Skeena River Floating Fish Trap Operations 2025

1. Project Background

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).

Fish Traps are a form of fixed gear, meaning that the tool remains deployed in one place to passively capture fish using an arrangement of fiber netting. Traps passively funnel fish, from the "lead (which consists of a fine meshed wall positioned perpendicular to the shore) through a maze of mesh compartments in which fish rarely escape (Figure 1) (Cobb 1930). Captured fish instinctively move against the current into progressively smaller compartments of a fish trap including the 'heart", "pot" and "live well" respectively (Tuohy et al 2019). The final compartment has dimensions appropriate for operators to sort the catch for research or passive release with little to no air exposure or handling. Fish remain free swimming within the trap and selected mesh dimensions minimize or prevent entanglement altogether (Tuohy et al. 2019). Recent research has demonstrated that fish traps can capture and release salmonids with nearly zero impact on fish survival (Tuohy et al 2020). These results suggest that the tool can help to reduce bycatch mortality in research, and fish harvest and provide a safe and low impact means for data collection. There are several fish traps currently in operation in the Pacific Northwest including three on the Columbia River, Washington State and one on the Fraser River in Canada. Lax Kw'alaams Business Development (Lax Kw'alaams BDL) proposes to expand the use of fish trap technology within the Lax Kw'alaams Band Traditional Waters of the Skeena River.

Since 2023, Lax Kw'alaams BDL has undergone permitting (federal and provincial) and consultation for a pile driven fish trap located at Orde Point. However, Lax Kw'alaams BDL will be installing a temporary floating trap at the Orde Point location in 2025 and 2026. The purpose of operating a floating trap is to test the feasibility of selective fishing technology at the Orde Point location without deploying permanent infrastructure that requires permitting (i.e. steel pilings, docks etc.).

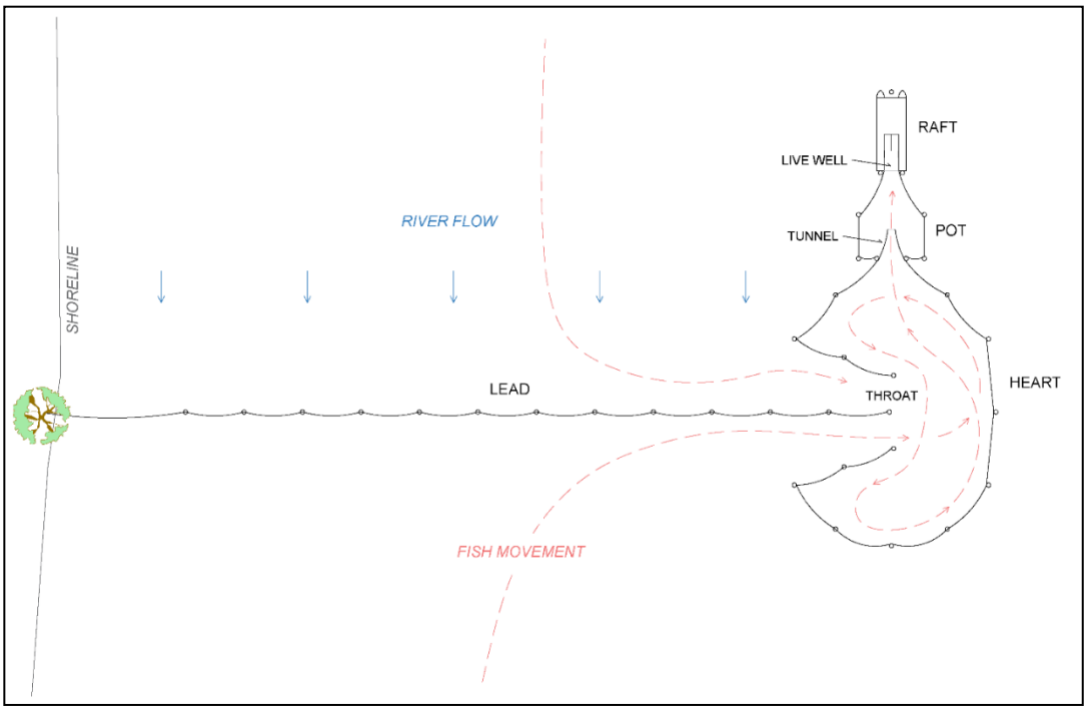

Figure 1. Design of a generalized pile driven fish trap currently operating on the Columbia and Fraser Rivers. The design of the temporary floating trap proposed for the Orde Point located on the lower Skeena River is illustrated in Figure 2 and 3.

