



Baynes Sound / Lambert Channel Ecosystem Forum | Spring 2022 **Summary Report**

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Executive Summary

The Baynes Sound / Lambert Channel Ecosystem Forum (hereafter referred to as the “EcoForum”) took place on June 17th, 2022 at Vancouver Island University’s Deep Bay Marine Station in Bowser, British Columbia. In attendance were approximately forty participants from indigenous, federal, provincial, and local governments, as well as members of industry, higher education, and environmental conservation organizations. A list of participants can be found in Appendix A.

The EcoForum has been meeting since 2018 on a bi-yearly basis with three key goals:

- To create opportunities for information sharing and collaborative dialogue among diverse stakeholders of the Baynes Sound / Lambert Channel ecosystem
- To identify ongoing processes and collaborative actions with potential to support the health and recovery of this ecosystem
- To share knowledge, experience, and ideas that can inform research and problem-solving

For the Spring 2022 EcoForum we focused presentations and discussions on a specific theme, to see if this could lead to richer, more in-depth learning and discussion. The EcoForum provided a space for presentations on herring stock management, conservation, and recovery from a diversity of perspectives. The presentations were followed by an open group discussion where participants and speakers spoke about some of the opportunities, threats, and challenges for herring stock recovery in the Strait of Georgia.

We had the great honour of launching the day’s discussions with a visit from the Honourable Josie Osborne who is the BC Minister of Land, Water, and Resource Stewardship, BC Minister Responsible for Fisheries, and MLA for our Mid Island - Pacific Rim region. She provided an overview of the new Ministry’s approach to resource stewardship and described the three key water strategies the Ministry will be working on: the Wild Salmon Strategy, the Coastal Marine Strategy, and the Watershed Security Strategy.

Dr. Eleni Petrou, Postdoctoral Researcher with the School of Aquatic and Fisheries Science, University of Washington; who is currently working as a geneticist at the Alaska Science Center, under the United States Geological Survey, gave a fascinating presentation on the temporal and spatial genetic diversity of Pacific herring.

Grant Scott, Hornby Island Trustee, and Chair of Conservancy Hornby Island, provided an overview of herring stock depletion in the Salish Sea and in the Strait of Georgia specifically. He spoke of the importance of protecting eelgrass beds, the threat of climate change, the consequences of over-fishing, and the need for a moratorium on the herring roe fishery in order to give herring stocks a chance to recover.

Denise Smith, *Kwyem tomolx (Speaks for the People)*, is the Interim Director of Lands and Resources for the Tla’amin Nation. She was the first woman to become Chief of her community

and was one of the negotiators for the 2016 Tla'amin Final Agreement. She provided a moving account of her Nation's relationship with land and marine resource stewardship. Her community is one of the few that has created a no commercial herring fishery zone, and she warns that sport fishing licenses may also lead to illegal or over-harvesting. Their community continues to work on herring conservation and restoration.

The morning presentations were followed by a panel discussion and question and answer period. The discussion included questions regarding the effects of climate change on herring and other traditional food sources, the effects of noise and development on herring spawns, slow recovery of herring stocks in areas affected by over-fishing, effects of climate change on bull kelp, eelgrass, and related herring rearing habitat, the need to buy out commercial fishing licenses, and find ways to help fishers retrain for other jobs or industries.

The floor was asked what could be done to support herring conservation and recovery. Participants and speakers shared a number of ideas:

- Reduce CO2 emissions and work to stop global warming
- Protect eelgrass beds to protect herring spawning and rearing grounds
- Do regular monitoring of eelgrass beds and replant depleted areas, given that this plant recruits annually through spore production
- Regulate residential, commercial, and industrial development in spawning and rearing grounds
- Regulate seawalls and upland septic systems and liquid waste pollution to protect the foreshore from erosion and contamination
- Prohibit creosote in marine environments
- Consider sunscreen as a pollutant for the marine environment, and promote ocean-safe sunscreens as a more sustainable alternative
- Regulate anchoring and mooring in sensitive areas, like at Drew Harbour near Rebecca Spit on Quadra Island. Mid-line float moorings could be used instead. There are a number of mariner maps and phone apps that could be used to educate boaters regarding anchoring and mooring best practices in sensitive areas

While there are many actions that can be undertaken to support the conservation of herring habitat and herring stock recovery, it was generally accepted that these actions will not be able to fully mitigate the long-term effects of climate change whereby local fish stocks will move northward as ocean temperatures rise and acidification increases.

If you have questions or comments about this report, please contact info@bayneslambertecoforum.ca



Introduction

Land Acknowledgement

We acknowledge that participants of the Baynes Sound / Lambert Channel Ecosystem Forum live and work in Indigenous, Métis, and/or Inuit communities across BC.

EcoForum participants gathered from the treaty and traditional territories of BOKÉĆEN (Pauquachin), Cowichan, Halalt, Homalco, Kómoks, Klahoose, Ts'uubaa-asatx (Lake Cowichan), Lək'wəŋən (SXIMELEL (Esquimalt), Songhees, TSou-ke, Lyackson, MÁLEXEL (Malahat), Penelakut, Qualicum, Scianew (Beecher Bay), səliłwətaʔt/seł'íłwitulh (Tsleil-Waututh), SEMYOME (Semiahmoo), Shíshálh (Sechelt), Snaw-naw-as (Nanoose), Snuneymuxw (Nanaimo), Skwxwú7mesh (Squamish), SÁÁUTW (Tsawout), Stzuminus (Chemainus), Tla'amin, Tsawwassen, We Wai Kai (Cape Mudge), Wei Wai Kum (Campbell River), WJOLELP (Tsartlip), WSIKEM (Tseycum), and xʷməθkʷəy̓əm (Musqueam).

We want to especially thank the host communities of Kómoks, Qualicum, Snaw-naw-as and Tla'amin Nations.

Grant & Funding Acknowledgement

Financial support was graciously provided by the Islands Trust Programs Committee and by the Comox Valley Regional District's Rural Community Grant which was applied for by the BC Shellfish Growers Association on behalf of the Baynes Sound / Lambert Channel Ecosystem Forum. We would also like to thank the Association for Denman Island Marine Stewards who provided financial support through a LUSH Cosmetics Charity Pot grant, and much appreciation to the VIU Deep Bay Marine Station which supported the Spring EcoForum through in-kind contributions towards venue, catering, and logistical support.

