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Proposed Research: Skeena Fish Trap Project
November 15th, 2023

1. Overview:

The Skeena River supports large-scale Canadian and U.S. commercial, recreational, and First Nation salmon fisheries. However, wild salmonid population declines from bycatch and other factors have constrained fisheries and highlighted the need for alternative commercial and test gears to minimize impacts to threatened stocks (Walters et al. 2008). Use of selective harvest techniques, such as fish traps (Figure 1), can help minimize mortality to threatened salmonids and increase productivity of non-target wild populations (Tuohy et al. 2019, 2020, 2023).

Lax Kw'alaams Business Development LP (Lax Kw'alaams BDL) proposes to build a fish trap on the Lower Skeena River in collaboration with Wild Fish Conservancy (WFC) and Skeena Fisheries Commission (SFC). The goal of the Skeena River Fish Trap Project is to evaluate the effectiveness of fish trap technology in the lower Skeena River as a method to selectively harvest salmon, while limiting bycatch mortality and providing important research opportunities. The proposed study has three major objectives:

1) Design, construct, and operate a modified fish trap in the lower Skeena River.
2) Conduct research studies to evaluate the survival of salmon and steelhead captured and released from the Lower Skeena River fish trap to determine the feasibility of using fish traps to harvest target species selectively while protecting threatened salmonid species from bycatch impacts. Methods to achieve this objective include a) assessment of immediate survival and b) estimation of salmonid post-release survival using 48-hour holding studies and radio telemetry.
3) Evaluate in-season Skeena salmonid abundance, run-timing, and stock-composition relative to the existing Tyee Test Fishery. Improvements in the precision and accuracy of run timing, stock composition, and abundance estimates are essential to advancing in-season adaptive management, maximizing net harvestable production, and maximizing harvestable production while ensuing sustainability of the stocks for future generations.

By achieving these three objectives, this project will advance the development of stock-selective harvest tools to reduce bycatch mortality of non-target salmon stocks and species. Fish trap technology has considerable potential to help protect and restore wild BC salmon stocks while providing sustainable salmon harvest and economic opportunities in BC fisheries. Given the low bycatch mortality and injury rate from contemporary fish trap technology, it is an ideal opportunity to support watershed-wide research aimed at advancing our understanding of wild and enhanced stocks.

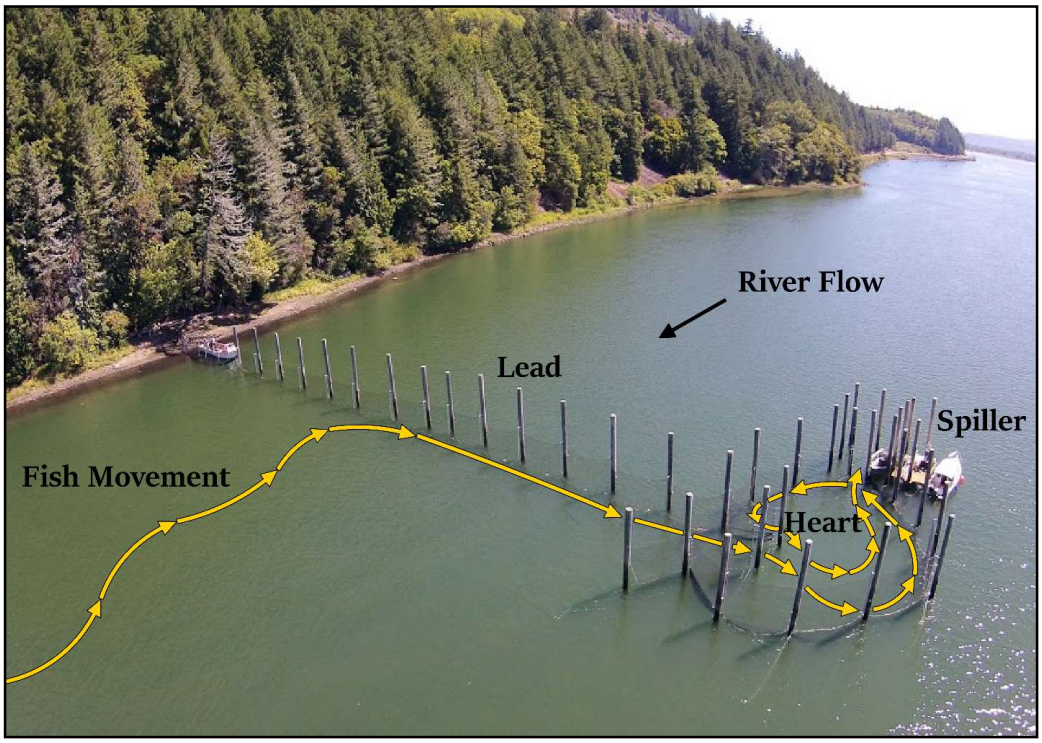

Figure 1. Example single pot fish trap. Commercial fish trap tested in the Columbia River for selective harvest and research (Tuohy et al. 2019).

