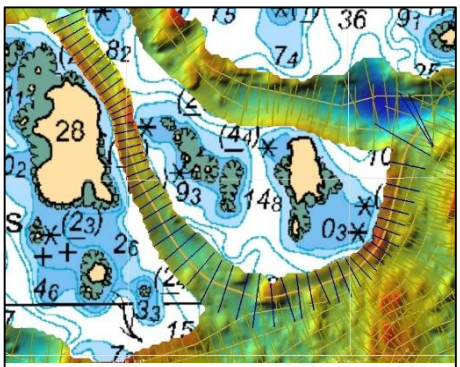


Image 1. Survey data capture in the McMullin Group (Queens Sound).

FOR MORE INFORMATION

Canadian Hydrographic Service ***New*** – 10 m resolution non-navigational bathymetric data

Recovery and Deployment of Oceanographic Moorings

Dates: June 1 – 14, 2021
Recurrence: Annually, since 1976
Locations: Johnstone Strait, Strait of Georgia, West Coast Vancouver Is., Queen Charlotte & Hecate Strait; Chatham Sound; Haida Gwaii; Douglas Channel
Vessel: CCGS John P. Tully
Lead scientist: David Spear (236) 464-2073
David.Spear@dfo-mpo.gc.ca

Description

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

Map 1. Study locations.

Objectives

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

Image 1. Mooring preparations.

Collaborators

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

FOR MORE INFORMATION

State of the Pacific Ocean

Dates: April 1, 2021 – March 31, 2022
Recurrence: Varied, since 1910s
Locations: Dixon Entrance, Hecate Strait, Queen Charlotte Sound, Strait of Georgia, Juan de Fuca Strait, West Coast Vancouver Island
Lead scientist: Peter Chandler (236) 464-3338
Peter.Chandler@dfo-mpo.gc.ca

Image 1. Lighthouse at Chrome Island.

Description

The British Columbia Shore Station Observation Program collects daily sea surface temperature and salinity data at 12 shore stations on the coast of British Columbia. This is a long-term dataset with over 100 years of data from some stations. Most of these shore stations are staffed by Fisheries and Oceans Canada, but two (Race Rocks and Amphitrite Point) are sampled by contracted observers.

Map 1. Study locations.

Objectives

1. Continue the time series of observations to use as an indicator of changes in the physical environment as part of Fisheries and Oceans Canada's State of the Ocean reporting; and

2. Continue the time series of observations in support of fisheries and ecosystems management programs, for example by estimating the northern diversion of returning Fraser River salmon, and monitoring hazardous algal blooms.

Image 2. Sampling water at Amphitrite Point.

FOR MORE INFORMATION

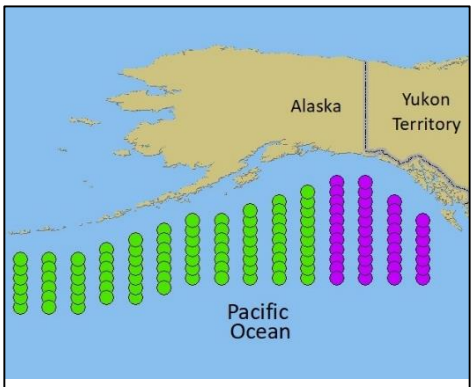
State of the Pacific Ocean and Open Government Portal

Dates: February 19 – March 24, 2022
Recurrence: 2019, 2020, 2022
Locations: Central North Pacific (Gulf of Alaska)
Vessel: CCGS Sir John Franklin
Lead scientist: Jackie King (250) 756-7176
Jackie.King@dfo-mpo.gc.ca

Description

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

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



Map 1. Study areas for 2022. Canada will complete survey operations in Zone V (purple).

Objective

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

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

Collaborators

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

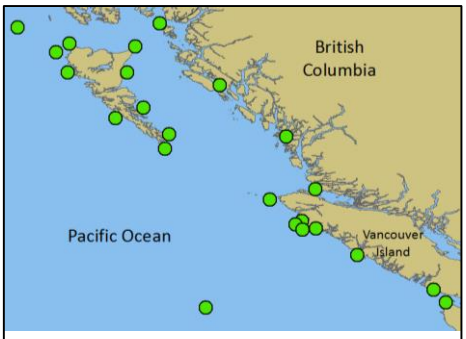
FOR MORE INFORMATION

International Year of the Salmon

Dates: August 10 – September 6, 2021
Recurrence: Every 1 to 2 years, since 1995
Location: West Coast Vancouver Island, Queen Charlotte Strait and Sound, Hecate Strait, Dixon Entrance, Haida Gwaii
Vessel: CCGS Sir John Franklin, Bell M. Shimada
Lead scientist: Stéphane Gauthier (250) 363-6587
Stephane.Gauthier@dfo-mpo.gc.ca

Description

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



Map 1. Survey locations.

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.

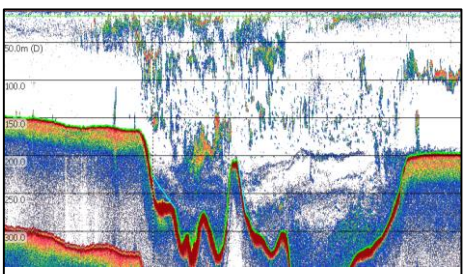


Image 1. Echogram of detected fish schools in the water column.