EcoForum Purpose & Goals

The overarching objectives of the EcoForum are:

- To create opportunities for information sharing and collaborative dialogue among diverse stakeholders of the Baynes Sound / Lambert Channel ecosystem
- To identify ongoing processes and collaborative actions with potential to support the health and recovery of this ecosystem
- To share knowledge, experience, and ideas that can inform research and problem-solving

This report is intended to provide a summarized overview of discussions, decisions, and actions undertaken at the EcoForum held on June 17th, 2022. Please note that consensus was not achieved on each and every point of discussion, though there has usually been agreement on steps for moving forward.

The Baynes Sound & Lambert Channel Ecosystem

Baynes Sound and Lambert Channel lands and waters have been the homeland of Indigenous Peoples since time immemorial. Their cultural heritage, knowledge, and stewardship of this area for thousands of years highlights the importance of this place as a unique coastal homeland.

Baynes Sound and Lambert Channel, a thermally stratified inland sea, is a highly productive ecosystem, home to a regionally unique combination of diverse marine and coastal habitats. As such, it has been internationally recognized as an *Important Bird Area (IBA)*, and nationally designated an *Ecologically and Biologically Significant Area (EBSA)*.

Baynes Sound / Lambert Channel is the highest ranked cumulative spawning and rearing area for herring in the Strait of Georgia: thirty-eight percent (38%) of all herring spawning that has ever occurred in BC (based on >30,000 records) has occurred in this area,¹ positioning this area as a critical linchpin for the ecosystem health of the Coast. Seabirds, juvenile salmon, mollusks and other forage fish find shelter in the ecologically-distinct elements of Baynes Sound and Lambert Channel. Baynes Sound and Lambert Channel are summer molting areas for sea ducks, with significant aggregations of waterfowl, shorebird and gull species during herring spawn. Several at-risk bird species use Baynes Sound for feeding or stop-overs.

Baynes Sound and Lambert Channel contain important foraging and haul out sites for Pacific harbour seals as well as Steller and California sea lions. Baynes Sound and Lambert Channel have been consistently used as spawning and rearing grounds for the last commercially harvested stock of Pacific herring. The estuaries and riparian areas of the Sound provide spawning and rearing habitat for coho, chum, coastal cutthroat trout and likely steelhead as well. More than fifteen salmon bearing streams drain into Baynes Sound and Lambert Channel. Intertidal eelgrass beds act as nurseries and provide protection and valuable food sources for these salmon. Significant quantities of both wild and cultured shellfish are produced within these waters.²

¹ Dr Doug Hay, retired. herring scientist, DFO in his Nov.2013 letter to FLNRO Deputy Minister Tim Sheldon

² Subsections titled “EcoForum Purpose & Goals” and “Baynes Sound & Lambert Channel Ecosystem” are based on the 2018 Baynes Sound / Lambert Channel Ecosystem Forum Summary Report by Dr. Karen Hurley and Kim Dunn.

Spring 2022 EcoForum Overview

The Spring 2022 Baynes Sound / Lambert Channel Ecosystem Forum took place on June 17th, 2022 at Vancouver Island University's Deep Bay Marine Station in Bowser, British Columbia.

Facilitator Felicia Fischer of Alderhill Planning opened the event with an acknowledgement that the EcoForum was being held on the unceded territory of the K'omoks, Qualicum, and Snaw-naw-as First Nations and the treaty territory of the Tla'amin Nation; and that the VIU Deep Bay Marine Station community acknowledges and thanks the Snuneymuxw, Snaw-naw-as, Squaxin, and Tla'amin people for their caretaking of the land.

Daniel Arbour, Chair of the EcoForum's Steering Committee welcomed participants to the EcoForum, reminding them that the Baynes Sound / Lambert Channel Ecosystem Forum is not a formal non-profit organization, but rather, it represents a loose coming together of diverse stakeholders that are collaborating to create a space for respectful dialogue, information sharing, and collective problem-solving. We have worked hard to break down old silos and find ways to work collaboratively to protect this ecosystem we all depend on.

Presentations

Honourable Josie Osborne - BC Minister of Land, Water, and Resource Stewardship, BC Minister Responsible for Fisheries, and MLA for the Mid Island - Pacific Rim region.

We were fortunate that Minister Josie Osborne and Deputy Minister James Mack of the new BC Ministry of Land, Water, and Resource Stewardship were able to join us to learn more about what the EcoForum and its stakeholders are concerned about and working on.

As a former fisheries biologist and former Mayor of Tofino, Minister Osborne gained an intimate understanding of the complicated web of jurisdictions that affect local marine environments in British Columbia and the challenges this creates for effective marine stewardship. The key to effecting change within these kinds of jurisdictional structures is collaboration across organizations. This is why the work of groups such as the Baynes Sound / Lambert Channel Ecosystem Forum are so crucial.

The new Ministry of Land, Water, and Resource Stewardship represents an exciting new holistic approach to resource stewardship in BC that prioritizes reconciliation with indigenous peoples, environmental sustainability, and economic prosperity. This is the first time that stewardship responsibilities for all landscapes – forests, mountain ranges, lakes, rivers, creeks and oceans – have been brought together under one Ministry with the goal of creating greater clarity and predictability for everyone.

The new Ministry will be responsible for: effective development of land and resource use, policy, and planning; biodiversity and ecosystem health; and it will require and build upon more active participation from First Nations, industry, and other stakeholders, so we can make better decisions together.

