Executive Secretary's Summary of Decisions
40th Annual Meeting
February 10-14, 2025
Portland, OR/online

The Pacific Salmon Commission held its 40th Annual Meeting on the dates above and discussed a number of topics (see attached agenda).

The Commission AGREED:

1. The minutes from January 2025 are approved as circulated.
2. The Commission will host a celebration of the 40th PSC anniversary in February 2026 with the existing Secretariat budget, with final plans to be confirmed in October 2025.
3. The Parties will review the Executive Secretary's draft Code of Conduct for Delegates with a view to approving it Intersessionally or no later than the October 2025 meeting.
4. The proposed U.S. federal subsistence fishery in the Taku River may proceed in 2025 under the constraints presented in writing to the Commissioners from the Transboundary Panel. Future approvals of this fishery will be considered year-to-year through 2028.
5. The 2025 workplan for the Committee on Scientific Cooperation is approved.
6. The Secretariat and Planning Inter-Panel Workshop on GSI (PIPWOG) working group may proceed to execute an April 2025 workshop to address issues surrounding the D104 bycatch of Fraser sockeye.
7. The Alaska Department of Fish and Game (ADF&G) will provide 2024 sockeye tissue and scale samples to the Secretariat from the D104 pink salmon fishery using the same criteria applied to 2023 samples.
8. The report of the Standing Committee on Finance and Administration is adopted, including the budget proposal for FY2025/26.
9. The Commission accepted the work plan progress reports from Panels and Committees, noting that most Panels expect to avoid negotiation meetings outside of the normal cycle and propose amendments to its respective chapter by February 2027. In particular, the Southern Panel responded that it will be extending its regular meetings to include Fridays. The Panel will also require one additional week of meetings per year, with the potential to

augment that with virtual meetings. It will also, if needed, use and repurpose some time from its annual coho working group meetings. The Fraser Panel will not require additional meetings beyond their regular meeting schedule if forecasted abundance remains low.

10. The report from the Chinook Interface Group (CIG) is accepted, including the following actions:
    a. Canada will provide a written response to the questions provided by the USA in its Feb. 4, 2025, letter and a Spring 2025 CIG meeting will be held to review the results of the 2025 ERA analysis (with the 2023 Snohomish data point from the 2025 ERA) for Snohomish Chinook and discuss what additional management actions, if any, are needed.
    b. Pursuant to Chapter 3, Paragraph 7 (g), the CYER limits for U.S. ISBM fisheries for the Nooksack, Skagit (Spring and Summer), Stillaguamish, and Snohomish stocks will remain consistent for 2025 with those provided by the CTC in April 2024 as adjusted for unmarked Chinook salmon using methods developed by the CTC.
    c. The CTC will report at the spring CIG meeting on the following tasks:
        i. The timeframe and resources required to identify the Chapter 3 obligations affected by catch and release updates in Canadian catches. These may include incidental mortality limits, AABM catch levels, and ISBM CYER limits.
        ii. The feasibility, timeframe, and resources required to identify the model inputs, outputs, and tools that will be affected by the updates and report back if the tasks are not feasible to be completed.
    d. A deadline of 60 days after the close of the February CIG meetings is set for national edits to the draft Chapter 3 treaty booklet insert, with the Secretariat preparing another updated version of the insert for presentation in October 2025.
11. The Mark Selective Fishery (MSF) Fund Committee summary report is accepted.

ATTENDANCE

PACIFIC SALMON COMMISSION
40th ANNUAL MEETING
FEBRUARY 10-13, 2024
HYATT REGENCY PORTLAND
PORTLAND, OREGON/ONLINE

COMMISSIONERS

CANADA

A. Thomson (Chair)
J. McCulloch
M. Ned
S. Farlinger
K. Connors (Attended virtually)
R. Jones

UNITED STATES

D. Vincent-Lang (Vice-Chair)
W.R. Allen
P. Anderson
S. Rumsey
W. Auger
R. Klumph
M. Oatman (Attended virtually)
D. Varmazis (Attended virtually)

Draft Agenda
40th Annual Meeting
February 10-13, 2025
Portland, OR/online

1. Cultural welcome (TBC)
2. Adoption of agenda (Action item)
3. Adoption of minutes: January 2025 Post-Season Meeting (Action item)
4. Executive Secretary's report
5. Update on Taku River U.S. subsistence fishery planning
6. Grant Programs update
7. CSC Liaison Group/CSC Work Plan approval (Action item)
8. F&A Committee report/budget recommendation for FY2025/26 (Action item)
9. Discussion of Chapter 3, paragraphs 7(c)i-ii ISBM responses
10. Reports from Panels and Committees
    a. Work plan progress
        i. Northern Panel (Sandra Davies/Andy Piston)
        ii. TBR Panel (Steve Gotch/Troy Thynes)
        iii. Southern Panel (Linda Higgins/Laurie Peterson)
        iv. Fraser Panel (Adam Keizer/Jason Gobin)
        v. SFEC (Angus Straight/Ryan Lothrop)
        vi. TCDS (Nick Komick/Nancy Leonard)
    b. CIG report adoption (Action item; contents TBC)
11. Other business
12. Public comment