Collaborators

- National Oceanographic and Atmospheric Administration
  - National Marine Fisheries Service

FOR MORE INFORMATION

Pacific Hake / Whiting treaty

Dates: May 26 – August 31, 2021
Recurrence: Annually, since 1963
Locations: West Coast of Vancouver Island, Queen Charlotte Sound, Hecate Strait, Dixon Entrance, Haida Gwaii
Vessels: Chartered commercial longline vessels
Lead: International Pacific Halibut Commission
David Wilson Executive Director
David.Wilson@iphc.int (206) 634-1838

INTERNATIONAL PACIFIC HALIBUT COMMISSION

Image 1. IPHC logo displayed on chartered fishing vessels.

Description

This fishing survey is conducted by the International Pacific Halibut Commission (IPHC) and uses longline hook gear to collect Pacific Halibut (*Hippoglossus stenolepis*) abundance and biological data. Each year, stations from Oregon to the Bering Sea are randomly fished. In British Columbia waters, DFO has collaborated in the past with both the IPHC and the Pacific Halibut Management Association of British Columbia to identify the catch of non-directed species and collect biological data from selected species.

Map 1. Survey locations in British Columbia waters.

Objectives

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

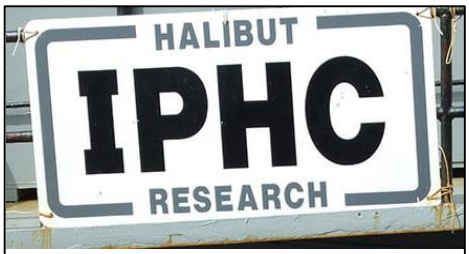


Image 2. Banner that is displayed on chartered fishing vessels.

Collaborators

- Fisheries and Oceans Canada
- Pacific Halibut Management Association of BC

FOR MORE INFORMATION

International Pacific Halibut Commission

Dates: October 10 – November 21, 2021
Recurrence: Annually, since 2003
Locations: West Coast of Vancouver Island, Queen Charlotte Sound, West Coast of Haida Gwaii, mainland inlets
Vessels: Chartered commercial trap vessels
Lead scientists: Malcolm Wyeth (778) 268-1184
Malcolm.Wyeth@dfo-mpo.gc.ca

Map 1. Survey areas.

Description

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

*Image 1. Sablefish (*Anoplopoma fimbria*).*

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.

Collaborators

- Wild Canadian Sablefish Ltd.

FOR MORE INFORMATION

Contact Malcolm.Wyeth@dfo-mpo.gc.ca or Brendan.Connors@dfo-mpo.gc.ca

Dates: Feb 15 – April 30, 2021
Recurrence: Annually, since 1972
Locations: Strait of Georgia, West Coast Vancouver Is., Queen Charlotte Sd, Dixon Entrance, Haida Gwaii
Vessels: Various seine vessels
Lead scientist: Jaclyn Cleary (250) 756-7321
Jaclyn.Cleary@dfo-mpo.gc.ca

Description

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

Map 1. Survey areas.

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.

Image 1. Removing Pacific Herring (Clupea pallasii) *scales for age sampling.*

Collaborators

- Kitasoo and Heiltsuk Nations
- Nuu-chah-nulth Nations and Tribal Council
- Herring Conservation and Research Society

FOR MORE INFORMATION

State of the Pacific Ocean

Dates: March 1 – April 30, 2021
Recurrence: Annually, since 1951
Locations: Strait of Georgia, West Coast Vancouver Is., Queen Charlotte Sd, Dixon Entrance, Haida Gwaii
Vessels/planes: Seine vessels, dive skiffs, float planes
Lead scientist: Jaclyn Cleary (250) 756-7321
Jaclyn.Cleary@dfo-mpo.gc.ca

Image 1. SCUBA divers measuring Herring spawn.

Description

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

Map 1. Survey areas.

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.

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

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

FOR MORE INFORMATION

State of the Pacific Ocean

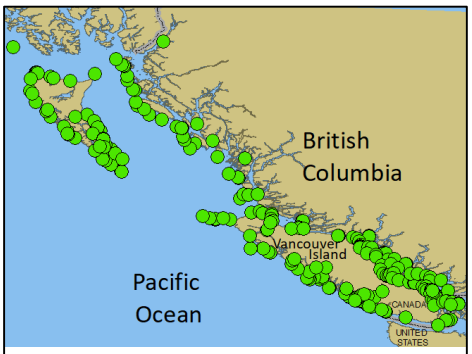
Sea Lion Aerial Survey

Dates: July 15, 2021 – March 15, 2022
Recurrence: Every 3 to 5 years, since the early 1970s
Locations: Johnstone Strait, Strait of Georgia, Juan de Fuca Strait, West Coast of Vancouver Island, Queen Charlotte Strait and Sound, Hecate Strait, Dixon Entrance, Haida Gwaii

Lead scientists: Strahan Tucker, Sheena Majewski
Strahan.Tucker@dfo-mpo.gc.ca (250) 756-7188
Sheena.Majewski@dfo-mpo.gc.ca (250) 619-0436

Description

Aerial surveys to estimate the seasonal (summer, fall, winter) abundance of Steller and California Sea Lions in British Columbia waters. Data will contribute to long-term monitoring of abundance and distribution trends, support the interpretation of diet data to understand potential pressures on fisheries resources, and support various marine conservation and impact assessment initiatives.



Map 1. Survey locations.

Objectives

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

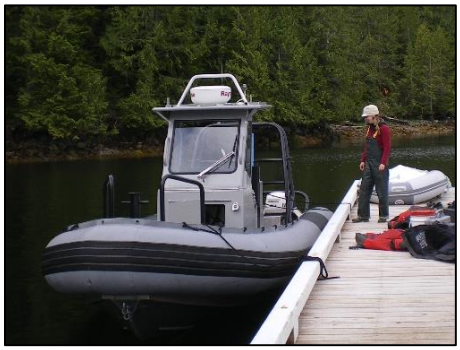
Image 1. Steller Sea Lions (Eumetopias jubatus).