The Ministry is bringing together this government's three key water strategies: the Wild Salmon Strategy, the Watershed Security Strategy and Fund, and the Coastal Marine Strategy. This is an interconnected approach to marine stewardship. Making progress on the Wild Salmon Strategy is one of the priorities. The Federal Government has supported the BC Government in the creation of a joint fund that addresses broad issues that affect wild salmon. The BC Salmon Restoration and Innovation Fund currently stands at \$143M and has invested in nearly 100 projects that range from things like flood control, to restoration of tidal marsh habitats, and using geo-spatial technology to monitor and manage wild salmon habitat. There are two projects that have been funded for the Comox Valley: Project Watershed received funding and has tested tools for identifying, mapping, and quantifying important forage fish populations, like herring; the Kus-kus-sum Restoration Project under the stewardship of the KFN received \$1.4M to restore key critical habitat in the Comox estuary, which is a critical salmon migration corridor. Healthy watersheds are critical for iconic species like wild salmon. Healthy watersheds also support climate adaptation as they create buffers against flooding, droughts and wildfires. This is part of the impetus for creating a Watershed Security Strategy and Fund. This year's budget has set aside \$30M to continue to build on the work begun last year, with the goal of improving and safeguarding BC's watersheds.

The Coastal Marine Strategy is a first effort for British Columbia and seeks to work collaboratively with First Nations to safeguard coastal habitats, while still providing strong economic opportunities for coastal communities. Coastal areas and marine zones are multi-jurisdictional spaces with different orders of government and different areas of responsibility. We need to focus on some of the most immediate and pressing needs, such as climate change and we need to recognize the impacts that climate change is already having on our ecosystems. Advancing reconciliation with First Nations is a cornerstone of this Coastal Marine Strategy, along with fostering resiliency in coastal communities. The Ministry has engaged with 80 First Nations and some stakeholder groups, has met with regional districts this year, and will be reaching out to the public later this summer. It will be publishing an intentions paper written in collaboration with First Nations communities later this year. Fin Donnelly, BC Parliamentary Secretary for Fisheries and Aquaculture will be the lead on that public engagement.

It is clear that herring are critically important to the marine food web, to commercial fisheries and to indigenous communities. Though the provincial government doesn't have jurisdiction over herring management, it is very committed to working with the federal government and other partners in restoring marine habitat, and the Ministry will do everything it can to restore, protect and support herring. The plan is to work collaboratively with government, industry, indigenous and non-indigenous communities to build out practices to ensure that we have healthy marine ecosystems and sustainable interconnected fisheries for generations to come.

Dr. Eleni L. Petrou* - Postdoctoral Researcher, School of Aquatic and Fisheries Science, University of Washington; *Geneticist at the Alaska Science Center, US Geological Survey

Dr. Eleni L. Petrou, Postdoctoral Researcher with the School of Aquatic and Fisheries Science, University of Washington, who is currently working as a Geneticist at the Alaska Science Center, United States Geological Survey, kindly joined us from Alaska via Zoom and gave a fascinating presentation on the temporal and spatial genetics of herring.

In the North Pacific Ocean, herring are abundant, widely distributed, and play an important role in the ecosystem. As forage fish, they feed on plankton, and then predators eat them, so they transfer energy from lower trophic levels to higher trophic levels. In doing so, they become an important link in the marine food web. Every winter and spring adult herring travel to coastal areas to spawn, thereby attracting many predators, such as marine mammals, salmon, sea birds, and even terrestrial animals such as wolves and bears. Herring are also important to human communities, as they support the livelihoods of those involved in large commercial fisheries, and they have been a traditional food source for indigenous peoples for over 10,000 years. Archeological studies of fish bones found in indigenous middens have found that herring made up approximately 20% of the diet of indigenous communities in Southern Alaska, Haida Gwaii and Western Vancouver Island, while in the Salish Sea it made up close to 80%. We can see that herring were a consistent food source over a long period of time.

Over-fishing in the Northern Pacific began with colonization and the rise of commercial fishing in the early 1900s. We began to see herring depletion as early as the 1930's. Traditional ecological knowledge held by indigenous peoples also indicates that overall herring numbers have been depleted compared to the past, and that herring spawns begin later in the year and end earlier than they used to.

It is important to note that not all herring spawn at the same time, for example, in Puget Sound spawns occur as early as January and as late as May. This diversity in spawn time is an example of biodiversity, given that the extended spawning time may mean there is a longer feeding period available to predators such as young Chinook Salmon. Dr. Petrou's research sought to investigate whether herring that spawn at different places and at different times might come from genetically distinct populations.

Dr. Petrou worked with the Washington Department of Fish and Wildlife, the Sitka Tribe of Alaska, the Haida First Nation, and the Heiltsuk First Nation to collect over 1000 herring from 23 different locations on the North West Coast, from Washington through British Columbia to Alaska. They collected samples that ranged in spawn times from January to June. The herring bone samples were stored in alcohol to preserve the DNA, which was later extracted in the lab for genetic sequencing.

The genetic samples were then clustered according to their genetic similarity and colour coded to their spawn time. Upon analysis of the Washington, British Columbia, and Alaska samples, a pattern emerged, which suggests that: a) populations with different spawn times are genetically

distinct; and b) there is a degree of geographic differentiation, whereby as the geographic isolation by distance increases, so does the genetic differentiation between the samples.

The next step was to investigate whether this diversity in spawn timing was important to the food systems of Coast Salish ancestors. With permission from the Puyallup Tribe and the Suquamish Tribe, ancient herring bone samples were taken from sediment layers 100 and 500 years old at two shell middens in Puget Sound. At one site, herring bones made up 90% of all fish bones found and indicated sustained use of herring over many centuries. Analysis of the ancient herring DNA suggests that Coast Salish ancestors depended on diverse herring populations, and made consistent use of winter and early spring spawners.

Dr. Petrou also investigated the role of herring biodiversity in the context of Chinook salmon diets. Young Chinook salmon tend to prey heavily on Pacific herring to sustain growth. When herring are abundant relative to salmon, there are increased growth opportunities for juvenile salmon. Spawn timing diversity was found to increase the diversity of prey fish size, thus prolonging foraging opportunities for predators. In other words, a wide distribution of prey sizes means there are more food options for Chinook of varying sizes and at different life stages.

Herring found in the gut contents of 256 adult and juvenile salmon were analyzed via DNA sequencing, which indicated that 96-99% of herring eaten by adult Chinook came from the Mar/Apr herring spawn group; while 18% of the herring eaten by juvenile salmon in the summer came from the January/February spawn, suggesting that this early spawn group may be an important food source for the development of juvenile salmon specifically.