Annotated agenda – 40th Annual Meeting

(Executive Secretary's annotations in *italics*)

1. Cultural welcome (TBC)
2. Adoption of Agenda (Action item)
   - *Consistent with PSC bylaws, an agenda shall be adopted by the Commission at the start of each meeting. The Commission shall not ordinarily take a decision on any item that has not been included in the draft agenda for the meeting. Where circumstances warrant, supplementary decision items may be added to the agenda with the concurrence of the Chair and Vice Chair.*
3. Approval of minutes (Action item)
   - *The Parties received draft minutes from the January 2025 Post-Season Meeting for review prior to the present meeting.*
4. Executive Secretary's Report
   - *The Executive Secretary will provide a short report on significant events since the last Commission meeting, "housekeeping" items for the current meeting, and other issues needing attention. These will include an update on Commission deliverables under Annex IV, revisitation of the draft Code of Conduct introduced in January 2025, and revisitation of plans to celebrate the PSC's 40th anniversary.*
   - *Possible action items: the Commission may adopt a Code of Conduct and plans to celebrate the 40th anniversary as appropriate*
5. Update on Taku River U.S. subsistence fishery planning
   - *At the January 2025 Post-Season meeting, the TBR Panel co-chairs reported national differences about the advisability of authorizing a U.S. federal subsistence fishery on the Taku River. Commissioners asked for an update on Panel resolution of the matter and may need to take action if the Panel is at an impasse.*
6. Grant Programs update
   - *The Grant Program Manager (Sascha Bendt) will report on recent activities of the various PSC grant programs, with support from the MSF Fund Committee as appropriate. No action is required from the Commission.*

7. CSC Liaison Group update/CSC Work Plan approval (Action item)
    - *The CSC Liaison Group and CSC members will report on their recent deliberations, including updates on GSI Workshop planning and submission of a 2025 CSC Work Plan for Commission adoption.*
8. F&A Committee report/budget recommendation for FY2025/26 (Action item)
    - *The F&A Committee will present its annual report and budget recommendations for Commission consideration. The Commission must adopt a budget for FY2025/26.*
9. Discussion of Chapter 3, paragraph 7(c)i-ii ISBM responses
    - *Consistent with paragraph 7(c)i, Canada responded to the Commission on Jan. 10, 20205 regarding 2024 ISBM triggers for certain stocks. In that response, Canada mentioned revisions to certain historic sport fishery catch data as well as management measure taken to address the relevant ISBM fisheries.*
    - *Consistent with paragraph 7(c)ii, the CTC has provided a response about potential improved management tools to narrow divations between CYERS and CYER ilmits to a maximum of 10%. In addition, in January 2025, the Commission requested the CTC to analyze the impacts of certain retroactive changes to Canadian historic catch estimates.*
    - *Action: Under Chapter 3, paragraph 7(c), the Commission is expected to discuss the Canadian proposals and CTC analyses by the end of the current meeting.*
10. Reports from Panels and Committees
    - *As per PSC bylaws and past practice, Panel and Committee leadership shall present and discuss written summaries of their work to implement their annual work plans, including any expectations for extraordinary meetings to conclude chapter negotiations by February 2027.*
11. Other business
12. Public comments: When appropriate, and with the concurrence of the Vice-Chair, the Chair may provide time for public visitors to speak during the meeting.

2019-2028 Pacific Salmon Commission and Party tasks identified in amended Annex IV:

Chapters 1, 2, 3, 5, and 6[1] in chronological order

Prepared by the Executive Secretary and national representatives (updated 2/11/25)

| Deadline | Chapter/para | Task (emphasis added) | Status |
|---|---|---|---|
| January 2019 - December 2028 | Chapter 3, paragraph 2(c) | **[The Parties shall] implement through their respective domestic management authorities, a 10-year Chinook salmon CWT&R program that begins in 2019 that provides timely data to implement this Chapter via improvements and studies designed to achieve CTC and CWT work group data standards and guidelines.** The purpose of the CWT&R program shall be to:<br>(i) maintain and improve the precision and accuracy of critical CWT- based statistics used by the CTC and Selective Fisheries Evaluation Committee (SFEC) in support of this Chapter,<br>(ii) accelerate the processing of CWT data to provide CWT data for the pre-season planning process,<br>(iii) increase the number of exploitation rate indicator stocks to represent Chinook production and fishery exploitation rates for escapement indicator stocks,<br>(iv) examine the representativeness of exploitation rate indicator stocks for escapement indicator stocks and CWT model stocks, and<br>(v) develop analytical tools that involve the analysis of CWT data in the implementation of this Chapter; | Ongoing: Addressed through TOR for CEII-CWT/R working group |
| January 2019 - December 2028 | Chapter 3, paragraph 2(d) | **[The Parties shall] implement through their respective domestic management authorities, a 10-year Chinook salmon CEII program that begins in 2019 that provides timely data to implement this Chapter via objective and repeatable methodologies in data limited situations and in others via improvements and studies designed to achieve CTC data standards, guidelines, and analysis schedules.** The purpose of the CEII program includes the development of analytical tools that involve catch and escapement data in the implementation of this Chapter. | Ongoing: Addressed through TOR for CEII-CWT/R working group |