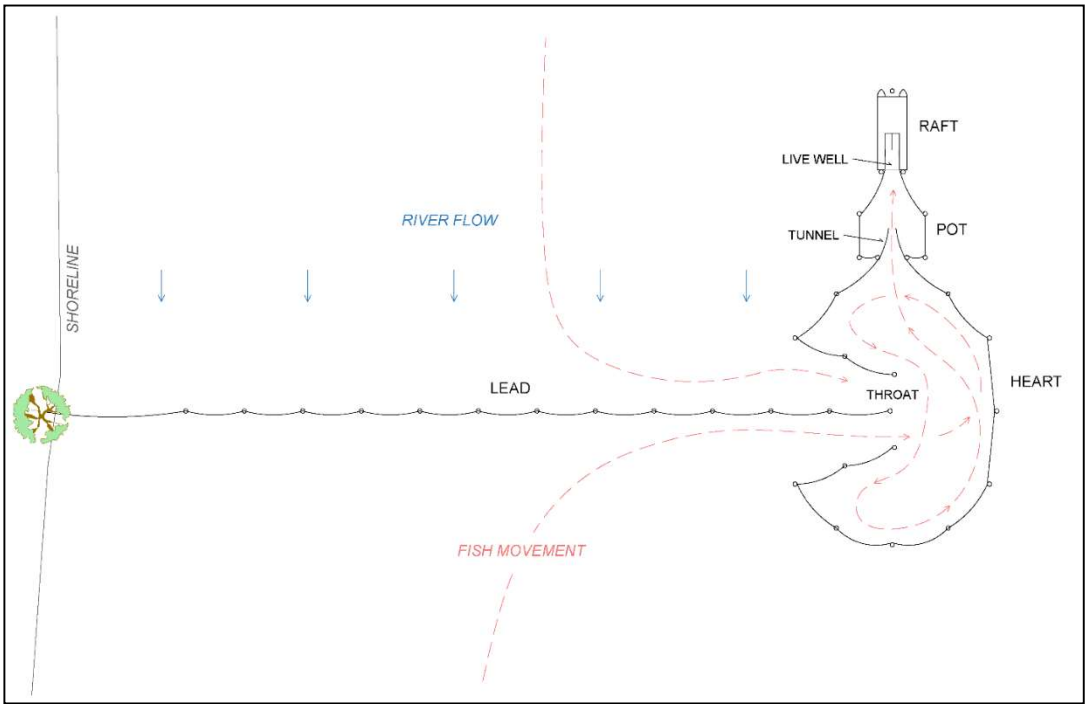

Figure 2. Design of a generalized single pot fish trap similar to the final proposed design on the Skeena River within the Granulite Point region.

2. Fish Trap Description:

Salmon traps or “pound nets” are a form of fixed gear, meaning that the tool remains deployed in one place to passively capture fishes. The fish trap is constructed using an arrangement of fiber netting supported by a series of pilings. Traps passively funnel returning adult salmonids from the “lead” (a fine-meshed wall positioned perpendicular to shore) through a maze of mesh compartments in which fish rarely escape (Figure 1 and 2) (Cobb 1930). Captured salmonids instinctively move against the current into progressively smaller compartments of a fish trap (“heart,” “pot,” and “live well,” respectively) (Cobb 1930; Tuohy et al. 2019). The final compartment has dimensions appropriate for operators to sort the catch for harvest or passive release with little to no air exposure and handling. Salmonids remain free-swimming within a fish trap and selected mesh dimensions minimize or prevent entanglement altogether (Tuohy et al. 2019).

