



CEDAR COAST FIELD STATION

"To preserve ecological health through place-based research and education that celebrates the cultural and biological diversity of Clayoquot Sound."

www.cedarcoastfieldstation.org

ANNUAL
REPORT **2019**

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ANNUAL REPORT 2019

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A Letter from the Director

2019 was a groundbreaking year for the Cedar Coast Field Station Society. Over the past 12 months our charitable organization has grown rapidly, with a newly repurposed research and education facility, a refined and expanded in-house ecological monitoring program, and a massive influx in visiting researchers and education groups. Now, as our operations slow down for winter, it is time to reflect on the growth we have instigated, experienced, and endured. This growth has brought Cedar Coast ever closer to our vision of preserving ecological health through place-based research and education that celebrates the cultural and biological diversity of Clayoquot Sound.

The Cedar Coast vision is one that I have been personally manifesting for many years, but it is also much more than that. When it comes to the preservation of ecological health and the celebration of Clayoquot Sound's cultural and biological diversity, we as an organization stand on the shoulders of giants. It would be ignorant of me to celebrate the good work our team has accomplished this season without first recognizing the monumental achievements of those that came before us. The Keltsmaht and Ahousaht Nations, whose traditional and unceded territory we live and work in, have been stewards of these lands and waters since time immemorial, and without this stewardship the world renowned cultural and biological diversity we are celebrating today simply would not exist. In recent decades these Nations have been joined by a myriad of organizations and individuals all aligned with the common goal of protecting this place we all love, Clayoquot Sound. As a new organization, the work we are doing at

Cedar Coast is built on the foundations laid by those who came before us, and those who work alongside us today.

Cedar Coast is also wholly dependent on the incredibly talented and passionate individuals that make up this organization. Our organization would hold little value without the educators, researchers, volunteers, staff, directors, and donors who are working every day to turn our vision into a reality. I am eternally grateful for all those who have supported Cedar Coast over the years -- your courage and unwavering support of this new and ambitious project is invaluable, and it is appreciated. I could not, nor would I want to, do it without you.

As a grass-roots charitable organization we are working hard to achieve our mission on a bare bones budget. This year we enter a new chapter without a financial guarantor, which means that we will now be entirely dependent on public support to fund our charitable operations. Any amount that you, or anyone you know, can donate to the Cedar Coast Field Station Society will enable us to build on the many successes of our 2019 season. I continue to be inspired every day by the good work our organization is doing, and I am optimistic that these efforts will continue for many years to come.

With gratitude,

Simon Nessman
 Director



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Our Vision & Mission

Our vision at the Cedar Coast Field Station is to preserve ecological health through place-based research and education that celebrates the cultural and biological diversity of Clayoquot Sound.

We continually strive towards this vision by ensuring we fulfill our Mission:

- to provide a place for exploration, observation, and contemplation of the local ecosystem;
- to be inclusive and accessible for a diverse and collaborative community of researchers, naturalists, artists, educators, and students;
- to provide scientific resources within Clayoquot Sound by conducting objective research and producing publicly available data;
- to inspire individuals to recognize and understand our human dependence on the natural world.



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Education

Place-based knowledge is one of our core values here at Cedar Coast. Every act, from what we study and what we teach, to what we eat and how we live is connected to this "place" -Vargas Island- the traditional territory of the Keltsmaht and Ahousaht Nations. And the learning is continuous! It is our goal to keep the field station widely accessible to a variety of people, from all ages and different backgrounds. As we reflect on our 2019 season, it is incredible to see the reach of Cedar Coast throughout the local community, across school districts, and across international borders.

School Groups

This past season, 17 classes across 13 schools visited the field station. Many of these field trips took place in the spring and autumn months, so students found their learning space steeped with the changing of seasons. We were very excited to see the diversity of ages that utilized our station as a space for furthering the topics they were discussing at school, fostering their own inquiry-based projects, or just enjoying spending time exploring nature. From little ones new to elementary school to post-secondary students, each group filled our station with the energy of learning!

Of the 12 visiting school groups across BC, we were especially thrilled to see familiar faces of returning youth from the Maaqtusiis Secondary School in Ahousaht. This past year, five classes visited our field station through the support and dedication

of Maaqtusiis Secondary Principal Kate Drexler, CCFS Educator Marcie Callewaert John, CCFS Board Member Lennie John, as well as funding through the NSERC PromoScience grant. We were humbled to see our facility being used as a place for Maaqtusiis educators to connect their teachings to many of the student's traditional territory.

The youngest student group to visit us was the Grade 1 class from Maaqtusiis Elementary. Their day at the station was spent immersed in tidepools and marvelling over the small things like different textures of leaves. Another highlight was hosting the Grade 11/12 Culture Class this past September. Together we learnt the process of fermentation by instructor Heather Wolf, and shared our experiences surrounding herbalism and traditional methods of food preservation with Maaqtusiis educators, Ketchkie and John Frank.

Huband Park Elementary from the Comox Valley spent three days in June exploring with us on Vargas Island. Being an active learning focused class, their time was action packed and focused on inquiry based learning that empowered students to practice their leadership skills. Through this lens, we explored how wildlife cameras function, learnt water safety behaviour, hiked across the island to Ahous Bay, and discussed where microplastics come from.