[1] This table summarizes new tasks identified for the Parties or the Commission under amended chapters 1, 2, 3, 5, and 6 in Annex IV. It does not include tasks that are conditional (e.g., if a fishery's limit is exceeded, then the Commission reviews and recommends remedial action), nor does it include routine management actions (e.g., pre-season run forecast delivery, sample collection schedules, means to achieve quota share, etc.). This summary does not address tasks assigned to Panels and Committees, which will be addressed through implementation plans developed by the relevant Panels/Committees and due to the Commission at the January 2019 Post-Season meeting.

| Deadline | Chapter/para | Task (emphasis added) | Status |
|---|---|---|---|
| February 2019 | Chapter 1, Paragraph 3(a)(iii). | Increase CWT tag rates for Stikine River Chinook salmon to achieve CTC indicator stock standards. | Addressed in TBR Panel implementation plan |
| February 2019 | Chapter 1, Paragraph 3(b)(iii). | Increase CWT tag rates for Taku River Chinook salmon to achieve CTC indicator stock standards. | Addressed in TBR Panel implementation plan |
| February 2019 | Chapter 3, Appendix A, paragraph 14 | **The Commission shall receive the model improvements from Phase 2 and make a decision about their implementation.** | Completed January 16, 2020 with adoption of revised Tables 1-2 and Appendix C |
| October 2019 | Chapter 3, paragraph 5(b) | **The Parties agree that for the Chapter Period:**<br>**b) the Commission shall establish a work group to explore issues related to Okanagan Chinook, including the establishment of management objectives, enhancement and the possible use of Okanagan Chinook as an indicator stock. The work group shall report to the Commission by October 2019.** | Work group formally created October 2019; final report and recommendations provided Oct. 2023. |
| December 2019 | Chapter 3, paragraph 2(e) | **[The Parties shall] create and maintain a work group to discuss the programs initiated in sub-paragraphs (c) and (d)[2] by 2020**. The work group shall:<br>(i) create opportunities for the exchange of project results and conclusions, advancements in knowledge, and discussion of the direction of these programs between the Parties, management entities, and knowledgeable individuals;<br>(ii) review project results and conclusions from these programs and provide these reviews to the project proponents and the Commission; and<br>(iii) identify, for the Commission, changes to projects or suggest new projects to fill gaps in knowledge. | Ongoing: Addressed through TOR for CEII-CWT/R working group |
| c. February 2020 | Chapter 1, paragraph 3(b)(i)(B) | **The Parties shall develop a joint technical report and submit it through the Parties' respective review mechanisms with the aim of establishing a bilaterally approved maximum sustainable yield (MSY) goal for Taku River sockeye salmon prior to the 2020 fishing season.[3]** | Completed May 21, 2020; confirmed by PSC July 2020 |

[2] The CWT&R and CEII programs.

[3] It is not specified if the Parties will be acting through the TBR Panel or otherwise.

| Deadline | Chapter/para | Task (emphasis added) | Status |
|---|---|---|---|
| c. February 2020 | Chapter 1, paragraph 3(b)(i)(C) | The Taku River sockeye salmon assessment program will be reviewed by two experts (one selected by each Party) in mark-recovery estimation techniques. **The Parties[4] shall instruct these experts to make a joint recommendation to the Parties concerning improvements to the existing program including how to address inherent mark-recovery assumptions with an aim to minimize potential bias prior to the 2020 fishing season.** | Completed May 21, 2020; confirmed by PSC July 2020 |
| February 2020 | Chapter 3, paragraph 4(c)(i) | **The CTC shall recommend standards for the desired level of precision and accuracy of data required to estimate incidental fishing mortality** by February 2020. The Commission will consider the recommendation of the CTC regarding standards for the desired level of precision and accuracy of data required to estimate incidental fishing mortality. | Ongoing. IM standards report published in March 2022. The CTC is awaiting further direction from the CIG on whether additional work is needed and the CIG placed this issue on its forward agenda as of Oct. 2022. |
| January 2022 | Chapter 2, introduction | **By the Commission post season meeting in January 2022, the Parties will have completed a review of the performance of the provisions in this Chapter.** The review will identify management actions taken to support conservation of Nass River and Skeena River sockeye, evaluate the consistency of those actions with Chapter 2 obligations and outline, where feasible, the benefit of those actions for those populations. | Completed Feb. 2023: Commission accepted joint N. Panel report including areas for further work |
| January 2022 | Chapter 3, paragraph 2(a) footnote #9 | The model configuration from March 2018 (CLB1804) shall be used to establish a baseline run. **The Parties shall document specific concerns or inconsistencies between that configuration and the management regime in 2018. The Parties agree that in order to complete this documentation, the Commission shall direct the CIG to work with the CTC to develop a draft outline on how to document specific concerns or inconsistencies between that configuration and the management regime in 2018. The Commission will review this draft outline and direct the CTC how to prepare the report.** | Completed Feb. 2022 via Commission acceptance of CIG report and recommended change in footnote 9. |