3. Proposed Locations:

In 2019, Lax Kw’alaams BDL conducted a feasibility study to select suitable sites for a fish trap on the lower Skeena River (WFC 2019). Potential site locations were evaluated using 10 criteria including physical, biological, and geopolitical constraints. A site at Port Essington was initially selected for permitting and consultation activities were conducted from 2020 – 2022. This location was determined to be less preferred due to concerns raised during consultations with Skeena River First Nations regarding land access, safety, accessibility, and potential impacts to marine mammal populations in this region. As an accommodation to these concerns, Lax Kw’alaams BDL initiated further site assessments and selected two potential site locations further upstream in the Granulite Point area (Figure 3).

A second feasibility study to select alternative sites within the Granulite Point region was conducted in August 2023 (WFC 2023). The Granulite Point region is located 1.5km – 3km upstream of the Kwinitsa River confluence and public boat launch. The results of these assessments led to two locations within a 2km area being selected as potential sites for the Skeena River Fish Trap – A) Orde Point and B) Granulite Point (Figure 3). Both locations are undergoing permitting and consultation simultaneously. This will allow final site selection to occur after consultation with Skeena River First Nations and additional assessments in the winter and spring to collect data on ice-flow and spring freshet conditions. The project will be located at one of the two potential locations, with a dock constructed in the Orde Slough for boat mooring during operations (Figure 3). The following section provides further details for both proposed site locations:

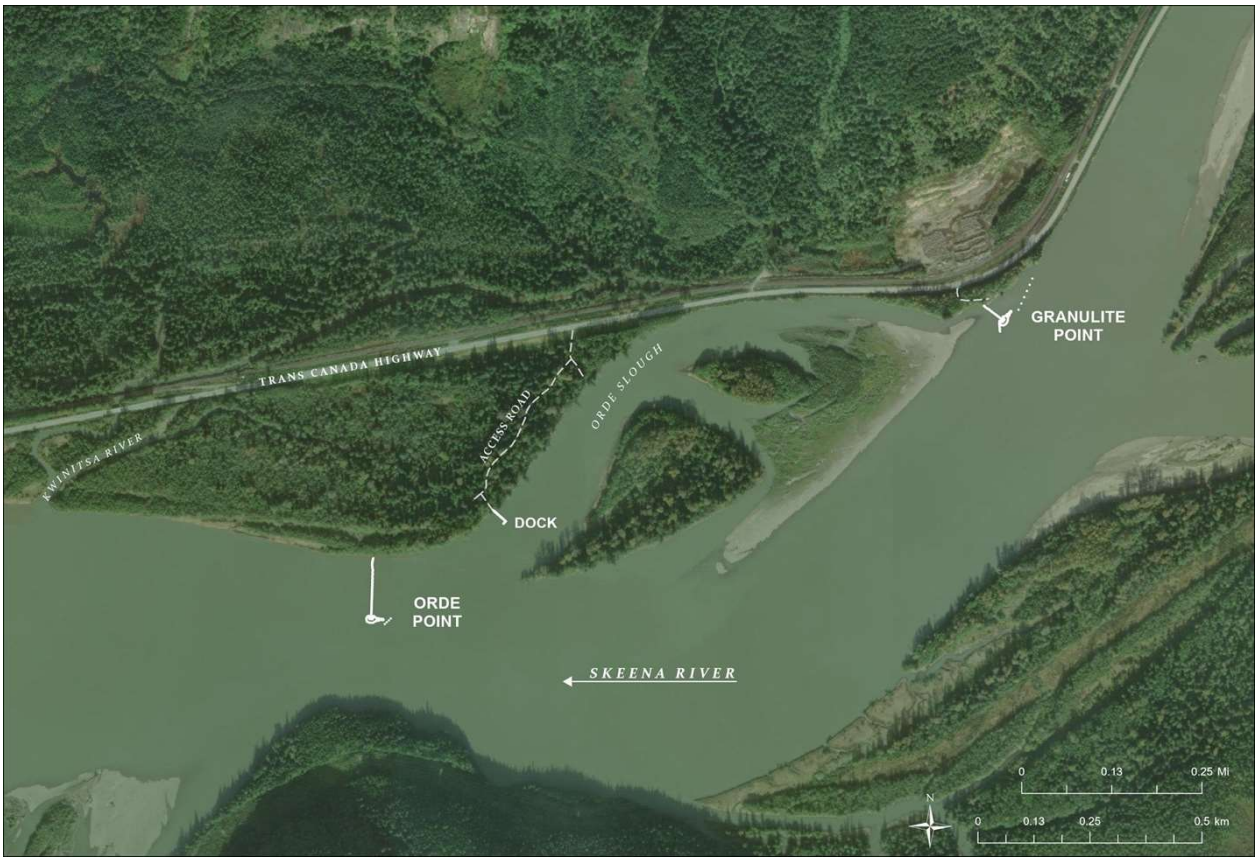

Figure 3. Map of Granulite Point region with two proposed locations at A) Orde Point and B) Granulite Point.