FOR MORE INFORMATION

Science Advisory Reports – 2018 and 2020

Dates: June 1 – August 31, 2021
Recurrence: Annually since 2001
Location: Queen Charlotte Sound and Strait, West Coast Vancouver Island
Vessel: 5.5-m welded aluminum or 6.5-m rigid hull inflatable boats

Lead scientists: Linda Nichol, Thomas Doniol-Valcroze
Linda.Nichol@dfo-mpo.gc.ca (250) 729-8374
Thomas.Doniol-Valcroze@dfo-mpo.gc.ca (250) 729-8375



Description

This Sea Otter assessment collects data to inform estimates of population abundance, growth and distribution in British Columbia. Annual surveys are conducted in a core index area (with a 40-year longitudinal time series). Additional areas such as near the edge of the occupied range will be selected in order to monitor range expansion and changes in occupation patterns.

Map 1. Survey areas.

Objectives

1. Conduct survey of index areas and other portions of the range using standardized approach with 2-3 observers and a boat driver;
2. Search complex areas with binoculars and obtain counts of the number of animals in rafts; and
3. Develop and improve the field methodology utilizing Unmanned Aerial Vehicle technology with the aim to improve efficiency of counting rafts.

Image 1. Resting sea otters in kelp.

Collaborators

- Vancouver Island University

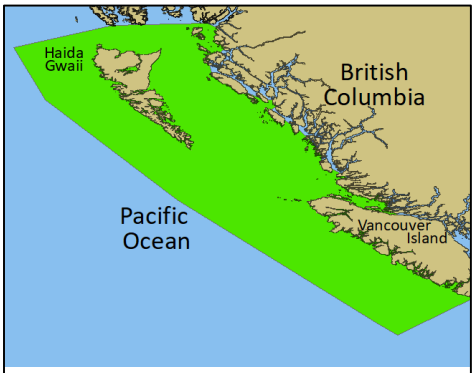
FOR MORE INFORMATION

Science Advisory Report 2020/036

Dates: June 29 – July 12, 2021
Recurrence: Annually, since 2002
Locations: West Coast Vancouver Is., Queen Charlotte Sound, Hecate Strait, Dixon Entrance
Vessel: CCGS Vector
Lead scientists: Thomas Doniol-Valcroze, Linda Nichol
Thomas.Doniol-Valcroze@dfo-mpo.gc.ca (250) 729-8375
Linda.Nichol@dfo-mpo.gc.ca (250) 729-8374

Description

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



Map 1. Survey area.

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).

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

Collaborators

- Parks Canada

FOR MORE INFORMATION

State of the Pacific Ocean

Dates: June 1 – September 15, 2021
Recurrence: Annually, year four of five (2018-2022)
Locations: Johnstone Strait, Queen Charlotte Strait, Queen Charlotte Sound
Vessel: Zodiac Hurricane – R/V Merlin (7 m)
Lead scientist: Sheila J Thornton (604) 364-5917
Sheila.Thornton@dfo-mpo.gc.ca

Description

Physiological assessment of individual Northern Resident (NRKW) and Transient (TKW; Bigg's) Killer Whales is undertaken to improve our understanding of physiological parameters and how they relate to nutritional and reproductive state, and body condition. Prey sampling, fecal and breath sampling, biopsies and drone imaging will inform foraging efficiency, prey selection and will define physiological parameters of whales.

Map 1. Study areas.

Objectives

1. Collect prey samples from sharing events during encounters where whales are foraging;
2. Collect breath, fecal, and biopsy samples from individuals;
3. Collect data on body condition from drone imaging to correlate with physiological parameters;
4. These data will build upon our understanding of foraging behaviour from previous tagging studies.

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

Collaborators

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

FOR MORE INFORMATION

Fine scale foraging research

Dates: June 15 – 28, 2021
Recurrence: Annually, year 1 of 1 (2021 only)
Location: West Coast of Vancouver Island and Haida Gwaii
Vessel: CCGS J. P. Tully
Lead Scientist: Tammy Norgard (250) 616-9278
Tammy.Norgard@dfo-mpo.gc.ca

Description

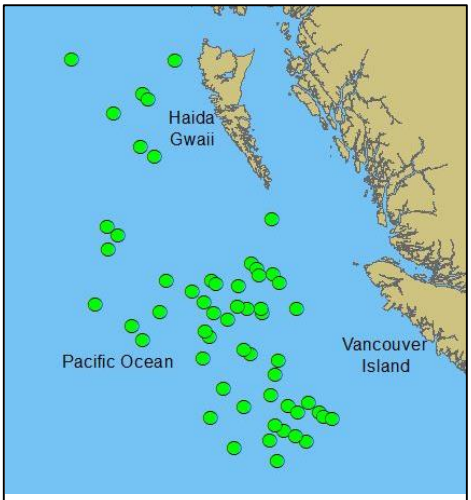
Of the 62 seamounts in the Offshore Pacific Bioregion, 52 have summits below 1 km depth. Only four of these deeper seamounts have been surveyed. This collaborative survey will collect biological, oceanographic, and bathymetric data at six deep seamounts .

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

- Nuu-chah-nulth Tribal Council
- Council of the Haida Nation
- Ocean Networks Canada



Map 1. Survey locations.