[4] It is not specified if the Parties will be acting through the TBR Panel or otherwise.

| Deadline | Chapter/para | Task (emphasis added) | Status |
|---|---|---|---|
| Unspecified | Chapter 5, paragraph 11(b) | Each Party may: request additional reductions in ERs to meet critical conservation concerns not adequately addressed by the ER caps. The Southern Panel shall develop bilateral guidance to indicate how this could be implemented in a responsible and timely manner during a Party's domestic preseason planning. **The guidance shall also include steps and timelines for communication with Commissioners. This process will require Commission approval before implementation** | Completed Feb. 2023 via acceptance of S. Panel work plan progress report and its proposed guidance on para. 11. |
| Unspecified | Chapter 5, paragraph 11(c) | Any party may request increases in the MU-specific ER caps determined under paragraphs 9(b) to (d) if the Party can demonstrate that the ER caps prevent it from accessing its own stocks to meet its fishery management objectives or from harvesting other allocations provided under this Treaty. The Southern Panel shall develop bilateral guidance to indicate how this could be implemented in a responsible and timely manner during a Party's domestic preseason planning. **The guidance shall also include steps and timelines for communication with Commissioners. This process will require Commission approval before implementation** | Completed Feb. 2023 via acceptance of S. Panel work plan progress report and its proposed guidance on para. 11. |
| January 2022, 2025, 2028 | Chapter 5, paragraph 12 | **The Parties shall review this Plan no later than three years after this Chapter enters into force and every three years after that date, unless otherwise specified by the Southern Panel**. The review shall include an assessment of the effectiveness of this Plan in achieving the management objectives of the Parties and any other issues either Party wants to raise, including, but not limited to:<br><br>(a) whether the ER caps established under paragraphs 9(b) to (d) have prevented either Party from accessing its own stocks to meet its fishery management objectives or from harvesting other allocations that are provided under this Treaty; and<br><br>(b) issues associated with the procedures and methods employed to estimate and account for total coho mortalities, including those incurred in mark-selective fisheries.<br><br>**The Parties shall modify this Plan, if necessary, based on the review and the need to incorporate results of bilateral technical developments** (e.g., to establish criteria to define MUs and to biologically determine allowable ERs, to develop a common methodology for measuring ERs in Canadian and U.S. fisheries, development of bilateral management planning tools, etc.). | First 3-year review underway via S. Panel work plans |

| Deadline | Chapter/para | Task (emphasis added) | Status |
|---|---|---|---|
| January 2022 | Chapter 2, paragraph 12 | The U.S. agrees to complete a harvest pattern analysis of the pink salmon fishery in District 104 salmon that shall be peer-reviewed by an independent contractor and then submitted to the Committee and the Northern Panel for further review. | Complete: N. Panel agreed bilaterally; published as PSC Tech Report June 2021 |
| c. December 2022 | Chapter 3, paragraph 5(e) | **The Commission shall use the Calendar Year Exploitation Rate (CYER) metric to monitor the total mortality in ISBM fisheries and shall review the CYER metric during the year 2022 to make a decision on its continued application or the use of an alternative metric**. In the absence of a Commission decision to use an alternative metric, the use of the CYER metric continues. | Commission agreed in Feb. 2022 that no alternative metrics are available for review, but could be reviewed in the future if necessary. |
| c. January 2023, c. January 2026 | Chapter 3, paragraphs 7(d-e) | **(d) [The Parties agree] to conduct up to two reviews of the CPUE-based approach to decide whether to continue to use this method to determine the catch limit for the SEAK AABM fishery, to return back to use of the Commission Chinook model, or to adopt an alternative method as determined by the Parties, to determine pre-season estimates of the aggregate AI of Chinook stocks available to the SEAK troll fishery and the relationship between the catch and AIs specified in Table 1.** The first review shall occur as soon as practical after the 2022 first post-season AI is calculated and the second review shall occur as soon as practical after the 2025 first post-season AI is calculated. The Commission decision shall be based on the outcome of:<br>(i) a comparison of cumulative actual catch and the cumulative post- season catch limit from the Commission Chinook model,<br>(ii) a comparison of the cumulative performance of the CPUE-based catch limit and the pre-season catch limit from the Commission Chinook model to predict the catch limit estimated from the first post-season calibration of the Commission Chinook model (model error), and a comparison of the abundance tier selected by use of the CPUE method and the abundance tier that is selected by use of the pre-season calibration of the Commission Chinook model with the abundance tier selected from the first post-season calibration derived from the Commission Chinook model;<br><br>**(e) to consider the results of reviews described in sub-paragraph (d), immediately, and decide whether to continue to use the CPUE method for the SEAK AABM fishery**. Unless the Commission decides to continue to use the CPUE-based approach or adopt an alternative method, the Commission Chinook model estimate of the AI and Table 1 shall be used to determine the annual pre-season and post-season catch limits; | CPUE method review completed, discussed by CIG and Commission in Oct. 2023.<br><br>Commission agreed to suspend use of the CPUE-based approach after the 2022 season. New multi-variate model 4.3 used to set SEAK catch limits for 2023 season.<br><br>In Jan. 2024, Parties did not reach agreement on an alternative methodology for setting the SEAK AABM catch limit. It was instead agreed that pursuant to paragraph 7(d) and 7(e), the Commission returns to the use of the Commission Chinook Model and Table 1 for SEAK AABM fisheries, and approved the application of the 10% exceedance rule that defines the triggers for 7(b)(i) and (ii). |