"These three days were full of fun, laughter, and sun. :) Thank you so much Cedar Coast!"

- Aby, age 12, Huband Park Elementary

Feedback we received from highschool students highlighted their enthusiasm about being able to engage in hands on learning in such a beautiful, diverse environment.

"I had the privilege of visiting CCFS as part of my environmental science class. During my time here, I collected samples of algae and examined them under a microscope, collected samples of microplastics, and identified a variety of plant and animal species. I had the unique opportunity to spend time in and learn from the nature of the west coast. Most significantly, I was encouraged to ask questions about the world around me, both small and large, which led to rich conversations with my peers, teachers, and CCFS members."

- Catie McCullough, West Point Grey Academy

17 Different classrooms.

13 Schools visited.



869

Educational user days.



A full list of the schools that visited us in our 2019 season were:

- Maple Leaf Educational Systems, Richmond, BC
- Maple Leaf Educational Systems, Kamloops, BC
- Queen Margaret's School, Duncan, BC
- Carihi Secondary School, Campbell River, BC
- Huband Park Elementary, Courtney, BC

- Maaqtusiis Elementary School, Ahousaht, BC
- Maaqtusiis Secondary School, Ahousaht, BC
- Heartwood Learning Community, Comox Valley, BC
- Royal Roads University, Colwood, BC

- West Point Grey Academy, Vancouver, BC
- Coast Mountain Academy, Squamish, BC
- Broadreach International
- Ucluelet Secondary School, Ucluelet, BC

Teacher Resources Pro-D Day

- Island ConnectED K-12 School, Nanaimo, BC
- SD71 Province Wide Pro D Day

As a research station, it was with great enthusiasm that we jumped deeper into our in-house monitoring projects with these older students. During our microplastic surveys we analyzed different types of plastics found in the samples and brainstormed where they could have come from. In the plankton tow, students learned how to use a plankton net, microscopes, and how to utilize a dichotomous key to identify different planktonic species. Sometimes success is measured in the joy learning derives, and it was with this in mind that we would smile inwardly when students would enthusiastically point out different edible berries after completing the forest ecology walk.

We cannot iterate enough how often we were amazed and humbled by the inquisitive nature, deep concern for the environment, and focused attitude that students exhibited during their time with us. The feedback we received from teachers often reflected that they too saw these attributes in their students after their time at the station.

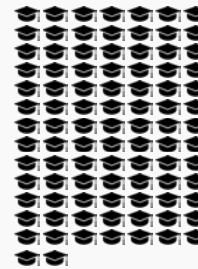
"We appreciate being able to participate with an organization that has a clear vision and mission, particularly as you begin to blaze trails of your own in the area of ecological and sustainable education. Our students enjoyed their experience explicitly (rain or shine) and are now contemplating how they can make small changes in their lives to address plastic consumption, contribute to the protection of our oceans and environment. You should know, this hasn't always been the case."

- Alison O'Marra-Armstrong, M. Ed.
Vice Principal, Curriculum & Instruction
Queen Margaret's School

With all groups, scientific learning is only a portion of what we teach. Like in previous operational years, we witnessed valuable moments occurring in the moments of deeper reflection. We saw grade 8s beginning to forge friendships to last their high-school experience, grade 12s reflecting on a closing chapter of their schooling while looking ahead to new experiences, and primary children reminding us how play in nature is best conducted.



93 Teachers visited.



18 Days of summer camp.



10 Workshop days in-house.



8 Days of two independent yoga retreats.



304 Students visited this 2019 season.



A keen youth group that came out to Cedar Coast multiple times over this past season was the local Surf Rider Youth Club. These enthusiastic youth dedicated their time to conduct several beach cleans on Keltsmaht and, together, we explored the impacts of sea lice on juvenile salmon and delved deeper into the diversity that makes Clayoquot Sound so unique.

As we look towards our 2020 season we are excited to welcome many returning school groups and collaborate with teachers to ensure that their students get the greatest benefit out of their visit to the field station.

Summer Camps

In July and August, we offered three summer camps designed in-house, that focused on youth empowerment, individual exploration, team bonding, and artist expression. In our first camp of the season, a Youth Empowerment Camp for youth ages 8-12, we had 23 campers join us onsite. For these five days our field station was filled with mirth of play, enthusiasm for new challenges, and lots of running children! Highlights of this camp were snorkelling (with our visiting dive instructor Tiare Boyes), 'Ninja' a game key in developing fast reflexes, and a camp favourite: hatchet throwing.

We had 8 youth aged 13-16 join us for a whole week to take part in our Arts for Ecology Camp. The longer time period and smaller group size created a more intimate setting for the campers to grow together, share ideas, and explore different creative outlets with the support of their peers. Mobile art pieces were created, aquatic life explored through watercolors, beach trash brought to life through poetry, wood carving techniques honed, and the finale featured an art gallery as well as an art magazine.