Interestingly, these samples were taken from the San Juan Islands area, but there is no herring spawning activity documented in the San Juan Islands. This suggests that juvenile herring that spawn elsewhere may move in and feed the juvenile Chinook in that area. It's possible that the San Juan Islands area serves as an important nursery habitat for both fish types.

If we compare relative gut content results to the overall biomass of each herring spawning group the results are not that surprising. The contribution of each spawning group to Chinook diets reflects their relative proportions as far as estimated biomass in the Salish Sea. Overall biomass has declined only slightly since the 1970s, however, the May/June spawn group's biomass has declined drastically. The reduction in herring biomass diversity may have had significant effects on predator fish.

Outside of spawning season, distribution of herring has not been adequately studied. Some questions for future research: a) What are stock-specific distribution and movement patterns of herring throughout the year? and b) Is there local retention of herring larvae near spawning grounds, and might those sites also function as nursery grounds?

As noted, forage fish are very important to the marine food web, and the existence of diverse herring populations supports marine predators and human communities, as such, their biological diversity is well worth conserving.

Grant Scott - Hornby Island Trustee and Conservancy Hornby Island Chair

Grant Scott is a Hornby Island Trustee, Chair of Conservancy Hornby Island (CHI), and a retired commercial fisher. He has worked tirelessly for herring conservation as a committed member of the *HELIT TFE SLON,ET* (*Let the Herring Live*) conference and campaign; an organizer for Hornby Island's six years of CHI *Herring Fest* events and the CHI *Marine Conservation Atlas*; and a campaigner for a petition signed by over 200,000 people that call for a moratorium on the Pacific herring roe fishery. We are happy that Grant was able to join us at the EcoForum this year to share his wealth of experience, knowledge, and passion.

To date, Lambert Channel has the most consistent spawn out of any area from Mexico to Alaska. He explained that the concentration of krill in the deeper waters serve to attract migratory and resident herring, while the extensive eelgrass beds that line the shallow waters of Lambert Channel between Denman and Hornby Islands provide ideal spawning grounds.

Herring has been of critical importance to coastal First Nations who have long respected this remarkable fish and used it for food and cultural practices for thousands of years. Archeological studies have shown the historic abundance of herring bones found in First Nations middens, with especially remarkable concentrations of herring bones in middens around the south end of Vancouver Island.

Hereditary Chief of Tsawout of the WSANEC Nation, Chief Eric Pelkey, presents a gripping talk on the state of the herring population in the southern Strait of Georgia. An excerpt of the video was played at the EcoForum, but the full video can be viewed at the link below.

<https://www.youtube.com/watch?v=M9LNTQq27SM>

Herring have long provided critical sustenance for humans, land and marine wildlife. The energy flow of vital ocean nutrients moves upwards through the food web from plankton to forage fish, to predators, to humans. Every year in March the people of Hornby Island witness this spectacle that brings sea lions, harbour seals, salmon, orcas, sea birds and the fishing fleet to feast on the abundance of herring.

There are two kinds of herring stock: migratory and non-migratory or resident stocks. A 1986 Georgia Strait and Johnstone Strait Herring Bait Fishery questionnaire indicated that there were 91 migratory stocks and 170 non-migratory or resident stocks.³ DFO's 2008 study by Beacham, Schweigert et al indicated that herring from the east side of the Strait of Georgia are predominantly non-migratory. Since 1990 many Strait of Georgia resident herring stocks have unfortunately become extinct. The difficulty here is that very little is known about the Strait of Georgia resident herring stocks, so we have to be careful when talking about "precautionary" or "ecosystem based" management plans. How can we develop management plans for stocks that we don't fully understand?

³ *The Georgia and Johnstone Straits Herring Bait Fishery in 1990: Results of a Questionnaire Survey.* J.F. Schweigert, DFO Nanaimo. M. Linekin, University of Victoria.

If we look at this year's spawn in March 2022 there are many reasons to be concerned. The spawn around Hornby Island started on March 4th, but there was nowhere near the level of spawn we had in previous years. We were optimistic when we heard that Minister Joyce Murray reduced the herring fishery quota by 50% from 15,600 tons to 7,800 tons, thinking this could give herring a chance to recover a little bit. However, fishers struggled to meet this reduced quota this year. The seiners caught 813 tons and the gillnetters caught 3407 tons. Fishers were unable to catch their allowable quota of 7,800 tons; the fish simply weren't there. This year, we saw no spawn in Baynes Sound, and no spawn on the usually heavily spawned east coast of Denman Island. There was little to no spawn from Bowser to Victoria. There was some spawn in Squamish, Coal Harbour, and on the east coast of the Strait of Georgia. Of the five major Canadian Pacific herring fisheries, four have collapsed due to over-fishing, changing ocean conditions, and complexities related to climate change. Is the Strait of Georgia herring fishery next?

More research needs to be done on resident herring stocks in the Strait of Georgia. Studies show that Puget Sound herring have distinct and varying genetic characteristics. Is the same true for our local resident herring stocks? How do resident stocks contribute to the local food web compared to migratory stocks? What are the best ways to manage and replenish these depleting stocks? If we want to create precautionary or ecosystem-based management plans, we need to fully understand the predator uses of Strait of Georgia herring. Fisheries and Oceans Canada is working with the Nuu-Chah-Nulth Tribal Council to better understand predator use of west coast herring stocks. We look forward to learning more from that new research, and how it might be relevant to our area.

What can be done to help herring stocks recover? We need to place a moratorium on the herring roe and food and bait fisheries until stocks have had a chance to rebuild. We need to buy back and retire commercial herring fishing licences. We need to assist First Nations in rebuilding stocks and herring habitat in their territories. We need to support coastal communities and support fishers with retraining. We need to fund independent science to better understand herring as a keystone species. Finally, we need to change the high-volume low-value herring industry into a high-value low-volume fishery by supporting small scale industries that will use herring as human food, including First Nations roe-on-branch traditional harvesting.