| Deadline | Chapter/para | Task (emphasis added) | Status |
|---|---|---|---|
| January 2023 | Chapter 3, paragraph 7(h) and Appendix A paragraph 14 | **The Commission will consider the draft outline of the five-year review provided by the CTC and will provide direction on how to proceed with preparing the report.** | Underway: CTC directed to begin work on the review based on the outline provided in Feb. 2023 except for the section on harvest rate indices for ISBM fisheries. In Oct. 2023, Commission agreed the MREER metric will be included in the Chapter 3 five-year review to provide additional and complementary information alongside the CYER metric for ISBM fisheries. |
| December 2023 | Chapter 1, paragraph 3(a)(ii) | The Parties shall develop and implement an abundance-based approach to managing coho salmon on the Stikine River. Assessment programs need to be further developed before a biologically based escapement goal can be established. **By 2024, the Parties shall review the progress on this obligation**. | Underway via the TBR Panel with updates in annual work plans |
| c. December 2023 | Chapter 1, para 5 | **The Parties shall review midway through the Chapter Period, or other time mutually decided by the Parties, the current Chapter and determine if they want to renew this Chapter for an additional period of time.**[5] | TBR Panel recommends no changes to Chapter 1: to be reflected in Chapter 1 implementation plan. |
| By December 2024 | Chapter 1, paragraph 3(a)(i)(c). Appendix to Annex IV, Chapter 1 | **Expand and initiate new bilateral sockeye salmon enhancement programs in the Canadian portion of the Stikine River watershed.** | TBR Panel reported in October 2024 that initial exploratory evaluation activities are underway, limited progress to date. |

[5] Chapter does not specify how this review will be conducted, including the respective roles of the Commission and TBR Panel.

| Deadline | Chapter/para | Task (emphasis added) | Status |
|---|---|---|---|
| January 2025 | Chapter 3, paragraph 7(h) | In January 2025, **the Commission shall review the report [from the CTC on its 5-year review] to identify any appropriate modifications to this Chapter to improve its implementation.** | Commission agreed in Oct. 2024 to postpone this deadline to Oct. 2025 |
| December 2026 | Chapter 2, paragraph 5 | **The Parties agree to review[6] Annex IV, Chapter 2, a minimum of two years prior to its expiration with a view to renewing it**. If such renewal is not successfully concluded prior to the expiration date, then overages and underages must be carried forward to the next Chapter period. | |
| Unspecified | Chapter 1, paragraph 7 | the Parties[7] shall consult with a view to developing, for the transboundary sections of the Columbia River, a more practicable arrangement for consultation and setting escapement targets than those specified in Article VII, paragraphs 2 and 3. | Ongoing since October 2019 through establishment of the Okanagan Work Group |
| Unspecified | Chapter 3, Appendix A, paragraph 14 | **The Commission shall receive the model improvements from Phase 3 and make a decision about their implementation.** | CTC developing work group for Phase 3 improvements. Commission agreed in February 2022 these will not be available in January 2023 for 5-year review of Chapter 3. |

[6] Chapter does not specify how this review will be conducted, including the respective roles of the Commission and the Northern Panel.
[7] It is not specified how this consultation will be conducted, including the respective roles of the Commission and TBR Panel.