Our final summer camp of the season, the older Youth Empowerment Camp (ages 13-16), offered the same thrill of the younger version of this camp but with added challenges and deeper call for self reflection. In this camp, there was the addition of a surfing lesson, hiking Lone Cone mountain on Meares Island (a 742 metres elevation vertical gain!), and a longer period of structured solitude.

Overall, the summer camps we offered this year added the spice of play to our station and allowed 40 youth, between the ages of 8 and 16, the opportunity to explore nature, their connection with others, and develop a relationship with themselves in a deeper capacity.

Adult Education

Learning does not stop in our youth (as all of our staff can attest to!) so this past spring we offered two adult education workshops: Permaculture Design and Introduction to Woodcarving.

In the permaculture workshop, led by Michael Nickels, participants delved deeply into what it means to work with your surroundings to optimize food, water, and energy systems. Over this 5-day workshop students learned the basics of how to design systems for off-grid electricity, rain-water catchment, compost, fruit and vegetable production, surface-water management, and off-grid heating. Because this workshop took place during the final stages of landscaping, students were able to get lots of hands on experience with designing garden areas and then building them!

Robinson Cook, a renowned local woodcarver shared his expertise over a three-day intensive workshop that introduced students to the fundamentals of hand carving. Like any fine artform students learned how to read the subtle hints of the trade - the grain of the wood, how to select the perfect tool for the task, and that perseverance is key! Connecting to wood in a building accented by locally sourced wood offered abundant inspiration. After much hard work each student walked away with new knowledge and their very own hand carved cedar platter.



Facility Buyouts

Upon request, the Cedar Coast Field Station is often able to accommodate local groups and businesses wishing to utilize the facility for personal events or workshops. This past spring, yoga teachers from Coastal Bliss Yoga and MOcean Yoga led rejuvenating retreats, and local business spent time to celebrate and reflect on another successful tourism season in Tofino, BC. Cedar Coast will continue to rent out the facility next season to fulfill our vision of being inclusive and accessible for a diverse and collaborative community of researchers, naturalists, artists, educators and students.



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Our Facility

A wise man once said, “the most ecologically sustainable building is the one that already exists”. Reflecting on the past year and a half of construction at our off-grid, boat-access location we wholeheartedly agree. Construction is among the most resource and energy intensive processes on the planet. This is especially true when building on an island covered in dense 10 ft salal bushes and coastline exposed to wind and swell. While our new field station facility does include 7 newly constructed out buildings (6 cabins and a shower house), the main building is a pre-existing 5000 square foot timber frame structure that was designed as a wartime museum and built to lock up in the mid 1990’s. At that time the project was abandoned due to financial constraints and logistical challenges. The building sat empty for many years, unfinished, slowly becoming reclaimed by the encroaching forest. Faced with the challenge of needing a new location after our first year of operation, we embraced the opportunity to re-purpose the abandoned building next door and turn it into the main facility for our ecological field station.

Lot 1 Vargas Island was purchased for the development of the Cedar Coast Field Station in October 2017. At this time it was agreed that our director, Simon Nessman would personally pay for all expenses associated with the purchase and development of the property, and Cedar Coast Field Station Society would become the long-term tenant. With a long-term principle agreement in place, we set to work designing a purpose-built research and education facility that would suit the needs of Cedar Coast for many years to come. With no existing electricity, water, sewage treatment or road access there was a great deal of planning and groundwork to be done before facility construction began.

Access

The first consideration in developing a boat-access property is access—everything revolves around the wind, swell and tides! The existing building was constructed largely with the use of helicopters, which is an inefficient long-term solution for transport of building materials and station supplies. The original construction also included a floating dock fixed to pilings, but without a mechanism for removing the dock, this initial infrastructure was destroyed by the first winter storms it faced. Our solution to access was two-pronged: First, using materials from the property we constructed a corduroy driveway approximately 600 metres from the station to a gravel beach to the south. Using a tractor and trailer this driveway provided an access point for all heavy equipment and building materials that arrived on the beach by barge and skiff. Second, we designed and installed a small floating dock off of a rocky point nearby the station. With a hand powered winch and series of pulleys suspended from an old growth Western red cedar above, the small dock and gangway can be lifted entirely out of the water during periods of



rough weather. This gives us the convenience of safe dock access through most of our operating season (April-October) and the security of having the dock out of the water for winter storms.

Water

Another major consideration in building off-grid is access to water. After failing to find a location with adequate recharge rates for a shallow well, we decided to embrace the regions heavy rainfall and focus on rainwater catchment. We set up approximately 4000 square feet of rainwater catchment on the main building, which feeds into a 101,832 litre water cistern comprised of four, 25,458 litre polyethylene tanks. This may sound like a lot of water storage, but with the average Canadian using 329 litres of water per day this supply would last 30 people just 10 days without rain. Given that 329 litres of water per day is far more than a person needs to live comfortably, we embrace our water constraints as an opportunity to educate visitors on various water conservation techniques. This year our water storage was more than enough to meet the demands of up to 30 people at a time through extended periods of drought. We did not collect exact data on water consumption per person per day but it would be an interesting project to undertake next season. Before consumption, the rainwater is passed through a series of particle and UV filters prior to supplying all of the stations potable water needs. In order to reduce the pressure on rainwater during times of drought, we dug a small pond (approximately 10,000 gallons) that supplies all of the water for toilets and gardens throughout the year.