Denise Smith - *Kwyem tomolx (Speaks for the People)*, Director of Lands and Resources for the Tla'amin Nation

It was a great honour to have Denise Smith join the EcoForum for a presentation and discussion about herring and its importance to the Tla'amin Nation. Denise was the first woman to become Chief in her community, and when she first rose to the position, the Tla'amin Elders gave her the name *Kwyem Tomolx* which means "Speaks for the People." She has served her community for over thirty years in a number of different roles on Council and she was one of the negotiators for the 2016 Tla'amin Final Agreement. Denise joined us at this EcoForum in her current capacity as Tla'amin Director of Lands and Resources. Denise shared the following vision statement with us:

The Lands and Resources Housepost recognizes there is a spiritual connection between our Kluth-Ky (Elders) that have gone before us and our Chi Chuys (Children) yet unborn. We have a responsibility to uphold our Taow (Teachings) and are committed to working with leadership and citizens to sustain our territory and resources responsibly to pass down to our future generations.

The Tla'amin Nation has used and occupied these lands and resources since time immemorial. Recent archaeological studies have verified that they have hunted, fished, gathered, and farmed in their territory for at least 10,000 years.

The Tla'amin Final Agreement came into effect in April 2016 after two decades of negotiations and is one of only three treaties that have been finalized between First Nations, BC Provincial and Federal Governments. As per the Final Agreement, the boundaries of Tla'amin fishing territories extend from the southern edge of Cortes Island to the southern tip of Lasqueti Island and includes most of the coastal areas between that stretch of Vancouver Island and the Mainland. Even though the map shows the fishing area extending from coast to coast, out of respect for other First Nations that share these marine areas, the Tla'amin Nation has chosen to draw a vertical dividing line between Vancouver Island and the Mainland, and keeps Tla'amin fisheries to the side closest to their community.

The Tla'amin community does not allow commercial herring fisheries in nearby waters and they may expand that prohibition to crab and prawn harvesting as well. They have found that recreational licenses can also lead to over-harvesting, so they are looking to reduce those activities as well. Even though there are clearly issues with illegal fishing and overharvesting, including from tourists, there are only two DFO officers that patrol the entire area. Enforcement has been insufficient, so the Tla'amin Nation started a fully self-funded Guardian Watchmen program. It was begun out of desperation, given that more enforcement and monitoring were needed. The Guardian Watchmen patrol with DFO and they assist BC Parks with archaeological monitoring. Despite having applied for funding four years in a row, they have yet to receive any funding from government. If the government is serious about co-management and collaboration with First Nations, they need to start funding Guardian Watchmen programs.

As part of their treaty rights, the Tla'amin Nation needs to ensure their community can get the allocations they were promised during negotiations. Currently the Nation is at the mercy of Provincial or Federal Government decision-making. Government bodies will usually make a

decision, and then attempt to engage with First Nations by sending out a document and giving a 30-day deadline to respond. They then proceed as planned, without true consultation or collaboration. It is important to understand that most Nations do not have experts on staff ready to respond to lengthy consultation documents on short notice. The burden is on First Nations to hire experts to be able to assess those consultation documents on a tight timeline. This leaves Nations with few options except to take the government to court for breaching treaty rights. It is important to remember, that despite the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) and all the good intentions some might have, consultation efforts will fall flat if First Nations don't have the technical capacity to engage in technical, forestry, archaeological, fisheries, or natural resource consultations.

Denise remembers the last large herring spawn in the Tla'amin community which occurred when she was around 8 years old. Traditional Tla'amin and other First Nations fish and herring traps as described in the videos entitled "*tišosəm - Tla'amin Community*" and "*wuxoθen - Fish Traps*" were sophisticated, enigmatic, spanned entire coastlines, and worked for various species of fish and crustaceans. The Tla'amin Nation set out herring boughs this year, but the crew was unsuccessful. They were grateful to receive herring from the test fishing vessels and to have received herring spawn-on-bough from the K'omoks First Nation.

The Tla'amin Nation is working on an assessment of food security needs and herring will be an important part of the community's food security strategies going forward. The community uses what is called the "*Thirteen Moons Harvest Calendar*" to document when they would normally be out on the land or water harvesting different resources, but they have noticed that harvest times and quantities are being affected by climate change, as well as industrial and residential development. They also face challenges related to the legacy of residential schools, which resulted in community members forgetting traditional food or place names; unlearning fishing, harvesting and cooking methods; and losing their connection to the land and marine resources. Thankfully younger generations have taken up the charge, wanting to learn, reviving traditions, and becoming leaders. Despite all these challenges, it's an exciting time to be self-governing.

The Tla'amin Nation works collaboratively with many nearby First Nations. It is Denise's dream that in the Salish Sea each and every community will find ways to flourish and meet their respective needs.

Tla'amin Nation YouTube Channel:

<https://www.youtube.com/c/SliammonFirstNationPowellRiver>

Tla'amin "*wuxoθen - Fish Traps*" video:

<https://www.youtube.com/watch?v=JWw9ZduMgb8>

Tla'amin "*tišosəm - Tla'amin Community*" video:

<https://www.youtube.com/watch?v=X6aNgeD4ldc>

Discussion Periods

Question and Answer Period with Dr. Eleni Petrou

Participants had a few questions about the herring stock sampling process, and about the potential to obtain genetic materials from herring scales. Dr. Petrou explained that the herring sampling scheme was based on sampling kits sent out to First Nations communities and researchers that formed part of informal research networks. The research was based on the samples that were sent back to them through this informal network. As a result, there are gaps in the research, as they were unable to obtain genetic samples from the Northern Strait of Georgia and the West Coast of Vancouver Island. The genetic material obtained in the study came from the marrow inside herring bones. This DNA is easier to obtain because with bones, the outside surface can be decontaminated without ruining the marrow. The problem with fish scales is that the DNA is preserved in mucous, and when the scales are decontaminated using bleach, the mucous is destroyed. However, there have been some improvements in genetic sequencing technologies since this study was carried out. It would be interesting to do a small pilot study to see if it's possible to obtain usable genetic material from fish scales using new lab methods.