| Deadline | Chapter/para | Task (emphasis added) | Status |
|---|---|---|---|
| Ongoing | Chapter 3, paragraph 4(a-d) | The Parties agree:<br>(a) **to monitor and manage incidental fishing mortality in AABM fisheries** with the intent of not exceeding levels as specified in paragraph 4(f) during the Chapter Period;<br><br>(b) that landed catch and incidental mortalities in ISBM fisheries are limited according to paragraph 5;<br><br>(c) **to provide estimates of incidental mortality of Chinook salmon in all ISBM and AABM fisheries**. ISBM fisheries have total mortality constraints (catch plus associated incidental mortality) while AABM fisheries have catch limits.<br><br>The CTC shall recommend standards for the desired level of precision and accuracy of data required to estimate incidental fishing mortality by February 2020 [see Commission task above];<br><br>(d) **to provide estimates of encounters of Chinook released in fisheries that, when multiplied by assumed gear-specific mortality rates, provide estimates of incidental mortality that are used in sub-paragraph (c).** These estimates:<br><br>(i) shall be developed by the Parties annually from direct observation of fisheries, or<br><br>shall be calculated from a predictable relationship between encounters and landed catch based on a time series of direct observations of fisheries reviewed by the CTC; | Paras c and d estimates presented in TCCHINOOK 21-05 and 21-04.<br><br>IM standards report discussed by CIG in Feb. 2022. Further review pending via CIG forward agenda. |
| Ongoing | Chapter 3, paragraph 4(g)(v) | …subject to the availability of funds, the U.S. shall establish a Mark Selective Fishery Fund (Fund). **The Fund shall be administered by the Commission** to assist fishery management agencies with equipment and operations, as needed, to mass-mark hatchery produced Chinook salmon, to estimate incidental mortality, and to maintain and improve the ability to estimate exploitation rates on Chinook salmon indicator stocks that are encountered in MSF, including improvements and development of bilateral analytical tools. **The Commission shall adopt procedures to solicit proposals** from U.S. and Canadian management entities for the use of the Fund, be advised on the merits of proposals by specialists as it determines appropriate, and make funding decisions. | MSF Fund and committee established Oct. 2020 |

| Deadline | Chapter/para | Task (emphasis added) | Status |
|---|---|---|---|
| Ongoing | Attachment E, paragraph 2 | The Parties request the Commission to:<br>(a) maintain a page on its web site that documents citations, references, or links to publicly accessible information published by the Parties, management entities, or others related to the habitat protection and restoration projects and programs that are important to Pacific salmon stocks subject to this Treaty; and,<br><br>(b) periodically review and discuss information on the habitat of naturally spawning stocks subject to this Treaty that cannot be restored through harvest controls alone, any non-fishing factors that affect the safe passage or survival of salmon, options for addressing non-fishing constraints and restoring optimum production, and progress of the Parties' efforts to achieve the objectives for the stocks under this Treaty. | Website update complete |

**Taku River Sockeye Salmon**
**Pacific Salmon Treaty – Chapter 1 Transboundary Panel – Bilateral Response and Recommendations**
**U.S. Proposal for a Taku River Subsistence Sockeye Salmon Fishery in 2025**
**February 11, 2025**

*The Transboundary Panel has reviewed the January 15, 2025 U.S. proposal to initiate a new subsistence sockeye salmon fishery on the Taku River administered by the U.S. Forest Service in 2025. The fishery would be administered in addition to U.S. commercial, sport, and personal use fisheries in District 111.*

*The U.S. section noted that in addition to further restrictions taken in the State of Alaska personal use fishery, the U.S. believes there will be negligible additional impact to Canadian origin salmon in the Taku River. There will be little or no increase in effort as: any Alaska resident eligible to obtain a federal subsistence fishing permit for the Taku River is already eligible to obtain a state personal use fishing permit; There is very little incentive to obtain a federal subsistence permit over a state personal use permit with nearly identical management measures for each fishery; residents of Juneau, the largest population center in Southeast Alaska and primary harvesters of personal use Taku River salmon, are not eligible to obtain a federal subsistence permit; there were no federal subsistence permits issued for the Taku River in 2024; there will be little to no increase in Chinook salmon harvest; there are very few Chinook salmon below the border after mid-July. From 1988–2024, 21,158 large Chinook salmon were sampled during stock assessment projects below the border, only 69 (0.3%) fish were sampled after July 15; and, the incidental Chinook salmon harvest in the personal use fishery has been minimal with a 2018–2024 average harvest of 10 large Chinook salmon.*

*Canada noted that the proposal diverges from Pacific Salmon Treaty Article III, Principles 3 (a) and 3(b), which obligate the Parties to take into account the desirability to reduce interceptions and avoid undue disruption of existing fisheries. It is Canada's position that the most appropriate process for consideration of the proposed U.S. fishery is through the Chapter 1 renegotiation process leading up to Pacific Salmon Treaty renewal in 2029. None the less, Canada acknowledges the U.S. desire to proceed with consideration of the proposed fishery on a year-to-year basis during the interim period (between 2025 and 2029).*

*Recognizing the above, the Transboundary Panel recommends that proposed fishery proceeds on condition that the following measures are implemented for the 2025 season:*

- restricted to rural residents of Southeast Alaska (excludes residents of Juneau)
- fishing area is limited to the Taku River drainage from Taku Lodge upstream to the U.S./Canada Border
- harvest limits cannot be accumulated with State personal use fishery harvest limits
- gear is restricted to set gillnet
- net length may not exceed 15 fathoms
- annual limit of 10 sockeye salmon per household of 1/20 sockeye salmon for household of 2 or more
- possession limit of incidentally harvested Chinook salmon is 2 fish
- possession limit of incidentally harvested coho salmon is 6 fish
- permit holder must be physically present at net while it is in operation
- set gillnets may not be fished within 100 yards of Canyon Island fish wheels
- season dates are July 15 through August 14
- all salmon harvest will occur in a manner that is consistent with Pacific Salmon Treaty Chapter 1 requirements.
- all salmon harvested will be accounted for in U.S. Pacific Salmon Treaty harvest allocations
- any salmon tags or transmitters applied by U.S./Canada stock assessment projects must be returned to the Alaska Department of Fish and Game

- the federal fishery manager / management agency will present a report on fishery administration in 2025 to the Transboundary Panel at its post-season meeting. The report will include a written description of: The number of licences issued; the number of licences actively fished; the total fishery effort (number of fishing days); the number of fish caught and retained (by species, statistical week and total); the number of fish caught and released (by species, statistical week and total); a description of fishery compliance monitoring and harvest reporting activities completed and any observations of non-compliance with permit conditions.