Electricity

Despite rapid advancement of renewable—and off-grid—energy technologies, it is still challenging and expensive to power large scale off-grid operations. The primary power supply for the new facility is a 12 kW solar electric array mounted on the East, South, and West pitches of the main building roof. With a separate solar controller for each roof aspect, a person can watch the solar energy supply shift from East to South to West as the sun traverses the sky daily. Solar energy is stored in a 48V, 2,062 Amp hour lead acid battery bank and converted into domestic 120V power supply with a 12 kW inverter. A 6500 watt gasoline generator provides backup power supply during periods of lower solar energy input and high demand. The solar electric energy supply provided ample electricity for the station on all but a few occasions throughout the operating season. Working within the constraints of the solar electric energy supply provided an opportunity to educate visitors on the importance of conserving electricity whenever possible.

Heat

Given the station is situated on 45 acres of young, tightly spaced evergreen forest, wood was the natural choice for heat energy. Two drawbacks of wood heat are deforestation and air pollution. In order to address concerns over deforestation we are avoiding clear-cutting and we are instead selectively thinning the young densely spaced forest on the property in order to provide more light to the understory. This practice has the benefits of providing a renewable fuel source while increasing species abundance and diversity in the forest floor (Verschuyl et al., 2011). To address concerns over air pollution we have installed a high efficiency wood fired furnace with a 1500 gallon water heat sink. The furnace burns wood efficiently at high temperatures, then stores the heat energy in water and distributes it gradually throughout the building. This system reduces our dependence on wood stoves that burn wood at comparatively lower temperatures and produce more air pollution. The wood furnace supplies heat to all of the main buildings air spaces as well as all domestic hot water. For backup we installed an on-demand propane hot water heater and a traditional wood burning stove in the main living space.



Gardens and Orchards

With the ultimate goal of growing all produce consumed at the station, we made substantial progress in developing food gardens and orchards this season. Drawing on the principles of permaculture design, we created 3 food production zones at various distances from the station. Surrounding the front porch of the main building, a series of raised beds produced leafy greens, leeks, herbs, peas, strawberries, and rhubarb. A flat shelf directly uphill of the station consisted of additional raised beds flourishing with leafy greens and root vegetables. Our final food production area is a moderately sized clearing on a plateau above the station which contains a pond, a small orchard with 20 fruit and nut trees, and a number of garden rows planted with potatoes and garlic. A big thank you to Michael Nickels, educator of our Permaculture Design workshop, for all of his expertise and insight on how best to grow food on Vargas Island. And of course, to our volunteers who helped weed, water, plant, harvest and enjoy all of the produce!

Main Building

While the shell of the main 5000 square foot building was built in the mid 1990's, we spent a great deal of time and energy repurposing it to better suit the field station's needs. We started by bringing in natural light with the installation of 33 skylights throughout the building and surrounding covered decks. We replaced the leaky roof with a standing seam metal roof that should last 50 years or more. The interior spaces are largely open concept, with a spacious dining hall, kitchen, conference room, library, field lab, two offices, a mud room and a large multi-purpose room. For flooring we chose to leave exposed the

original plywood floors from the 90's, which we sanded down and sealed with a clear coat. Most of the countertops and tables in the station were salvaged with an Alaskan mill from a single cedar log that lay alongside the access driveway. All of the insulation in the building is Rockwool—a rock based mineral fiber insulation that is more ecologically sustainable than traditional fibre-glass insulation. In all construction decisions we prioritized local, ecologically sustainable options wherever possible.

Outbuildings

All of the sleeping accommodations are located in canvas wall tents along the shoreline in front of the station. Each tent is assembled atop a sturdy cedar platform and contains custom made cedar bunk beds with wool mattresses. The tents are suspended from a post and beam structure that supports a metal roof, which was salvaged from the original building. Adjoined to each tent is a small cedar cabin which provides a wind break for the tents and a space to study in peace and quiet. Much of the lumber in the cabins was salvaged by boat right here in Clayoquot Sound. All of the tents are connected by a network of trails that were built by hand and covered in wood chips.

The shower house is located between the wall tents and the main building. Looking out over the ocean, it is an open-air building constructed entirely out of western red cedar—much of which was locally salvaged. The shower house contains 4 shower stalls, and 4 stations for washing and brushing teeth. Toilets are located inside the main building.

Research: 2019 Season in Review

We are extremely grateful to be a part of the network of research and conservation organizations throughout Clayoquot Sound that are working to restore, monitor and protect this pocket of the world we call home. We have many partners and donors to thank for making our work possible. And as a result, over the past three years we have grown to become a scientific resource within our community. Amidst the patchwork of local organizations who we collaborate with to sample microplastics, monitor seastar wasting disease, or conduct oceanographic surveys, our most unique project, that fulfills what was once a void in our coastal waters, is our wild juvenile salmon and sea lice monitoring.

To access all of our research reports, visit the Archives section of our website:

<https://www.cedarcoastfieldstation.org/archives/>



01.