A member of the K'omoks Guardian Watchmen related that a herring spawn used to occur in the Comox Estuary during the month of September. Although that spawn is no longer active, there would likely be archeological evidence of the existence of this ghost population of herring. This would be fascinating to study using genetic sequencing of ancient herring bones.

Based on participant questions, Dr. Petrou shared a few remarks on the genetic distinctness of various herring spawns. A study was done in Sitka Sound in Alaska looking into the genetic differences in waves of herring spawns over a 30-day period. No significant DNA differences were detected in waves of herring spawns that occurred in such temporal and geographical proximity to one another. The stability of the genetic makeup of different geographical herring groups over long periods of 20 years or more, suggests that the fish are coming back to the same location consistently year after year. This raises the question of whether herring are "imprinting."

There were questions about overall herring biomass and whether it has *truly* been consistent since the 1970s. Dr. Petrou responded that localized herring biomass has fluctuated; however, when the entire biomass throughout the entire Pacific herring range is calculated, it has stayed consistent as a whole. The May/June spawning groups have seen an overall decline, while the March/April spawning groups have seen a relative increase. There are no strong hypotheses on why this is so, but localized pollution, increased industrial activities, or sea temperature trends are possible factors.

Question and Answer Period with Grant Scott

Regarding the amazing spectacle of the herring spawn, and its potential economic value in terms of tourism and recreational industries, Grant responded that commercial herring fishing brings in approximately \$30M per year, whereas sports fishery and recreational activities such as whale watching are worth approximately \$100M per year.

A participant noted that the changes in herring stocks in Baynes Sound and Lambert Channel are eerily similar to what happened in other areas along the Pacific Coast, which could imply that these changes are the effects of climate change, among other factors.

To the question of whether shutting down the herring fisheries would result in an end to stock monitoring, Grant responded that as part of herring recovery programs, there could be an opportunity for First Nations to provide monitoring through Guardian Watchmen programs.

Another participant noted that there are no spawns on the Southern half of Vancouver Island, from Qualicum to Victoria to Sooke to Bamfield. While much of the fisheries science is good, approximately 25-30% of the science is commercially captured or based on fish farm industry data. He emphasized that the DFO needs to be more transparent about how much herring is caught and where it is caught, especially for special use fisheries data that has been protected by privacy provisions.

Question and Answer Period with Denise Smith

On the issue of moving away from large-scale industrial practices that contribute to global warming, and learning to manage resources in sustainable ways based on traditional methods, Denise responded that as children, their elders taught them to only take what they need, and to never take more than that. The community shared resources and looked after one another. The Thirteen Moons Calendar is what the Tla'amin Nation has used to manage land and marine food sources for many generations, but climate change impacts are concerning. They are starting to see harvest times and quantities change, and food security is now becoming a greater concern, not just for her people, but for surrounding communities. They are seeing an increase in non-indigenous people looking for traditional First Nations food sources like oysters, clams, herring and mushrooms. The COVID pandemic also demonstrated how dependent we all are on large supply chain systems. There will be more food supply chain disruptions in future, and that means we must learn to take care of ourselves at the local level with less technological dependence, and with a greater focus on sovereignty and self-sustainability. Many community members are getting older, so they are now focusing on teaching the youth to fish, hunt, and harvest.

On the question of whether it would be possible to purchase sports fishing licences directly from First Nations rather than going through the Provincial or Federal government, Denise shared that they have tried to negotiate with the Government on this issue due to their concern with overharvesting on their beaches and marine areas, particularly with respect to oysters, clams, crab and lobster. The Tla'amin Nation was pushing for a way to restrict these licences

geographically, so that licences could be cut off after a maximum was reached for that area. The Government is not only unwilling to change the system, but they also don't provide enough enforcement officers to be out there checking permits and ticketing over-harvesters. The Tla'amin Nation decided to give their Guardians and Beach Monitors uniforms and clipboards so they could monitor and keep track of permits and harvest limits. In the absence of enforcement officers, they are now pushing DFO to give the Nation the authority to issue tickets as well.

Regarding the Tla'amin Final Agreement and how it intersects with the Federal Government's goal of turning 25% of Canadian waters into marine protected areas, Denise shared that the Tla'amin Nation's sovereignty under the Agreement is only subject to conservation and public health and safety issues. The Tla'amin support the creation of archeological conservation areas and marine protected areas. Though the creation of marine conservation areas does not limit the Nation's ability to fish or harvest in those areas, the Nation always complies whenever there is a conservation concern or protective measure.

Participants asked for advice on best practices for collaborating with First Nations communities on land and marine use planning. Denise shared that working with non-profits has been much easier than working with government, and they are currently collaborating with a number of non-profits on marine and ecosystem restoration projects in the region. Working with the Provincial and Federal Governments, on the other hand, has not been easy. Governments have an obligation to consult, but they need to rethink how they go about that consultation process. If the Nation doesn't have a lot of capacity, the DFO's consultation document might end up on the desk of an overstretched Fisheries Manager or Band Councillor. Capacity is a big challenge, and timelines tend to be much too short. They often give 30 days to respond, and if the Nation can't respond by deadline, they go ahead with their plan anyway. It's a matter of understanding the pressures involved in the consultation process, and the fact that different Nations have different needs and experiences, and may even have competing interests on some issues. It would be beneficial for DFO to hire aboriginal people that can act as liaisons. Aboriginal Liaisons could give First Nations Governments a heads' up that DFO is coming and could provide more information prior to these consultation meetings. There also needs to be a change in the mentality of government officials. It doesn't help when they start negotiations from the perspective that the Government owns all the resources and that the Nation needs to negotiate to get those resources back. They literally put a price tag on every fish, which is very hard to swallow. Denise emphasized that if she knew then what she knows now, she would have walked away from their treaty negotiations. Now that the treaty negotiations are over, they have to learn to live with it and make it work.

Panel and Group Discussion

On the question of whether recent herring research has altered herring management methods in the USA, Dr. Petrou responded that herring is managed by State Governments and the approaches are not cohesive. In Washington state, there is no commercial herring fishery due to depleted stocks. In Alaska, the Sitka Tribe has tried to stop some herring fisheries through the court system. In Alaska, herring management is spatial but not temporal, and it is further complicated by the boom-and-bust cycles that forage fish seem to go through.