*Should the U.S. wish to proceed with the proposed fishery in 2026, a proposal which provides details on the fishery objectives and associated management measures shall be presented to the Transboundary Panel for consideration and decision in advance of the 2026 fishing season.*

Transboundary Panel Chair, Canada

Feb 11, 2025
Date

Transboundary Panel Co-Chair, U.S.

2/11/25
Date

# 2024 Grant Programs Update

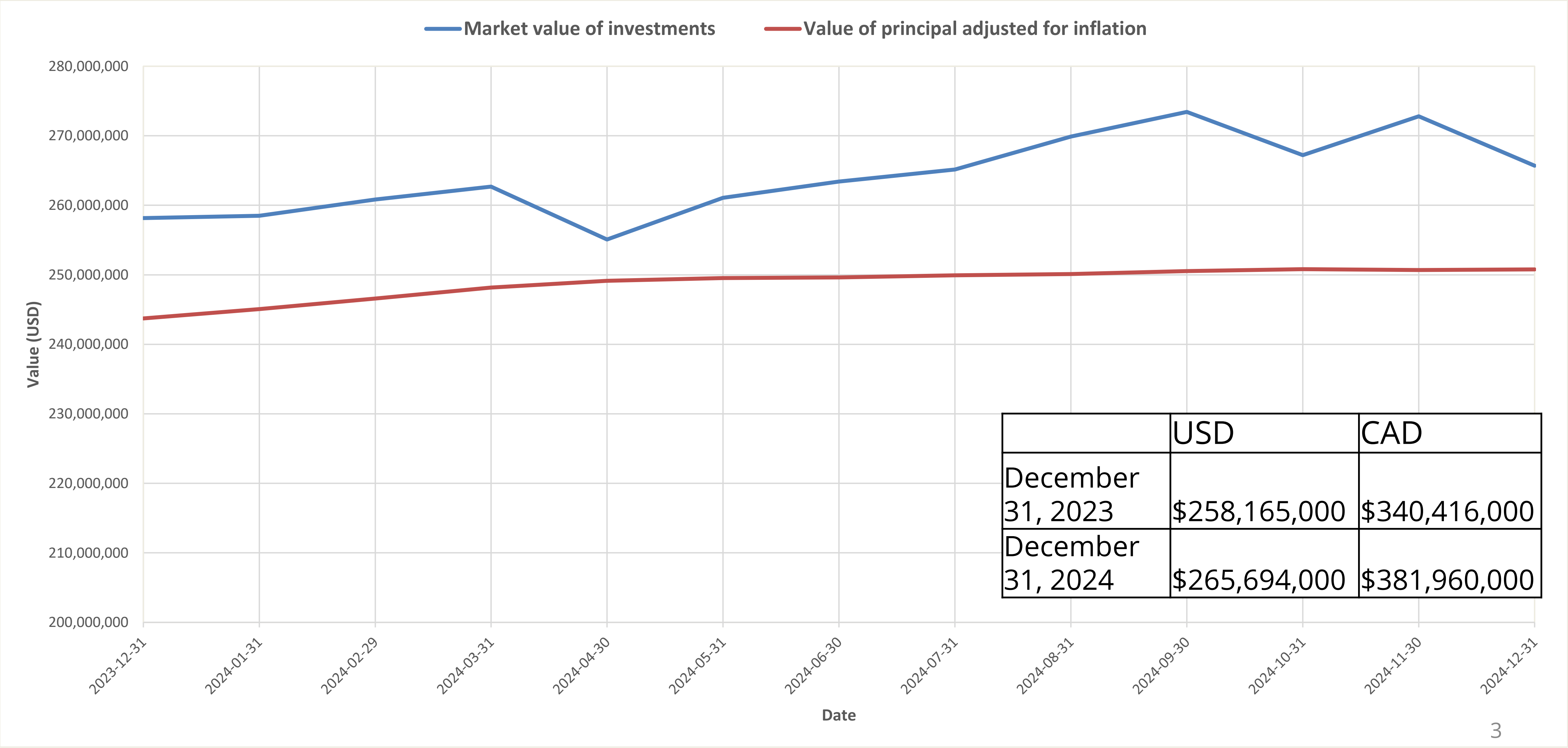
February 13, 2025

Sascha Bendt, Grant Program Manager

# Agenda

- Southern Boundary and Northern Boundary and Transboundary Rivers Restoration and Enhancement Funds
  - Investment performance
  - 2024 projects
  - Call for Proposals for projects beginning in 2025
  - Overview of other business in 2024
- Mark Selective Fishery Fund
  - 2024 projects
  - Project Summary
- Yukon River Panel Restoration and Enhancement Fund
  - 2024 projects
  - Call for Proposals for projects beginning in 2025