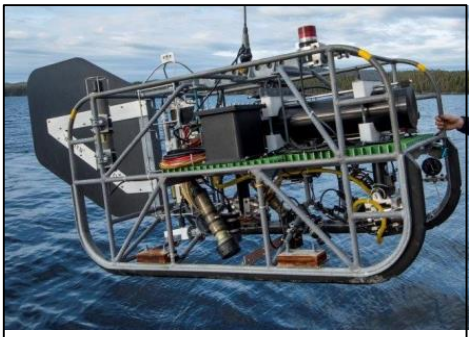


Image 1. The DFO Pacific deep-sea camera and sensor system that can dive to 2 km depth.

FOR MORE INFORMATION

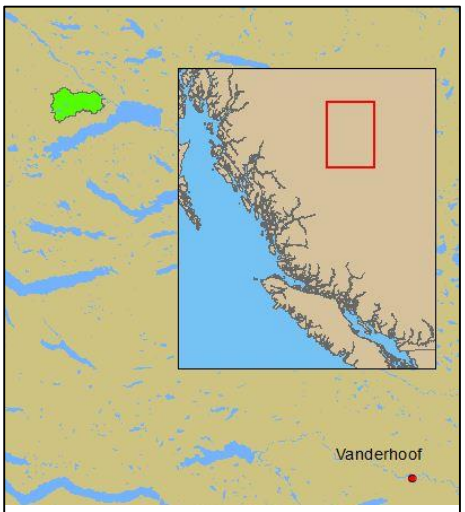
Contact the Lead Scientist at Tammy.Norgard@dfo-mpo.gc.ca

Dates: July 1 – August 30, 2021
Recurrence: Annually, since 2019
Location: Baptiste watershed (north west of Prince George)
Lead scientist: Doug Braun (604) 703-9069
Douglas.Braun@dfo-mpo.gc.ca

Image 1. Aerial view of experimental harvest area.

Description

The Baptiste watershed is an important spawning grounds for Early Stuart sockeye salmon (Oncorhynchus nerka). This project builds on forest harvest experiments conducted in the Baptiste watershed as part of the Stuart-Takla Fish-Forestry Interaction Project (1990 - 2008), and will assess the long-term impacts of forest harvest practices on headwater stream temperatures. This will improve our understanding of the interaction between forest harvesting and aquatic habitats in interior British Columbia.



Map 1. Study area.

Objectives

1. Replicate previous network of stream temperature monitoring;
2. Quantify the long-term impacts of forestry on stream temperature; and
3. Evaluate the recovery of headwater stream temperatures following forest harvest.

Image 2. Study stream post harvest.

Collaborators

- Simon Fraser University

FOR MORE INFORMATION

Contact the Lead Scientist at Douglas.Braun@dfo-mpo.gc.ca

Dates: April 1 – November 30, 2021
Recurrence: Annually, since 2019
Locations: North Thompson River Basin
Lead scientist: Doug Braun (604) 703-9069
Douglas.Braun@dfo-mpo.gc.ca

Image 1. Identifying juvenile salmonids in the field.

Description

This project will assess relationships between terrestrial land use and stream habitat used by juvenile Coho Salmon (*Oncorhynchus kisutch*) for rearing. A large number of streams (20+) will be studied throughout the North Thompson watershed. This work has been developed in conversation with Secwepemc Fisheries Commission and Simpcw First Nation.

Map 1. Study area.

Objectives

1. Survey habitat characteristics including water quality, large woody debris, gradient and canopy cover in each study watershed;

2. Monitor streamflow, air and water temperature;

3. Quantify the relationship between terrestrial land use (e.g. forestry and agriculture) and habitat characteristics; and

4. Develop targets for habitat indicators that can be used for planning and management.

Image 2. Surveying large woody debris.

Collaborators

- Simon Fraser University

FOR MORE INFORMATION

Contact the Lead Scientist at Douglas.Braun@dfo-mpo.gc.ca

Dates: October 2021
Recurrence: Annually, since 2014
Locations: West Basin, West Arm, North Arm and East Arm of Quesnel Lake
Vessel: R/V Elvis
Lead scientist: Svein Vagle (250) 363-6339
Svein.Vagle@dfo-mpo.gc.ca

Description

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

Map 1. Study locations.

Objectives

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

Image 1. Project crew preparing to deploy a mooring.

Collaborators

- University of British Columbia
- University of Northern British Columbia

FOR MORE INFORMATION

Water Resources Research

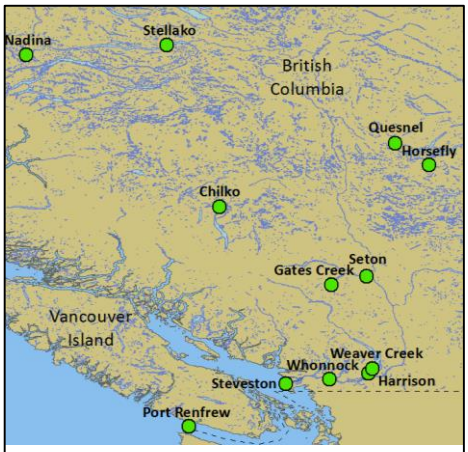
Sockeye Salmon
Freshwater Migratory Stress

Dates: April 1 – November 30, 2021
Recurrence: Annually, since 1997
Locations: Fraser River basin, including Stuart, Nechako, Quesnel, Chilcotin, Shuswap, Seton, Harrison, Chilliwack watersheds
Lead scientist: David Patterson (604) 666-5671
David.Patterson@dfo-mpo.gc.ca

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

Description:

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



Map 1. Study locations.

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.