There was a discussion on the impact of land-based and underwater noise on herring spawns. One participant noted that herring continue to spawn in False Creek despite all the noise and activity at that location, but perhaps there is a strong impetus for that herring stock to return to this location each year. Another participant added that with other fish and marine mammal species, the sensitivity to sound appears to be specific to underwater noise, as opposed to land-based noise. That may also be the case with herring, but we don't know for sure. Another participant mentioned that in the traditional ecological knowledge from indigenous communities there are stories about elders telling the youth to be very quiet when in the water to not disturb the herring as they come to spawn. This suggests that there are experiential accounts that corroborate the idea that underwater noise has an effect on herring, but the effect of large-scale industrial or land-based noise is unknown.

Another participant noted that this year the herring spawn *appeared* to have disappeared because they were absent from the east side of Denman Island and because fishers had a reduced catch; however, there were still significant spawns occurring in the Strait of Georgia, though further north compared to the usual locations. The official stock assessment document for this year's herring fishery should be ready in September 2022. While it's true that the herring fishery was weak this year, it's not the first time that fishers have been unsuccessful. He emphasized that he was surprised to hear people say that there was no spawn in Victoria, even though this was the first year that we saw a bit of a spawn in that area, which is a good sign of potential recovery. In terms of the other side of the water, there was a decent spawn around Texada Island, but no other large spawns. We shouldn't leave this Forum with the impression that it's all doom and gloom. In terms of some of the historic data, there has been some good science done on herring, but quoting perspectives from the 1960s or 1980s is not helpful in terms of explaining our current understanding of what's happening now.

On the question of why herring stocks that collapsed decades ago are so slow to recover, there was some discussion with regards to potential factors such as climate change, ecosystem damage, and overfishing. Grant Scott responded that it seems to be a combination of overfishing and climate change effects. It is a deeply complex situation that we don't understand well enough, which is why the precautionary principle should be applied to herring fisheries management. Dr. Petrou noted a research paper on herring biomass in Haida Gwaii that looked at the stock interaction with commercial fishing. That research showed a pattern whereby a very low biomass in one year resulted in effects on recruitment in following years, often extending to

a decade-long decline in the stock. Human activities, climate change, changes to oceanic conditions will all have an effect on herring stocks.

One participant reiterated that while herring stock depletion is surely due to both natural and human effects, we can't deny that the anthropogenic effects have been hugely influential: winter fisheries and year-long bait fisheries have seriously depleted stocks. DFO shut down 60% of the fisheries, but not herring. Even with the reduced quotas, fishers were barely able to catch half their quota. There is something really wrong, even in the Baynes Sound / Lambert Channel area. It may be difficult to do, but we need to shut down some of these fisheries, and help fishers retrain in other areas to reduce the dependence on herring fisheries for employment.

Another participant raised the point that the science has been looking at changes over the last few decades, but we need to remember that if we go back further, the baselines for the herring spawns were quite different. There is a shifting baseline here that we need to keep in mind, and this shifting baseline shows us that we need to compare current conditions to the conditions described in traditional stories from First Nations communities (if we truly want to understand the longer trajectory of stock depletion over hundreds of years). If we look at stock depletion in that context, it becomes clear that the cause of the depletion has more to do with human activity, than climate change. A few participants pointed to the fact that climate change is also caused by human activity, so it's all anthropogenic anyway. We shouldn't get bogged down in trying to find one *primary* cause, instead we should focus on potential solutions.

On the question of whether any climate change impact models have been done for Pacific herring, one participant noted that since herring have been found as far south as Baja California, perhaps they could withstand warmer waters. Another participant noted that herring spawn at a time of ocean upswelling, so they may be better adapted to higher levels of ocean acidity.

However, another participant asked us to remember that climate change impacts will affect the whole ecosystem, because if warming ocean temperatures or acidification affect a few aspects more significantly (ie: a food source, an essential plant, or spawning ground), those food sources, or plants, or habitats, will affect the rest of the chain of life that is part of that ecosystem. We can't disconnect the parts from the whole. Another participant provided a good example of this, in that bull kelp distribution has shrunk dramatically in the Salish Sea in the last 20 years; and eelgrass is susceptible to shore activities and disease in warmer waters. Certain areas of Baynes Sound and Lambert Channel waters are at above 20 degrees now, based on monitoring that has been done every half hour over the last 10 years. Chrome Island Light Station monitoring shows unprecedented ocean warming trends. Another participant reminded the group of the close connection between herring spawns and the Spring phytoplankton blooms. Phytoplankton will be affected by warmer ocean conditions, thus putting herring food sources at risk.

This led to a discussion about causation and the human struggle with complexity. Trying to find the smoking gun for herring stock depletion is impossible. As humans we struggle to understand causation and we try to point a finger to one key cause, but we need to remember that these systems are incredibly complex and difficult to predict. If we accept that fact, and understand

how difficult it is to prove causation, then we need to pay even more attention to the precautionary principle when managing herring stocks. We need to remember that it is a keystone species that is an important food source for other land and marine animals that rely on them for survival.

Grant Scott pointed out that even though there are many factors that have led to the depletion of herring stocks – overfishing, changing ocean conditions, and global warming – to name a few, of those three factors, there is only one that we can take immediate action on: overfishing. We can put a moratorium on the herring fishery immediately to try to help the herring stocks recover. In an economic study carried out by CHI, they figured out that the commercial roe fishery generates 761 full-time equivalent jobs on a yearly basis. Those jobs only generate \$30M per year. The economics of this industry don't make any sense. We need to look deeper to find solutions that will take care of these fisheries workers, while conserving and protecting herring stocks.