2. Project Summary

Lax Kw'alaams BDL is working in collaboration with Wild Fish Conservancy (WFC) and Skeena Fisheries Commission (SFC) to install and test the feasibility of a temporary floating fish trap at Orde Point (54.22034, -129.55482) from June – October in 2025 and 2026. Orde Point is located approximately 1.5 km upstream of Kwinitsa Creek on the Lower Skeena River (Figure 2). Operations on the floating trap will occur for research purposes only, there will be no harvest of salmon occurring.

The goal of the Skeena River Fish Trap Project is to evaluate the effectiveness and feasibility of selective fish trap technology in the lower Skeena River using a floating fish trap as a method to selectively harvest salmon, while limiting bycatch mortality and providing important research opportunities. The proposed study has five major objectives:

1) Design, construct, and operate a temporary floating fish trap in the lower Skeena River.
2) Conduct research studies to evaluate the survival of salmon and steelhead captured and released from the 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 a holding study (48 hour) and radio telemetry.

3) Evaluate estimates of in-season Skeena salmonid abundance, run-timing, and stock- composition relative to the existing Tyee Test Fishery.
4) Monitor marine mammal occurrence and behaviour around the fish trap, along with potential impacts to salmon captured at the floating fish trap (bite marks etc).
5) Removal of the floating trap at the end of the season to be stored on-land leaving no permanent infrastructure instream (i.e. steel piles or docks).

Figure 2. Location of the floating fish trap at Orde Point approximately 1.5km upstream from Kwinitsa Creek.

3. Selective Trap Design

The Orde Point location will consist of a “lead” fiber net spanning up to 300 feet (3 1/8" stretch, #21 knotted black nylon) from the shore anchors to the “heart” compartment of the fish trap, built of untreated Sitka spruce logs. The wooden frame of the heart compartment will take the shape of an equilateral triangle, (~95’ x 45’) with the apex positioned ~40’ upstream of the heart side entrance. Steel pipes (2-1/2’’ diameter; 10.5’ length) will be inserted at 8.5’ intervals through holes augured vertically within the wooden frame of the heart perimeter. Each steel pipe will be equipped with a pad-eye at ~10.5’ depth at low water (zero tide), through which rope will be used to pull-down and secure heart compartment wall and floor netting (2.5’’ knotless nylon, #21). Fish that migrate from the lead wall through the heart compartment will instinctively migrate against the river

current to the apex of the heart and through a conical-shaped mesh tunnel (2.5'' knotless nylon, #21). Once fish pass through the outlet of the tunnel, they will enter the "pot" compartment of the fish trap. The pot will be triangular in shape, with the apex extending ~22' upstream; the downriver-end of the pot will be ~16' wide. Similar to the heart compartment, steel pipes will be inserted through holes augured vertically within the wooden frame of the pot perimeter. Rope and pulley will then be used to lift and lower to pot wall and floor netting (2.5'' knotless nylon, #21) to help corral the catch into an aluminum framed "livewell" positioned at the apex of the pot. The livewell will be 8' (L) x 3' (W) x 2.5' (D), with all sides covered in 1'' knotless nylon mesh to allow for constantly circulating river flow. The livewell represents the final chamber where the catch will be handled and sorted by wading biologists or fishermen. An aluminum exit gate in the livewell may be opened to allow fish to passively swim out of the trap to resume the upriver migration.