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

Collaborators

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

FOR MORE INFORMATION

Environmental Watch Program

Dates: April 1 – July 31, 2021
Recurrence: Annually, year one of three (2021-2023)
Location: Fraser River estuary
Vessels: Small rigid inflatable boats
Lead scientist: Tanya Brown (250) 353-9211
Tanya.Brown@dfo-mpo.gc.ca

Description

This project will identity and assess the effects of contaminants to Chinook Salmon in the Fraser River estuary. Findings will enable the development and implementation of effective controls to reduce the inputs of contaminants into the habitat of Fraser Chinook and endangered Southern Resident Killer Whales, thus contributing to the recovery of these two at risk species.

Map 1. Study areas.

Objectives

1. Measure and prioritize over 400 contaminants from 13 contaminant classes in juvenile Chinook Salmon and their habitat (water, sediment, wastewater effluent); and

2. Assess contaminant-related health impacts in juvenile Chinook through changes at the gene, protein and metabolome level, and evaluate whole organism effects.

*Image 2. Sampling juvenile Chinook Salmon (*Oncorhynchus tshawytscha*).*

Collaborators

- Tsawwassen and Pacheedaht First Nations
- Environment & Climate Change Canada
- Metro Vancouver
- Simon Fraser University
- University of British Columbia
- Raincoast Conservation Foundation
- Ocean Wise Conservation Association

FOR MORE INFORMATION

Contact the Lead Scientist at Tanya.Brown@dfo-mpo.gc.ca

Dates: April 1 – November 30, 2021
Recurrence: Annually, since 2020
Locations: North Thompson River Basin
Lead scientists: Doug Braun, Emma Hodgson
Douglas.Braun@dfo-mpo.gc.ca (604) 703-9069
Emma.Hodgson@dfo-mpo.gc.ca (604) 702-8394

Image 1. Minnow traps set to sample juvenile Coho Salmon.

Description

This project will assess the availability and productivity of tributary and off-channel habitats for juvenile Coho Salmon (*Oncorhynchus kisutch*) in the North Thompson watershed. This work has been developed in conversation with Secwepemc Fisheries Commission and Simpcw First Nation.

Map 1. Study area.

Objectives

1. Estimate habitat availability and Coho Salmon productivity (population density, age composition, growth and condition) within tributary and off-channel systems;

2. Model the relationship between mainstem flow in the North Thompson and off-channel habitat availability; and

3. Develop models of salmon productivity at the watershed scale.

Image 2. Juvenile Coho Salmon (Oncorhynchus kisutch) with a yellow Visible Implant Elastomer (VIE) tag.

Collaborators

- Simon Fraser University
- Wilfred Laurier University

FOR MORE INFORMATION

Contact Douglas.Braun@dfo-mpo.gc.ca or Emma.Hodgson@dfo-mpo.gc.ca

Dates: April 1 – November 30, 2021
Recurrence: Annually, since 2020
Locations: North Thompson River Basin
Lead scientist: Emma Hodgson (604) 702-8394
Emma.Hodgson@dfo-mpo.gc.ca

Description

Freshwater habitat quality and availability has been identified as a key factor in the decline of interior salmon populations. Understanding of distribution and movement within freshwater systems is limited for many of these populations. This research will identify important freshwater habitat for juvenile Coho Salmon (*Oncorhynchus kisutch*) during rearing and migration within the North Thompson watershed.

Objectives

1. Analyze water samples and sculpin (*Cottus sp.*) otoliths for strontium isotopes and elemental concentrations;

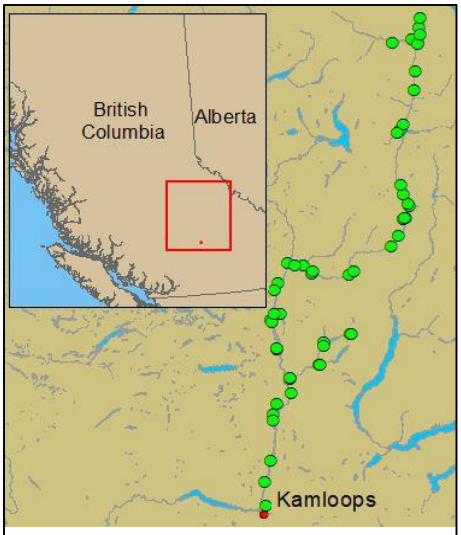
2. Develop an isoscape (map of water chemistry using strontium isotopes) that can be used to discern distributions of Coho Salmon and other species (e.g., Chinook Salmon); and

3. Identify rearing and migratory patterns of juvenile Coho Salmon across years using otolith microchemistry from adults that have returned to spawn.

Collaborators

- Simon Fraser University
- University of Utah

Image 1. Confluence of study tributary and the Thompson River.



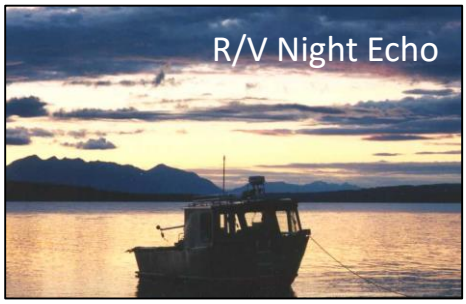
Map 1. Study area.

Image 2. Collecting otoliths from Coho Salmon (Oncorhynchus kisutch).

FOR MORE INFORMATION

Contact the Lead Scientist at Emma.Hodgson@dfo-mpo.gc.ca

Dates: July 15 – November 15, 2021
Recurrence: Varied, since 1974
Locations: Cultus, Chilliwack, Seton, Fraser, and Francois Lakes
Vessel: DFO R/V Night Echo
Lead scientist: Daniel Selbie (604) 824-4702
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.