Juvenile Salmon and Sea Lice Monitoring 2019

Project Summary

2019 marked our first full season of wild juvenile salmon monitoring in Clayoquot Sound, building off our pilot season in 2018. Wild Pacific Salmon in Clayoquot Sound, BC face significant threats from industry, land use and a changing marine ecosystem. Juvenile salmon migrating from Clayoquot Sound this spring were again exposed to high levels of sea lice as the finfish aquaculture industry failed to control and mitigate sea lice infestations on farms in southern Clayoquot Sound. This year, we assessed the sea lice load and external health of juvenile salmon during their out-migration in Clayoquot Sound. We collected samples to be assessed for the presence of pathogens, trialled purse seining to capture larger out-migrating smolts, responded to another herring die off and conducted preliminary tests to assess the presence of drug resistant sea lice in Clayoquot Sound. Our monitoring area was the migration corridor from the Bedwell and Cypre River out to the Pacific Ocean. We plan to continue this monitoring next year, continue sea lice resistance testing and collecting samples to try and detect the presence and source of diseases in juvenile salmon within Clayoquot Sound. Our annual sea lice report and a report on drug resistance trials will be released over the coming months

Publicity & Outreach

Over the past year, our Research Coordinator, Mack Bartlett, gave a number of presentations and demonstrations to approximately 250 participants. These events took place at Ocean Outfitters, the Clayoquot Sound Community Theater, the 2019

Clayoquot Salmon Festival, and at the Cedar Coast Field Station to visiting school groups. We also continue to play an active role as a member of the Clayoquot Salmon Roundtable, providing expertise and technical support with assessing salmon related activity in the region.

As we share our scientific findings within our coastal community, it is inspiring to see the breadth of our impact at a global level as news articles shine light on the health of wild salmon populations in Clayoquot Sound. Our research has recently been featured in: The Tyee, The Narwhal, CBC, Chek news, Global News, Ha-Shilth-Sa, The Nest, Tofino Times, Undercurrent news, Radio Canada International.

Our project involved 4 volunteers, 4 visiting researchers and 5 station staff. We had support and technical assistance from approximately 15 other individuals. We collected data, collaborated with and received technical support from several local and remote organizations including: Uuathluk Fisheries, Ahousaht Fisheries, Central Westcoast Forest Society, Salmon Coast Field Station, Martin Krkosek Lab (University of Toronto), Hakai Institute, Clayoquot Biosphere Trust, Department of Fisheries & Oceans (DFO) Molecular Genetics Lab.

Support

Cedar Coast received funding to support this project from Ocean Outfitters, Clayoquot Biosphere Trust, a Tofino Saltwater Classic grant, a Keen Critical Coastline grant, Eco Canada, Government of Canada, and the Malcolm Family Foundation. Thank you to everyone who made this project possible and successful!



5 Research Programs



4 Collaborations and student projects



02.

Local Gray Whale Monitoring

Project Summary

This year we had our first season of Gray whale monitoring in Clayoquot Sound. Most Gray whales migrate between their winter breeding grounds in Baja, Mexico and summer feeding grounds in the Arctic. However, a small endangered population of Gray whales, the Pacific Coast Feeding Group, feed exclusively from Washington to Northern BC throughout the summer. Gray whales are ecologically, culturally and economically significant to the ecosystem and communities of Clayoquot Sound.

The goal of this project is to contribute to the documentation of population abundance trends in this unique group of whales. This summer we photo-identified Gray whales in Clayoquot Sound on a weekly basis tracking the number of individuals using these coastal waters, their identity, and made notes of interactions between whales and what they were feeding on. We have created a 2019 Gray whale identification catalogue of summer residents that will integrate with the long-term catalogue and database created by Pacific Wildlife Foundation. Ultimately this monitoring will lead to greater understanding of this endangered population, and how it is impacted by changes in prey availability and this year's unusual mortality event. We aim to continue this monitoring into 2020.

Publicity & Outreach

We shared the Gray whale monitoring project with the community by submitting an article that was published in the Tofino Times, September 2019 Edition.

The Gray whale monitoring project involved three Cedar Coast staff, four volunteers, and Claudia Tersigni, a visiting research student from Quest University Canada. Photo IDs were provided by a number of community members, and presentations were given to many visiting students at CCFS. Our hope is that the 2019 Gray whale catalogue will be used as a resource by boaters, guides and tourists that are lucky enough to see this special Pacific Coast Feeding Group in our local waters.

Support

With support from the Clayoquot Biosphere Trust, we received a Research and Environment grant to conduct the Grey whale monitoring project. Although our staff and visiting researchers spent many early mornings on the water gathering ID photos along the southern coast of Flores Island and Ahoos Bay, we were fortunate to have the photo ID contributions from local guides Mark Sawyer and Ashly Hoyland. Finally, this project was initially inspired and supported by whale biologist, Jim Darling. Thank you to Jim and Josie Byington for your expertise in whale ID and for creating a baseline data set to build off of.



Research: 2019 Season in Review

03.

Salmon Population Analysis

Salmon populations in Clayoquot Sound are at, or near historically low levels. We are having very few adults returning to spawn each year with hatchery fish making up a large component of the returning populations.