Attendees and speakers were asked to consider what practical actions, big and small, could be taken to support herring going forward. These are some of the suggestions from the floor:

- Reduce CO2 emissions and work to stop global warming
- Protect eelgrass beds to protect herring spawning and rearing grounds
- Do regular monitoring of eelgrass beds and replant depleted areas, given that this plant recruits annually through spore production
- Regulate residential, commercial, and industrial development in spawning and rearing grounds
- Regulate seawalls and upland septic systems and liquid waste pollution to protect the foreshore from erosion and contamination
- Prohibit creosote in marine environments
- Consider sunscreen as a pollutant for the marine environment, and promote ocean-safe sunscreens as a more sustainable alternative
- Regulate anchoring and mooring in sensitive areas, like at Drew Harbour near Rebecca Spit on Quadra Island. Mid-line float moorings could be used instead. There are a number of mariner maps and phone apps that could be used to educate boaters regarding anchoring and mooring best practices in sensitive areas

As a final note, one participant shared data from recent research on the effects of ocean warming and acidification and their effect on herring, and it appears changing ocean conditions will have a significant negative effect. Putting moratoriums in effect and saving habitats, however laudable, will not mitigate the long-term trend of fish moving northward as ocean temperatures rise. Southern areas of BC will experience the greatest fish stock depletions, as fish move north in search of cooler waters. Some southern species may move north to find our relatively cooler waters, and some local species may learn to adapt to changing ocean conditions. In the years ahead, we will face unprecedented changes to our ecosystem, and we may need to look to new methodologies and approaches to protect and conserve important keystone species like herring.

Committee & Working Group Reports

Steering Committee Update – Daniel Arbour and Dorrie Woodward

The Steering Committee is currently composed of: Daniel Arbour (CVRD), Todd Boychuk (KFN), Carl Butterworth (VIU), Nico Prins (BCSGA), Dorrie Woodward (ADIMS), Chris Pearce (DFO), and David Critchley (Islands Trust).

Dorrie spoke to Chief Michael Recalma of the Qualicum First Nation, who was a member of the Steering Committee, but has been on medical leave for some time. He is still recovering from a recent kidney transplant, but he wanted others to know that he is doing well and he expects to be well enough to attend the upcoming EcoForum in November 2022.

Daniel and Dorrie reminded members that the EcoForum is not an organization in and of itself, and that it has no regulatory authority over Baynes Sound and Lambert Channel. There are currently twenty-nine different marine plans in this region that represent competing interests from diverse stakeholders. As such, the Steering Committee sees itself as having a catalyst role that can help bring people together to discuss the hard questions, share diverse perspectives, and envision a more united path forward. To begin with, the Steering Committee would like to see marine plans that are coherent, area-based, and built upon an ecological foundation, but there is much more work to do. The hope for the future of Baynes Sound and Lambert Channel is that we can find a path towards a more integrated management of local marine ecosystems.

Updates and Announcements

Area Based Aquaculture Management – Candace Newman and Elysha Gordon

Elysha Gordon, of Fisheries and Oceans, is the Senior Aquaculture Management Coordinator for the Area Based Aquaculture Management Team. Candace Newman is the Archeology and Referrals Coordinator for the K'omoks First Nation, who is filling in for Todd Boychuk, the Director of Intergovernmental Relations for the K'omoks First Nation, who sends his regrets.

In 2018 the previous Minister of Fisheries announced that BC would be taking a new approach with Area Based Aquaculture Management (ABAM). An area-based management approach was seen as key for distinct geographical areas that have unique jurisdictional, environmental, social, cultural, and economic values. In 2021, a \$3M budget was set aside for an Area Based Aquaculture Management Pilot Project and requests for expressions of interest were sent out to coastal First Nations. We are happy to announce that the K'omoks First Nation was the successful applicant for this two-year pilot project, even though the official announcement won't come out until the Fall. The pilot project is still in the beginning phases, but in the coming years the hope is to build a regional committee, and some area committees, and then a variety of groups will be brought to the table to discuss options for good area-based management.

Fisheries and Oceans and the K'omoks First Nation would like to thank the EcoForum Steering Committee and EcoForum participants who assisted in preparing the successful ABAM Pilot Project Application submitted by the K'omoks First Nation in December 2021. Special thanks also go to Daniel Arbour and Dorrie Woodward who reached out to Fisheries and Oceans early last year and really pushed to have Baynes Sound and Lambert Channel considered as a potential pilot area.

Spring 2022 Baynes Sound / Lambert Channel Ecosystem Forum Participants



Appendix A: Participants List

Facilitator, Alderhill Planning Inc.	Felicia Fischer
Comox Valley Regional District (CVRD)	Daniel Arbour
Regional District of Nanaimo (RDN)	Stuart McLean
Islands Trust (IT) Denman Island	David Critchley, Laura Busheikin
Islands Trust (IT) Hornby Island	Grant Scott, Alex Allen
Islands Trust Ecosystem Protection Specialist	Kathryn Martell
K'omoks First Nation (KFN)	Candace Newman
Tla'amin Nation	Denise Smith
BC Ministry of Land, Water and Resource Stewardship	Hon. Minister Josie Osborne, Deputy Minister James Mack, Kevin Romanin
Fisheries & Oceans Canada	Chris Pearce, Bryan Rusch, Amber Neuman, Elysha Gordon, Jennifer Perry, Jaclyn Cleary, Doug Hay
BC Shellfish Growers Assn (BCSGA)	Nico Prins, Malcolm Cowan
Assn for Denman Island Marine Stewards (ADIMS)	Dorrie Woodward, Theresa Clinton, Melanie Hewson
Conservancy Hornby Island	Grant Scott, Cath Gray, Joanne Wyvill, Rebecca Benjamin-Carey
Project Watershed	Bill Heath, Caitlin Pierzchalski
Univ. of Washington and Alaska Science Center, USGS	Dr. Eleni Petrou
Pacific Salmon Foundation	Nicole Christiansen
Independent Grower and Alternative Practices Cttee	Doug Wright
Victoria Herring Enhancement Project	Jim Shortreed
UBC Natural Resource Management, Herring Researcher	David Ellis
Independent Herring Fisheries Scientist	Dr. John D. Neilson
Independent Biologist	Jenny Balke
UVIC, Juanes Lab, MSc Student specializing in herring	Jessica Qualley
Island Marine Aquatic Working Group, Biologist	Nicole Frederickson