Map 1. Study locations.

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.

Image 1. Hauling a catch of pelagic fish onboard.

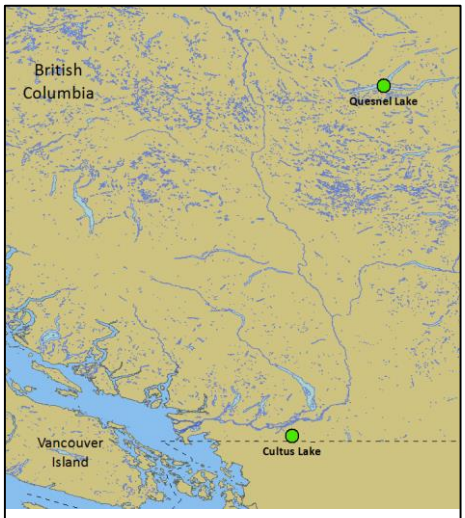
FOR MORE INFORMATION

Contact the Lead Scientist at Dan.Selbie@dfo-mpo.gc.ca

Dates: May 1, 2021 – November 30, 2021
Recurrence: Varied, since 1985
Locations: Cultus Lake, Chilliwack Lake
Vessels: G.E. Hutchinson, K.R.S. Shortreed
Lead scientist: Daniel Selbie (604) 824-4702
Daniel.Selbie@dfo-mpo.gc.ca

Description

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



Map 1. Study locations.

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.

Image 1. Limnological sampling for water chemistry and plankton.

Collaborators

- University of British Columbia
- Mount Allison University

FOR MORE INFORMATION

Contact the Lead Scientist at Dan.Selbie@dfo-mpo.gc.ca

Dates: April 1, 2021 – March 31, 2022
Recurrence: Annually, since 1950
Locations: Fraser River basin, including Upper Fraser, Stuart, Nechako, Quesnel, Chilcotin, Thompson, Seton, Harrison, and Chilliwack watersheds
Lead scientist: David Patterson (604) 666-5671
David.Patterson@dfo-mpo.gc.ca

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

Description

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

Objectives

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

Map 1. Study locations.

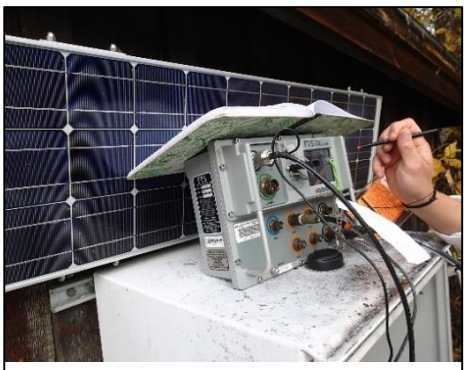


Image 2. Real time water temperature logger installation on Stuart River.

Collaborators

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

FOR MORE INFORMATION

Environmental Watch Program

Dates: May 12 – 25, October 11 – 24, 2021
Recurrence: Biennially–spring since 1991, fall since 1988.
Location: Burrard Inlet, Strait of Georgia
Vessel: CCGS Neocaligus
Lead scientist: Rick Ferguson (250) 756-7195
Rick.Ferguson@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.

Map 1. Survey areas.

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.

*Image 1. Adult male Dungeness crab (*Cancer magister*).*

FOR MORE INFORMATION

Pacific Region Crab Fishery and State of the Pacific Ocean

Dates: November 1 – 10, 2021; February 1 – 10, 2022
Recurrence: Annually, since 2001
Location: Howe Sound
Vessel: CCGS Neocaligus
Lead scientist: Rick Ferguson (250) 756-7195
Rick.Ferguson@dfo-mpo.gc.ca

Description

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

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

Map 1. Survey area.

Objectives

1. Collect detailed catch, size, and sex data for estimating recruitment parameters; and

2. Monitor stock response of escapement based thresholds.

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

FOR MORE INFORMATION

Pacific Region Prawns

Dates: August – September 2021
Recurrence: Annually, since 2012
Locations: Okanagan Lake, Okanagan River, and Vaseux Lake
Lead scientist: Sean MacConnachie (250) 619--0220
Sean.MacConachie@dfo-mpo.gc.ca

Description

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

Map 1. Survey locations.

Objectives

1. Undertake annual survey of key mussel beds;

2. Develop a long-term data series to inform future assessment by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) on abundance trends; and

3. Explore the range of Rocky Mountain Ridged Mussel throughout the Okanagan valley lakes to find additional mussel beds.

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

Collaborators

- Province of British Columbia
  - Forests, Lands, Natural Resource Operations and Rural Development
  - Ministry of Environment and Climate Change Strategy

FOR MORE INFORMATION

Contact the Lead Scientist at Sean.MacConnachie@dfo-mpo.gc.ca

Dates: April 1, 2021 – March 31, 2022
Recurrence: Annually, since 2017
Locations: Burrard Inlet, Fraser River delta, Howe Sound entrance
Vessels: CCGS Vector, Tanu and Neocaligus
Lead scientists: Paul Covert (250) 363-6765
Paul.Covert2@dfo-mpo.gc.ca

Description

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

Objectives

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

Collaborators

- Tsleil-Waututh and Tsawassen First Nations
- Environment and Climate Change Canada
- Coastal Ocean Resources (ShoreZone)
- Ocean Wise
  - PollutionTracker

Map 1. Study area.

Image 1. Conducting beach surveys.