Option A) Orde Point

Orde Point (54.22048, -129.55401) was selected as the primary location for the Skeena River Fish Trap based on accessibility, protection, and potential success at capturing target salmon species such as sockeye (WFC 2023). A large static vegetated gravel bar upstream provides protection from strong river velocities, in-season large woody debris and potential ice-flow. The trap will be constructed entirely within the foreshore environment with no structures on land. Land adjacent to the proposed trap location is private property (parcel # 014-991-756). A trap at this location will be accessed from the water by jetboat from the Kwinitsa Boat Launch. Permission to access the river through private property has been granted by landowners while a long-term solution (purchase or easement) is negotiated with private property owners. If permanent land access is granted a small floating dock will be constructed adjacent to the proposed trap location in Orde Slough.

The Orde Point location will consist of a “lead” fiber net spanning up to 448 feet (3 1/8" Stretch #21 Knotted Black Nylon) from the shore to obtain a final depth of 12 feet at low water (zero tide). A total of 51 steel pilings are proposed at the Orde Point location, including the floating dock in the Orde Slough. The lead will consist of approximately 19 steel pilings measuring 12 – 16" in diameter and will be placed 30 to 14 feet apart, with distance between pilings decreasing closer to the heart. Pilings will be driven into the substrate to a minimum depth of 20 feet. The configuration of these pilings will be a straight line from shore, and they will remain at the site year-round. The “heart” is an oval structure that will consist of 14 steel pilings (12- 16" diameter). After swimming into the heart, captured salmonids instinctively move against the current into progressively smaller compartments – the pot (9 steel pilings, 12-16 diameter) and the “live well”. The “heart” and “pot” will be surrounded by fiber netting (2 1/2" Stretch #21 Knotted Black Nylon). The aluminum framed “live-well” (10 x 4 x 4 feet deep) will be wrapped with fiber netting (1" Stretch #21 Knotted Black Nylon) and will be set in a floating dock (22’ by 9’) composed of untreated lumber. An aluminum gate in the “live-well” will be opened to allow fish to passively swim out of the trap or be selected for sampling. An additional 4 steel pilings 24 – 28 inches in diameter will be installed above the “trap” to act as an ice breaker to protect the heart of the trap during periods of ice movement in the river. The floating dock located in the Orde Slough will consist of 5 steel piles (12 – 16" in diameter) that will anchor a seasonally deployed floating dock. The dimensions of the floating dock are anticipated to be 120 feet long with a 30-foot wing extending downriver. Additional details regarding project components can be found in the Construction Environmental Management Plan (CEMP).

Option B) Granulite Point

Granulite Point (54.2265598, -129.532498) was selected as the alternative location for the Skeena River Fish Trap based on the accessibility and potential success at capturing target salmon species such as sockeye (WFC 2023). This site is protected from the rocky bed-rock point upstream, however high river velocity results in a shorter fish trap. There is also a higher risk posed by debris, ice, and strong velocities at this location. The trap will be constructed entirely within the foreshore environment with no structures on land. A trap at this location will be accessed from the water by jetboat from the Kwinitsa Boat Launch and by land through the adjacent private property owned by Lax Kw’alaams BDL private property (parcel # 015-274-501).

The Granulite Point location will consist of a “lead” fiber net spanning up to 205 feet (3 1/8" Stretch #21 Knotted Black Nylon) from the shore to obtain a final depth of 8 feet at low water (zero tide). A total of 46 steel pilings are proposed at the Granulite Point location, including the floating dock in the Orde Slough. The lead will consist of approximately 12 steel pilings measuring 12 – 16" in diameter and will be placed 20 to 14 feet apart, with distance between pilings decreasing closer to the heart. Pilings will be driven into the substrate to a minimum depth of 20 feet. The configuration of these