A marine mammal deterrent gate will be installed at the entrance to the heart to minimize entry of mammals to the heart and prevent entry into the pots of the trap. This mammal deterrent gate will be built of 2.5'' knotless-nylon mesh and the line-and-pulley design will allow for rapid deployment and retrieval during seasonal operations. In addition to this gate, there will also be an aluminum grate at the entrance to the pots to prevent any seals that make it into the heart from entering the pots.

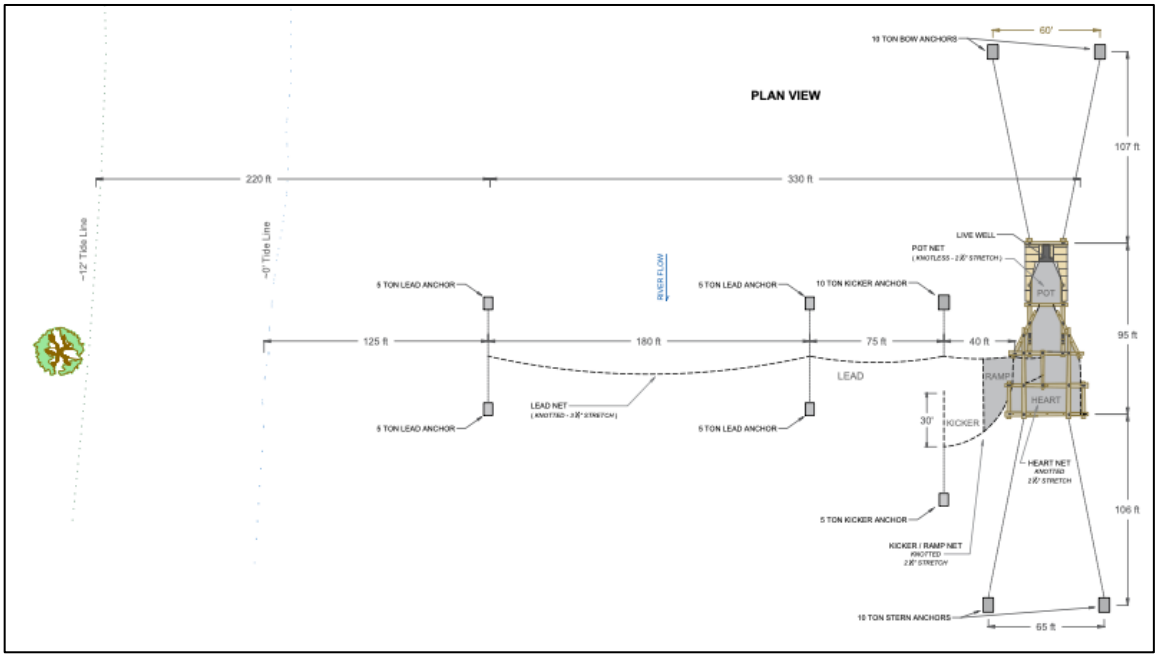

Figure 3. Floating trap design proposed for the Orde Point located on the lower Skeena River.

4. Fish Trap Operations

Seasonal Floating Trap Installation
All elements of trap construction (net building and fabrication of trap components) will occur on-land away from the trap location in prior to June 2025. During June 2025, the trap will be towed upstream from Prince Rupert to Orde Point to be anchored and deployed over a period of ~1-2 weeks. Nets and trap components are hung on the floating trap frame and poles, and the trap is anchored with cement anchors and chain with no impacts to the streambed occurring. Nets, floating docks, and trap components will be installed for trap operations (July – October 2025) and removed after the research period (October 31st, 2025) to be stored at an on-land storage yard in Prince Rupert.

Floating Trap Operations Protocol
Once the floating trap is seasonally installed at Orde Point, trap operations will occur over July – October, with the anticipated season end date of October 31, 2025. Scientific Fish Collection Permits from DFO and FLNRORD will be obtained prior to operations. All fishing conducted will be scientific research only, with no salmon harvest (traditional FSC harvest or otherwise) occurring at the trap location.