Knowing the number of salmon that return to our rivers each year is important data, but only a piece of the overall stock assessment puzzle. Determining the fishing pressure of that particular salmon run, the age structure of each salmon species, and ideally knowing the inputs from local hatcheries are all valuable factors to consider when trying to determine the population status of a specific salmon run.

Currently, our government attempts to assess salmon stocks by analyzing a number of rivers within a large geographic area. In doing so, it is difficult to determine if one river (and its salmon populations) is doing well, or poorly. As a result, we cannot accurately decipher how well individual salmon runs are doing over time. An alternative solution is to assess populations over time from individual rivers, which can paint a more accurate picture of the productivity and resilience of each local salmon population.

This spring, Cedar Coast staff started working to develop river-level population assessments for salmon in Clayoquot Sound and the surrounding West Coast of Vancouver Island. Rowen Monks, one of our Canada Summer Jobs students, undertook a major data collection and entry effort to prepare for the next steps of this analysis. Working in conjunction with researchers from Dalhousie University, Salmon Coast Field Station Society and Pacific Salmon Foundation, we are intending to have the analysis completed next season. This project is supported by Ocean Outfitters and the Canada Summer Jobs Program.



04.

Juvenile Salmon Residence and Disease Assessment

How juvenile salmon use the marine environment in Clayoquot Sound is not fully understood. We know what time of year they leave the rivers but once they reach the marine environment we do not yet have a grasp on where they go, or how long they stay resident in Clayoquot Sound.

With changing oceanic conditions and the identification of disease outbreaks and agents present at both fish farms and fish processing plants, it is critical that we understand how the juvenile salmon are using the Clayoquot Sound corridor. As a component of our juvenile salmon sampling program, we trialled different catchment methods including purse seining and micro-trolling in order to collect tissue samples of out-migrating salmon smolts.

The tissues we collect are sent to The Molecular Genetics Lab at the Pacific Biological Station (PBS) to be assessed for genetic signatures of known disease agents and for signs of disease in the tissues themselves. We will be continuing this project into the winter as we assess Coho and Chinook winter residence in the region. Cedar Coast has been working with Uu-a-thluk Fisheries to complete this project, and we have had sampling and technical support from the Pacific Salmon Foundation, The Molecular Genetics Lab at the Pacific Biological Station and the Hakai Institute. This project is supported by Ocean Outfitters.



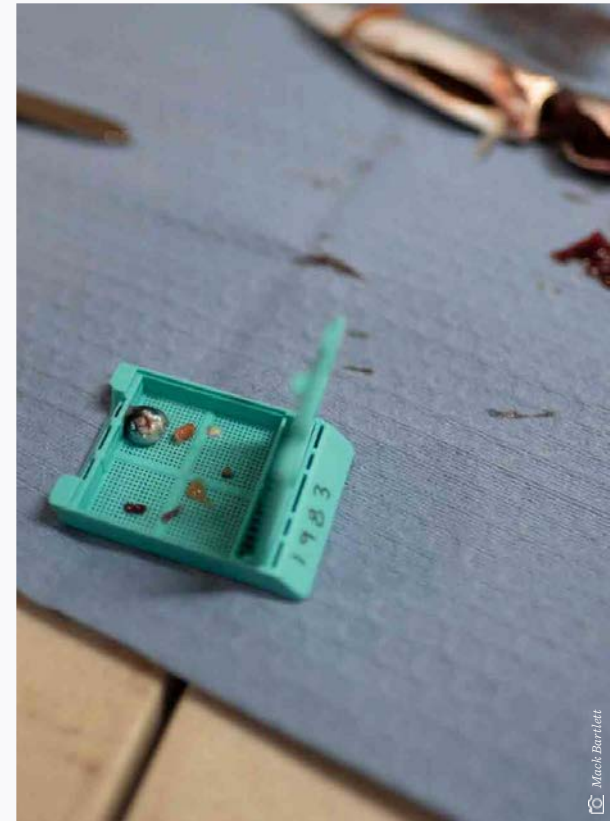
 Mack Bartlett

05.

Drug Resistance in Sea Lice


In 2018 the fish farms within Clayoquot Sound reported that their main tool to control sea lice, SLICE, had become less effective and drug resistance was detected by the industry. SLICE resistance has occurred in all major salmon farming regions of the world, with British Columbia being one of the exceptions. This management challenge led to a lapse in sea lice control on farms within Clayoquot Sound and caused a cascade of effects including use of emergency sea lice treatments (Lufenuron medication and hydrogen peroxide baths) as well as high levels of sea lice on wild juvenile salmon in 2018 and 2019. If SLICE resistance has developed within BC, then this is a new major challenge to both aquaculture and wild Pacific Salmon stocks in BC.

This year we conducted an analysis to see if we could detect SLICE resistance in sea lice we had collected from adult salmon caught by recreational fishers. No drug resistance was detected in our trials and we will continue the assessment next year using lice collected from juvenile salmon, a better indicator of localized resistance. Samples were sent to the Pacific Biological Station for genetic signatures of resistance to also be assessed. This project was run by Quest University student Christian "Critt" Carson and Salmon Coast Field Station researcher Rob Humenney, with support from local fishing guides, recreational fishers, Tofino Resort + Marina and the Salmon Coast Field Station Society.