pilings will be a straight line from shore, and they will remain at the site year-round. The "heart" is an oval structure that will consist of 14 steel pilings (12- 16" diameter). After swimming into the heart, captured salmonids instinctively move against the current into progressively smaller compartments – the pot (9 steel pilings, 12-16 diameter) and the "live well". The "heart" and "pot" will be surrounded by fiber netting (2 1/2" Stretch #21 Knotted Black Nylon). The aluminum framed "live-well" (10 x 4 x 4 feet deep) will be wrapped with fiber netting (1" Stretch #21 Knotted Black Nylon) and will be set in a floating dock (22' by 9') composed of untreated lumber. An aluminum gate in the "live-well" will be opened to allow fish to passively swim out of the trap or be selected for sampling. An additional 6 steel pilings 24 – 28 inches in diameter will be installed above the "trap" to act as an ice breaker to protect the heart of the trap during periods of ice movement in the river. The floating dock located in the Orde Slough will consist of 5 steel piles (12 – 16" in diameter) that will anchor a seasonally deployed floating dock The dimensions of the floating dock are anticipated to be 120 feet long with a 30-foot wing extending downriver. Additional details regarding project components can be found in the Construction Environmental Management Plan (CEMP).

4. Construction Activities:

Pile Driving (May – June 2024)

Pile driving is scheduled to commence in spring 2024 and is anticipated to be completed within 5 to 10 days during peak spring flows during a 6-week period in May and June. Pile driving must be conducted outside the DFO window of least risk because the highest possible flows are required for barge and equipment accessibility. All possible mitigation measures will be taken to minimize potential risks of fish and marine mammal harm. Planned mitigation measures are outlined in the Construction Environmental Management Plan (CEMP) and updates to the CEMP can be made as required during the consultation process. Major mitigation measures are to use a vibratory hammer (when possible), create exclusion zones to protect marine mammals, adhering to threshold noise limits, monitoring of marine mammals and acoustic monitoring. If work is stopped due to elevated underwater noise levels, additional measures to reduce the sound pressure waves such as bubble curtains or installing hydro-sound dampers will be implemented before work is resumed. Although no construction will occur on land, this project will follow best management practices (BMPs) during site access and working in adjacent areas. The CEMP includes procedures regarding spill kits, wildlife management, waste management and archaeological resources. Refer the CEMP for more specific details on mitigation measures and BMPs.

The trap will involve installation of up to 51 steel pilings with the number of pilings determined by the final location selection (Orde Point or Granulite Point). Pile driving will be completed using a floating spud barge with hydraulic deck winches and either a Manitowoc Crane or a Link-Belt Crane. To the extent practical, a vibratory pile driver rather than an impact hammer will be used (e.g., installing piles initially using vibratory methods, with an impact hammer only employed for the final embedment into till and bedrock). A work boat and small tug will accompany the spud barge. Pilings will be

driven to a minimum of 20 ft. into the substrate and will maintain approximately 6 ft. of "freeboard" (pile above water) during 12 ft. high tides. All pile diameters will be 12-16 inches in diameter, except for ice guard piles which will be 24-28 inches in diameter. Minor changes in stream bed bathymetry may occur in the direct vicinity of pile location with the installation of steel pilings varying in diameter from 12 – 28 inches.

Seasonal Deployment of Trap Components (March – August 2024)

Most of the trap construction (net building and fabrication of trap components) will occur on-land away from the trap location from March – July 2024. During July and August 2024, minimal trap assembly activities will occur directly at the proposed location for a period of 2 - 4 weeks. Netting, dock, and live well will be installed within one week of anticipated fishing and will remain in position until the conclusion of the fishing season. Nets are hung on pilings and trap components attached and anchored to pilings with no major works to the stream or streambed occurring during this time. Nets, floating docks, and trap components will be installed for trap operations and removed after salmon season to be stored at on-land storage in Prince Rupert. Although no construction will occur on land, this project will follow best management practices (BMPs) during site access and working in adjacent areas. The CEMP includes procedures regarding spill kits, wildlife management, waste management and archaeological resources. Refer the CEMP for more specific details on mitigation measures and BMPs.

Operations (2024 – 2025)

Once constructed the fish trap will be monitored and operated daily for a 6-week period with the anticipated season end date of October 31, 2024. Fish Collection Permits from DFO and FLNRORD will be obtained prior to operations. All fishing conducted during 2024 and 2025 will be scientific research only. No fish harvest (traditional FSC harvest or otherwise) may occur at the trap location without additional permitting and consultation with DFO and Skeena River Fish Nations.