FOR MORE INFORMATION

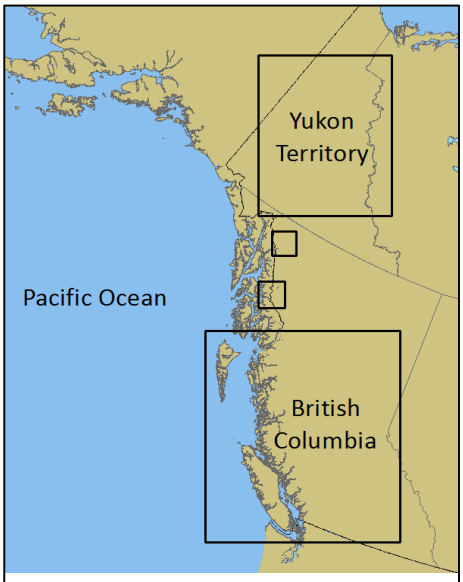
Coastal Environmental Baseline Program and Port of Vancouver pilot site

Dates: April 1, 2021 – March 31, 2022
Recurrence: Ongoing, since 1975
Locations: British Columbia and Yukon
Lead scientist: Kathryn Fraser (250) 739-0542
Kathryn.Fraser@dfo-mpo.gc.ca

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

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

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



Map 1. CWT areas.

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.

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

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.

FOR MORE INFORMATION

Coded Wire Tag Program

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

Image 3. CWT Tagging of juvenile salmon.

Objectives

- Sample 20% of the Chinook and Coho Salmon caught in British Columbia and Yukon commercial, recreational, and Indigenous fisheries; and

- Collect heads or snouts from fish that may contain CWTs, and collect associated catch monitoring data such as where, when, size, and how the fish was caught.

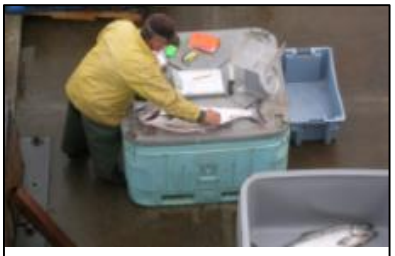


Image 4. CWT Sampling is a dockside monitoring program.

Collaborators

- First Nations
- Commercial and Recreational harvesters
- Marinas, tackle stores, fishing lodges, hatcheries, and First Nations communities who host Salmon Head Recovery Depots
- U.S. Pacific Salmon Treaty counterparts

Image 5. Salmon Head Recovery Depot.

FOR MORE INFORMATION – Chinook and Coho Indicator Stocks			
Yukon River	Steve Smith	(867) 393-6840	Steve.J.Smith@dfo-mpo.gc.ca
Transboundary	Bill Waugh	(867) 393-6764	Bill.Waugh@dfo-mpo.gc.ca
North Coast	Shaun Davies	(250) 627-3472	Shaun.Davies@dfo-mpo.gc.ca
South Coast	Wilf Luedke	(250) 756-7222	Wilf.Luedke@dfo-mpo.gc.ca
Fraser and Interior	Timber Whitehouse	(250) 851-4833	Timber.Whitehouse@dfo-mpo.gc.ca

Dates: April 2020 – March 2021
Recurrence: Annually, since ~1905
Locations: British Columbia and Yukon
Lead scientist: Diana Dobson (250) 756-7186
Diana.Dobson@dfo-mpo.gc.ca

Map 1. DFO administrative areas.

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

Image 2. Chinook Salmon mark recapture population study.

Description

DFO Science and Fisheries Management staff, often in collaboration with partners, deliver three types of monitoring programs to support area-based salmon stock assessment for five species in over 66 salmon management units and 409 conservation units in Pacific Region.

1. **Population monitoring** programs collect information to estimate the abundance and/or condition of individuals within a population. Methods and techniques used range from basic visual surveys to application intensive mark-recapture or passage enumeration and associated biological sampling.

2. **Catch monitoring** programs collect information to estimate the number of salmon caught, the number released, fishing effort, and the stock and age composition of the catch in order to evaluate harvest impacts on stocks. Catch, releases and fishing effort are estimated through a combination of harvester reporting and survey methods. Age and stock composition is estimated by sampling catch for scales, DNA, coded-wire tags and other unique stock identifiers, such as thermally marked otoliths.

FOR MORE INFORMATION

Pacific Salmon Stock Assessment and Research

Description (cont'd)

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

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

By the Numbers*	Population Monitoring	Catch Monitoring	Ecosystem Monitoring	Total
Yukon - Transboundary Rivers	26	7	-	**33**
North Coast	50	10	3	**63**
South Coast	37	22	1	**60**
Fraser and Interior	53	10		**63**
Total	**166**	**49**	**4**	**219**

* Individual projects under each type of programs may monitor multiple 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, Indigenous organizations
- Stewardship groups, watershed boards
- Harvest groups
- Universities
- Municipalities, province of British Columbia and Yukon territory.

FOR MORE INFORMATION

Yukon River	Steve Smith	(867) 393-6840	Steve.J.Smith@dfo-mpo.gc.ca
Transboundary	Bill Waugh	(867) 393-6764	Bill.Waugh@dfo-mpo.gc.ca
North Coast	Shaun Davies	(250) 627-3472	Shaun.Davies@dfo-mpo.gc.ca
South Coast	Wilf Luedke	(250) 756-7222	Wilf.Luedke@dfo-mpo.gc.ca
Fraser and Interior	Timber Whitehouse	(250) 851-4833	Timber.Whitehouse@dfo-mpo.gc.ca

ANNEX C: Datasets published in 2020 – 2021

In 2020-2021, Pacific Science published thirty-four new datasets on the Open Government Portal, and updated twenty-one datasets to reflect new data collected during the year.