When the fish trap is operational, the salmon migrating upstream will encounter the lead net perpendicular to shore. In efforts to find a path around the lead wall, the fish will swim into the heart of the trap. Once in the heart, the free-swimming catch will migrate volitionally against the river current through the tunnel and into the pot of the trap, where they may be corralled into the livewell chamber for data collection and sorting. If not selected for sampling, all fish will be able to passively 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, the pot will be lifted out of the water column and the heart compartment will be opened to enable all fish to pass unconstrained by the fish trap.

To begin a fishing event, trap operators will deploy the pot net using rope and pulley and open the tunnel to initiate the soak period. Observers will note the set time, tidal stage, tide height (m), water temperature (ºC), and presence of marine mammals within the vicinity of the trap. If mammals are observed near to the trap, the marine mammal deterrent gate at the entrance to the heart will be deployed and operators may consider opening heart net break-points to prevent the corralling of fishes. The marine mammal deterrent gate at the entrance to the pot will be in place at all times to prevent seals from entering the pot.

The soak period is the time when the trap is fishing and fish are entering the pot. As fish enter the pot, some will passively migrate into the live well where they will be counted, sampled and released. For those fish that do not enter the live wells passively, the entry end of the pot may be raised to corral fish into the livewell. During the soak period, fishes will passively migrate against the current into the attached livewell at the upriver terminus of the pot. The

livewell will be aluminum framed with 1'' knotless-nylon mesh walls to enable fresh river water to constantly flow through the chamber. It will be equipped with two parallel rectangular chambers (3 × 0.61 × 0.76 m) and mesh pivot capture doors near the entrance of the livewell from the pot. Operators will be able to open or close the capture doors of the livewell to passively entrap migrating fishes. Once in the livewell, operators will enumerate and collect additional data on salmon passing through the floating trap (Section 4).

Once all necessary data are collected, investigators will passively release the catch to resume the upriver migration by opening a mesh exit door of the livewell. This passive trapping and release process will allow operators to collect biological data without fish air exposure, handling, overcrowding, burst-swimming, and net contact associated with other fishing methods (with the intent of achieving nearly 100% post-release salmonid survival; Tuohy et al. 2020). Nevertheless, handling of fishes within the live well will be necessary for data collection and research purposes.

Data collection will continue until a cessation of fishing is desired, after which, all pot compartments and gates will be lifted from the water-column and heart net break-points will be opened to restore fish passage, prevent the corralling of fishes, and minimize attraction of marine mammals to the project site.

Public Safety during Operations

Lax Kw'alaams BDL will install and operate the trap in a safe manner than does not impact public access. Access for fishing will not be impeded by the fish trap by road or boat. The property at Orde Point has been private property for over 20 years, and there will be no change to land access. Thus, land access to this site by vehicle or car is only permittable with consent of the property owner or its designate (Lax Kw'alaams BDL) for safety reasons once the project is established. At the commencement of this project, signage was posted in multiple locations detailing the permissions needed. Access for fishing from the Skeena River will not be impeded by the stationary platform. As the trap location is outside of the main flow of the river, there should be no impact of the fish trap on drift netters and traditional gill net harvesters and rod and reel harvesters are able to harvest anywhere in the vicinity of the fish trap project with the requirement that they are outside of the safe distance requirement of 30.5 meters or 100 feet from the infrastructure.

Yellow retro-reflective tape or similar reflective markers, providing a reflective surface of not less than 10cm x 15cm each, will be installed at regular intervals around the outside perimeter of the work 1.5m above the high-water level. Construction equipment used during installing and boats in conjunction with this project shall be stored in such a manner that it does not obstruct navigation.

The fish trap is designed and maintained to withstand local weather conditions and short-term impacts from debris in the river during the summer (i.e. logs). The main currents typically move bigger debris in the main thalweg on the opposite side of the river and the

island upstream blocks most debris that may impact the fish trap infrastructure. The fish trap will be monitored by remote camera and checked daily to ensure no long-term damage from larger debris. During summer operations, large debris can be removed from the floating infrastructure by boat operators as needed.