 Mack Bartlett



 Mack Bartlett

Collaborations & Student Projects

01.

Hakai Integrated Coastal Observatory (ICO) and Oceanography

Project Summary

This year, Hakai Institute has been developing the Integrated Coastal Observatory (ICO) program. The goal of the ICO is to create a system for the collection of ocean-related observations across British Columbia. This year we started our fruitful collaboration with the Hakai Institute by conducting two oceanographic surveys, syncing our purse seining methodologies for capturing post-smolt juvenile salmon, and collecting eDNA (environmental DNA) on a monthly basis to detect the fish species that are present in Clayoquot Sound.

The Pacific Coast of Canada faces cyclic changes in temperature regimes, so the region of Clayoquot Sound is an ideal location to monitor changes in ocean conditions and biodiversity over seasons and years. As fish respond rather quickly to environmental changes, analysis of fish eDNA will be a useful tool to help us monitor the health of the marine environment and impacts of climate change.

Limited oceanographic data is collected in Clayoquot Sound each year and so it is challenging to make sense of changes to complex ecosystems and food webs without having an understanding of the basis for these systems. As a result of our two oceanographic surveys, we noted that water contained within the Bedwell and Cypre River corridor are disconnected from that of the open ocean. This means they act as if they are an inland water body and not situated so close to

the open ocean. We also found that the oxygen levels in Herbert Inlet are so low below 30 meters that fish could not survive, limiting their space to both feed and evade predators. Historically this anoxic layer was low in the water column but has moved upwards since the 1980s. We are looking to develop a year-round oceanographic program so we can better understand these changes in oceanographic conditions and how they may be affecting all life in Clayoquot Sound.

Publicity & Outreach

The ICO project involved three CCFS staff, two volunteers and seven Hakai Institute employees.

Collaboration

Hakai Institute provided technical support, materials and analysis for this program. We look forward to continuing this collaboration and contributing data that ultimately connects research and conservation along the BC coast.



02.

Salmon Genetics Program

Only a handful of the salmon runs from the rivers in this region have enough genetic information required by researchers and the Federal Government to manage salmon stocks to the local level. Without this information we cannot make informed management decisions about locally important salmon runs. In collaboration with the Salmon Coast Field Station Society, we manage the collection of salmon fin clips from small and remote salmon runs throughout coastal BC to build up the genetic database and provide the opportunity for more clear and local management of Pacific Salmon and their environment.

We have continued to work with our host of diverse partners, including avid recreational fishers and guides who collect samples for this project. We are currently working on collecting steelhead and trout fin clips so that we can create genetic databases like that of other salmon species managed by the Department of Fisheries and Oceans (DFO). Having these additions will help us understand how these enigmatic populations are structured. This project is supported by Ocean Outfitters, the Sitka Foundation and Nimmo Bay Resort.



03.

Coastal Wolves Monitoring with Parks Canada

We have recently started a new initiative to monitor the wolf population on Vargas Island. Our aim is to understand how the wolves of Vargas Island connect with those throughout the rest of Clayoquot Sound. Do we see the same wolves on Vargas as those that use Meares Island and the Esowista Peninsula? We are using low impact trail camera arrays for photo identification as well as scat samples to collect DNA from the wolves themselves and their prey. This project is in partnership with Parks Canada, BC Parks, The Nature Conservancy of Canada, the Ahousaht Nation and the Wildlife Restoration Ecology Lab (University of Northern British Columbia).



04.

Monitoring Canopy-Forming Kelps

Clayoquot Sound is recognized for its towering cedar stands but just beyond the ocean's surface grows another type of forested haven: kelp forests. These forests, reaching up to 10 meters high, are formed by canopy-forming brown algae commonly known as kelps. The two common species of kelp growing along our coast are bull kelp (*Nereocystis luetkeana*) and giant kelp (*Macrocystis integrifolia*).

When kelp forests are intact they provide the foundation for dynamic ecosystems; as primary producers, their wellbeing has a cascading effect on entire marine communities and keystone species such as the iconic sea otter (*Enhydra lutris*). With major environmental shifts impacting marine ecosystems, the role that kelp plays as an indicator species in sub-tidal ecosystems underpins the importance of continuous monitoring.

This project is working to establish a long-term kelp monitoring program and expand our knowledge of kelp forests in Clayoquot Sound. Monitoring takes place in late summer and is conducted on the water using kayaks and hand-held GPSs to map the spatial disruption of kelp beds. This past summer we trialled monitoring methods and are working to implement a full monitoring program by summer 2020. We hope that this project will help us gain a better understanding of how, and possibly why, kelp forests transform their range and density due to changing oceanic conditions.