The goal of operations in 2024 and 2025 is to evaluate the effectiveness at catching salmon and steelhead migrating through the lower Skeena River while monitoring post-release condition and survival. To do so, relative abundance of the different salmonid species and salmon stocks (determined via genetic samples and GSI analysis) captured at the fish trap will be compared to catches at the Tyee Test Fishery. Results will determine if the fish trap is sampling a mixed stock of salmon and if abundance patterns are tracking those currently used to determine in-season salmon estimates.

When the fish trap is operational, the salmon migrating upstream to natal spawning ground will encounter the lead net perpendicular to shore and swim along it and into the heart of the trap. Once in the heart, if not selected for sampling, all fish will be able to swim out of the trap. Any obstruction from trap nets will occur only during the fishing season (June – October) and nets will be removed from the water during winter and spring months. During hours of non-fishing or when the trap is unmanned, nets to the heart of the trap remain raised to allow all fish to pass unconstrainted by the fish trap. There is the potential for some non-target, species such as flat fish, to be entangled in

the net components. However, the WFC has documented extremely minimal harm or entanglement of non-target species in similar fish trap technology. During operations, the trap will be monitored constantly to assess for marine mammal interactions and all nets checked daily to document any net entanglements or non-target bycatch. Given that the success of fish trap technology to limit by-catch mortality and injury is the objective of this proposed work, mitigating and documenting this impact is of high priority to the project. A field crew will be present at or near the fish trap while it is operational to ensure it functions properly and to act as a deterrent to possible pinniped predation.

Future Operations (2026 – onwards)

Once the fish trap is operating successfully, future fishing and research directions will be determined by the success of the project along with, input from collaborators and stakeholders. Harvest of food fish for Lax Kw'alaams FSC quotas and the development of commercial fishing operations will require significant permitting and consultation with DFO and Skeena River First Nations.

A fish trap at the mouth of the Skeena River, provides a semi-permanent structure to sample watershed-wide fish populations and the foundation to develop collaborative research initiatives with upriver First Nations and academia. Future research directions are vast and will need to be developed overtime. However, initial planning is underway to use the trap to increase understanding of run size and timing of steelhead, Chinook and chum, Skeena River stocks which are currently understudied. The trap will also provide a suitable method to utilize advancing genetic techniques, such as Nanopores, aimed at developing rapid stock assessment, which would take the concept of selective fishing to the next level – harvesting enhanced salmon stocks while protecting threatened stocks of the same salmon species.

5. Project Timeline

Table 1. Proposed timeline of major events during the construction and operations timeline for the Skeena River Fish Trap Project.

Key Project Activities	Date
Permits Submitted	November 15, 2023
Skeena River First Nation Consultation Process	November 15, 2023 – May 15 - 2024
Pile Driving	May 15 – June 30, 2024
On-land construction Activities	March 15 – July 15, 2024
In-stream trap assembly	July 15 – August 15, 2024,
Fish Trap testing	August 15 – October 31, 2024
48-hour holding study	September 15 – October 31, 2024
Trap decommission and on-land storage (removal of nets, floating docks)	October 31, 2024
Post-release survival research operations	July 1 – October 31, 2025
Trap decommission and on-land storage (removal of nets, floating docks)	October 31, 2025

6. Required Permits

Table 2. Permits required for the Skeena River Fish Trap during A) Fish Trap Construction and B) Fish Trap Operations.

Activity	Permission	Issuing authority	Status	Timeframe expected	Reference Number (if available)
Fish Trap Construction	Navigation Protection Program (NPP)- *Canadian Navigable Waters Act*	Transport Canada	Required	90 - 180 days	
Fish Trap Construction	Changes In and About a Stream- *Water Sustainability Act* Section 11(1)	Province of B.C.	Required	45 - 180 days	
Fish Trap Construction	Fisheries Act Authorization	FFHPP	Not Required	Request for review complete	20-HPAC-00281
Fish Trap Construction	Crown Land Tenure Application	Province of B.C.	Required	90 - 180 days	
Fish Trap Construction	Species at Risk Ask Permit	DFO	Not Required	90 days	NA
Fish Trap Operations	Scientific Collection Permit	DFO	Required	45 days	
Fish Trap Operations	Scientific Collection Permit	Province of BC	Required	30 days	

7. Contact Information

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8. References

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