5. Study Design

The primary goal of operations in 2025 is to evaluate the effectiveness at catching salmon and steelhead in the floating fish trap 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. A secondary goal is to monitor mammal occurrence and behavior in the vicinity of the fish trap and record bycatch injury or mortality.

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. All occurrences of marine mammal sighting during fish trap operations will be recorded, including distance to the trap, behavior, and potential impacts to salmon at the floating fish trap (bite marks etc.). 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. All fish caught in the trap or entangled in the nets, including non-salmonids, will be documented.

Enumeration and genetics

Within the shallow live well, the free-swimming catch will be identified to species and jack/adult status; these fishes will be enumerated and noted for capture condition (Cox et al. 2019) by observation from above the water surface. A sub-sample of salmon (approximately 1000 samples) will be handled to record fork-length (FL) and collect genetic samples (non-lethal 1 mm caudal fin clips). The salmon species targeted for genetic samples in 2025 are sockeye and Chinook. A sub-sample of 25 sockeye fin clips per day will taken during high daily abundance periods.

Net Pen Holding Study

A holding study (48 hour) will also be conducted on ~~coho salmon~~ to investigate post-release survival from the floating fish trap. During the months of July and August, adult sockeye salmon captured at the trap will be transferred with a rubberized dip net to a

designated temporary holding chamber of the live well until a sample of approximately 20 fish are retained. When the desired sample size is achieved, operators will seal all outlets to the pot compartment, which will now function as a net pen holding chamber with dimensions roughly equivalent to net-pen holding studies of similar designs (Takata and Johnson 2018, Gayeski et al. 2020). Sockeye salmon will then be enumerated, noted for capture condition ("lively", "lethargic", or "no signs of life"), and released from the live-well by hand to the sealed pot compartment. Once the last fish is released into the net pen, operators will initiate a 48 observation period and note the date, time, and water temperature. As in prior net-pen holding studies (Takata and Johnson 2018, Gayeski et al. 2020) coho salmon that exhibit prior injuries unrelated to the fishing gear (i.e. gillnet marks, seal bites) will be excluded from the holding study.

To determine fish mortalities during the holding period, treatment groups will be checked twice daily at regular intervals from above and below the water surface (via snorkel survey). At the end of the holding period, all fish will be enumerated, measured (FL), noted for condition, and released. Post-release survival will be directly estimated by a binomial proportion (p = # survived/# total) with associated binomial variance.

It is anticipated that the holding study conducted on the Skeena River Trap will have minimal impact on fish sampled. For example, a previous 48-hour holding study of coho salmon caught with a fish trap on the Columbia River identified zero mortalities (n = 121), with all fish identified as lively and vigorous upon capture and release after 48-hour (Gayeski et al. 2020). No fish appeared lethargic or asphyxiate, despite higher river temperatures ranging from 12.1°C to 19.2 °C (Gayeski et al. 2020).

Radio telemetry

Lax Kw'alaams BDL is developing a secondary study using radio telemetry to investigate mid/long-term post-release survival. Lax Kw'alaams BDL is proposing to apply approximately six hundred radio telemetry tags to a sample of Chinook (n= 200), chum (n= 200) and steelhead (n=200) captured at the fish trap. Using radio telemetry receivers at strategic locations along the Skeena River, along with accounting for tagged fish harvested in FSC and recreational fisheries upriver through voluntary tag recovery programs, this method will allow direct evaluation of post-release survival upstream from and the Lower Skeena Fish Trap.

6. Data management and reporting

All data related to trap operations, catches, and harvests will be recorded on waterproof field datasheets. Data will be entered into an Excel spreadsheet and catch summaries can been shared with DFO or FLNRORD in-season if requested.

A post-season report summarizing the project findings will be prepared by March 31, 2026. This report will be shared with Skeena River First Nations, provincial and federal regulators and the public upon request. In addition, presentations will be provided for Skeena River First Nations at technical committee meetings (SFC and SFNTC) on main results and proposed plans for subsequent years.

7. References

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