Access these datasets by:

1. Visiting the Open Government Portal
2. Copying and pasting the name of the dataset in the search box
3. Clicking the "Find" button

Table 1: Datasets published by Pacific Science on Open Government Data (2020 — 2021)

Subject	Dataset Name
Aquatic ecosystems	• Diversity, Richness, and Biomass Hotspots (*new*) • Important Areas for Sponge Reefs in Strait of Georgia Ecoregion (*new*) • Pacific Marine Ecological Classification System and its Application to the Northern and Southern Shelf Bioregions (*new*) • Seamounts of the Northeast Pacific Ocean (*new*) • Sponge Reef Areas of the Pacific Region (*new*)
Aquatic Invasive Species monitoring	• Floating Structures In the Pacific Northwest (*new*)
Field Operations	• Fieldnotes: Pacific Science Field Operations (*new*) – ***available soon!***
Marine mammal conservation	• Northern Resident Killer Whale Group Cohesion (1980-2010) (*new*)
Oceanography monitoring	• British Columbia Lightstation Sea-Surface Temperature and Salinity Data (Pacific), 1914-present *(updated)* • Monthly Satellite Chlorophyll-a Climatology of the Canadian Pacific Exclusive Economic Zone (2003-2020) (*new*) • Monthly Satellite Sea Surface Temperature Climatology of the Canadian Pacific Exclusive Economic Zone (1981-2010) (*new*) • Monthly Satellite Sea Surface Temperature Climatology of the Canadian Pacific Exclusive Economic Zone (1990-2020) (*new*) • Northeastern Pacific Canadian Ocean Ecosystem Model (NEP36-CanOE) Climate Projections (*new*) • Northeastern Pacific Canadian Ocean Ecosystem Model (NEP36-CanOE) Climate Projections_Historical (1986-2005) (*new*) • Northeastern Pacific Canadian Ocean Ecosystem Model (NEP36-CanOE) Climate Projections_RCP 4.5 (2046-2065) (*new*)

Table 1 (continued): Datasets published by Pacific Science on Open Government Data (2020 — 2021)

Subject	Dataset Name
Oceanography monitoring	• Northeastern Pacific Canadian Ocean Ecosystem Model (NEP36-CanOE) Climate Projections_RCP 8.5 (2046-2065) *(new)* • Ocean Weather Station Papa, 1949-1981 *(new)* • Seasonal Climatologies of the Canadian Pacific Exclusive Economic Zone (1980-2010) *(new)* • Seasonal Climatologies of the Northeast Pacific Ocean (1980-2010) *(new)* • Seasonal Sigma-t Climatology of the Canadian Pacific Exclusive Zone (1980-2010) *(new)*
Pacific Salmon conservation	• Pacific Recreational Fishery Salmon Head Depots *(updated)* • Pacific Salmon Conservation Units, Sites & Status *(updated)* • Chinook Salmon Conservation Units, Sites & Status *(updated)* • Southern BC Chinook Salmon Conservation Units, Sites & Status *(updated)* • Chum Salmon Conservation Units, Sites & Status *(updated)* • Coho Salmon Conservation Units, Sites & Status *(updated)* • Even Year Pink Salmon Conservation Units, Sites & Status *(updated)* • Odd Year Pink Salmon Conservation Units, Sites & Status *(updated)* • Lake Type Sockeye Salmon Conservation Units, Sites & Status *(updated)* • River Type Sockeye Salmon Conservation Units, Sites & Status *(updated)* • Ocean Salmon Program - Barkley Sound Juvenile Salmon Study from 1987 to 1994 *(updated)*
Plankton monitoring	• Phytoplankton Pigment Monitoring on the West Coast of Canada *(new)* • Phytoplankton Pigments Along Line-P *(new)* • Phytoplankton Pigments Along the West Coast of Vancouver Island *(new)* • Phytoplankton Pigments in the Strait of Georgia and Inland Waters *(new)* • Zooplankton Database *(updated)* • Zooplankton Data From Central and Northern Strait of Georgia *(new)*
Stock assessment	• Eulachon Migration Study Bottom Trawl Surveys *(new)* • Eulachon Migration Study Bottom Trawl Surveys - North *(new)* • Eulachon Migration Study Bottom Trawl Surveys - South *(new)* • Groundfish Hard Bottom Longline Surveys *(new)* • Inside North Hard Bottom Longline Surveys *(new)* • Inside South Hard Bottom Longline Surveys *(new)* • Outside North Hard Bottom Longline Surveys *(new)* • Outside South Hard Bottom Longline Surveys (new) • Pacific Herring Spawn Index Data *(new)* • Pacific Region Commercial Salmon Fishery Post-Season Catch Estimates *(new)*

Table 1 (continued): Datasets published by Pacific Science on Open Government Data (2020 — 2021)

Subject	Dataset Name
Stock assessment	• British Columbia Spot Prawn (Pandalus platyceros) Spawner Index (SI) *(updated)* • Groundfish Synoptic Bottom Trawl Surveys *(updated)* • Hecate Strait Synoptic Bottom Trawl Survey *(updated)* • Queen Charlotte Sound Synoptic Bottom Trawl Survey *(updated)* • Strait of Georgia Synoptic Bottom Trawl Survey *(updated)* • West Coast Haida Gwaii Synoptic Bottom Trawl Survey *(updated)* • West Coast Vancouver Island Synoptic Bottom Trawl Survey *(updated)* • Rocky Mountain Ridged Mussel Distribution Survey Data *(updated)*


@linddealy