Board & Staff Members

Directors & Board Members

- Simon Nessman
- Lennie John
- Zephyr Polk
- Colin Bates
- Dave Ratcliffe

Staff

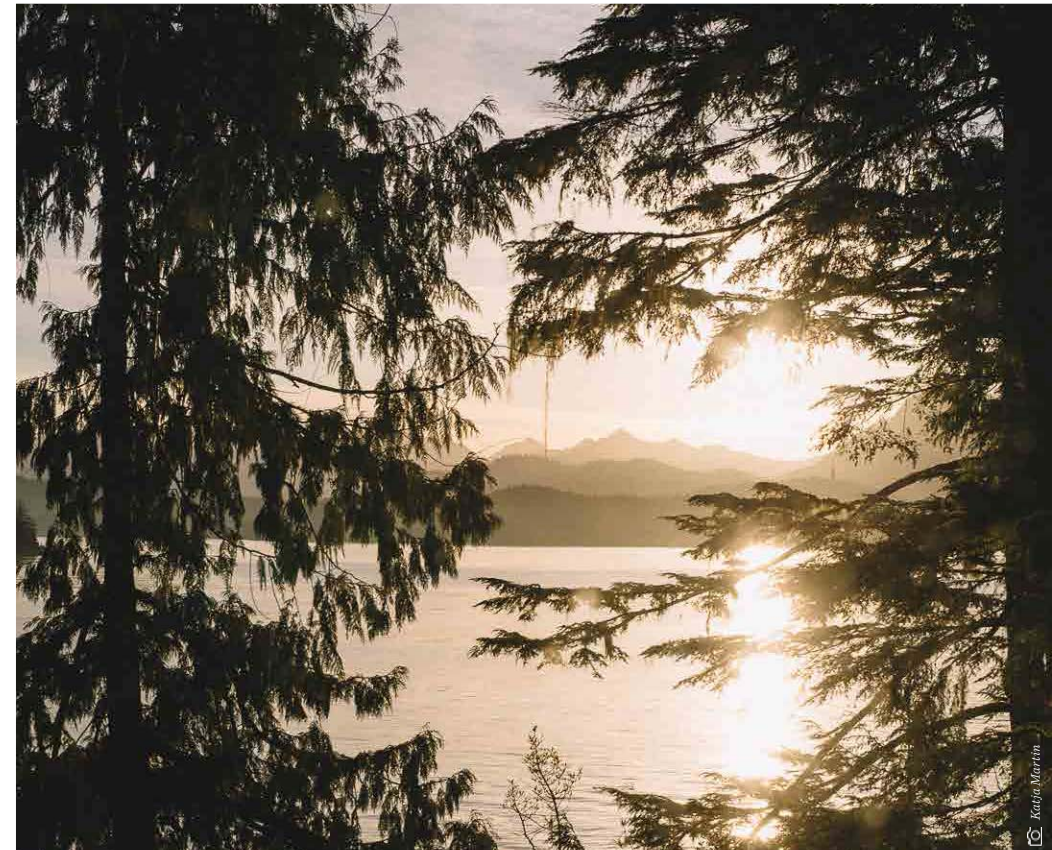
- Janessa Dornstauder, *Program Coordinator*
- Valerie Law, *Operations Coordinator*
- Mack Bartlett, *Research Coordinator*
- Satchel Robertson, *Station Coordinator*
- Julia Simmerling, *Field Technician & Educator*
- Marcie Callewaert, *Educator*
- Andrew Wood, *Educator*



Marcie Callewaert



Mack Bartlett



Katya Martin

Volunteers

Thank you to our volunteers

Throughout the entirety of our season, we have had so many volunteers from far and wide, jump fully into this project - our vision - to get their hands dirty and be a pair of helping hands.

Whether it be clearing trails, stacking firewood, cleaning bathrooms, or just making a simple meal for all to share at the end of a long work day, we thank you for all of your contributions. 21 volunteers lived on site throughout the season and formed powerhouse teams of 3-4 people that kept the station systems running smoothly.

We would also like to thank friends and family who helped out in early season as worker-bees to get the facility ready for the operating season.

22 Volunteers in total.



21 Lived on site this season.



2-3 Volunteers formed powerhouse teams

that kept the station running smoothly.



Donors & Supporters

Thank you to our supporters

It has been a complete honour to have received funding and support from individuals and businesses throughout Clayoquot Sound and our greater global community. With all of your support, our work at Cedar Coast Field Station has flourished, and our vision has become a reality. We thank you, and appreciate your generosity towards this project.

- Martin Jenkins Family Foundation
- Jason Kanner
- Andreea Diaconu
- Willie Mitchell
- Shane DeGroot
- Darren Bagert
- Sea Wench Naturals
- Pacific Wildlife Foundation
- Ocean Outfitters
- Tofino Saltwater Classic
- Clayoquot Wilderness Resort
- KEEN Critical Coastlines
- Clayoquot Biosphere Trust
- Government of Canada
- And Many More!



Donations

Interested in contributing?

If you are interested in supporting the Cedar Coast Field Station Society, please visit our website.





References:

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Thomas Jolicoeur, Canwest News Service
Wednesday, Mar. 18, 2009

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Thank you to the following photographers:

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- Ian Harland
- Valerie Law
- Melissa Renwick
- Brian Kelley
- Tiare Boyes
- Erin Walker
- Katja Martin
- Julia Simmerling
- Nessa Bryce
- Satchel Robertson
- Marcie Callewaert



ANNUAL
REPORT **2019**

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