# Endowment Funds Investment Performance




| | USD | CAD |
|---|---|---|
| December 31, 2023 | $258,165,000 | $340,416,000 |
| December 31, 2024 | $265,694,000 | $381,960,000 |

# 2024 Projects selected for funding

| Fund | # projects | Value of grants awarded ($USD millions) |
|---|---|---|
| Southern | 43 | 3.66 |
| Northern | 40 | 5.36 |

# Cumulative totals since inception

| Fund | # projects | Value of grants awarded ($USD millions) |
|---|---|---|
| Southern | 762 | 57.08 |
| Northern | 959 | 78.79 |
| Combined* | 1,721 | 135.87 |

* Excludes US $10M contributed to Chinook Sentinel Stocks Program

# Call for Proposals for projects beginning in 2025

| Fund | # project concepts received | $US M value of concept requests |
| --- | --- | --- |
| Southern | 96 | 10.6 |
| Northern | 70 | 8.2 |

| Fund | # project concepts invited to detailed proposal stage | $US M value of invited detailed proposals |
| --- | --- | --- |
| Southern | 62 | 6.03 |
| Northern | 49 | 6.43 |

# Overview of other business

- New business
  - Communications Implementation Plan
  - Withholding tax recovery
- Process updates
  - Secretariat administration fee model
  - Spending policy updates
- Routine business
  - Reviewing investment performance, interviewing existing managers
  - Reviewing Statement of Investment Policies and Procedures
- # Committee meetings in 2024
  - Southern Fund Committee: 4
  - Northern Fund Committee: 3
  - Joint Fund Committee: 2
  - Finance Sub Committee: 1

# 2024 Report of the Mark Selective Fishery Fund

- 2024 Projects
- Project Summary
- Other items

# Projects selected for funding

| | # projects | Value of grants awarded ($USD) |
|---|---|---|
| 2024 | 6 | 1,231,927 |

# Cumulative totals since inception

| Fund | # projects | Value of grants awarded ($USD) |
|---|---|---|
| Combined | 20 | 3,164,779 |

# Completed projects

| Project Name & Proponent | Dates Active | Funding Received |
|---|---|---|
| Mass Marking of hatchery produced Sarita Chinook salmon, Huu-ay-aht First Nations Government | November 1, 2021 - June 30, 2024 | $165,000 CAD |
| Evaluation of the Feasibility of Implementing a Mark Select Fishery in the Southeast Alaska Chinook Salmon Sport Fishery, Alaska Department of Fish & Game | February 21, 2023 – December 31, 2024 | $108,720 USD |
| Best Practices for Improving CWT Sampling and Recovery Data, Pacific States Marine Fisheries Commission | November 1, 2023 – October 31, 2024 | $34,349 USD |
| Populating a Coastwide Chinook and Coho Fishing Regulations Database, Pacific States Marine Fisheries Commission and Washington Department of Fish and Wildlife | November 1, 2023 – October 31, 2024 | $73,819 USD |

# Ongoing Projects

| Project Name & Proponent | Dates Active | Funding |
|---|---|---|
| Mass marking of Hatchery Produced San Juan Chinook Salmon, Pacheedaht First Nation | March 1, 2023 – January 30, 2026 | $163,834 CAD |
| MSF Regulations Database – FRIS Query/Export Tool, Fisheries and Oceans Canada | November 1, 2023 – March 31, 2025 | $40,000 CAD |
| Implementing a Canadian “Node” in the DIT Network Recommended in the CYER WG: Double Index Tagging and Escapement Recovery of Big Qualicum Chinook as an Audit of the CYER Analytical Methods being Implemented by the CTC, Fisheries and Oceans Canada | March 1, 2024 – November 30, 2026 | $170,330 CAD |
| Mass Marking of hatchery produced Sarita Chinook salmon, Huu-ay-aht First Nations Government | August 1, 2024 – July 31, 2025 | $75,000 CAD |
| Mass marking of hatchery produced Conuma River and Gold River Chinook salmon and development of a complementary reference fishery in PFMA 25 (Nootka Sound and Esperanza Inlet), Fisheries and Oceans Canada | April 1, 2024 – February 1, 2027 | $878,136 CAD |
| Assessment of post-release mortality in the recreational fishery: updating previous work and quantifying the use of best practices, University of British Columbia | July 2, 2025 – June 30, 2026 | $77,469 CAD |
| Estimating Chinook salmon incidental mortality in recreational fisheries in British Columbia, Fisheries and Oceans Canada | November 1, 2024 – October 31, 2025 | $85,000 CAD |
| Maintaining a Canadian “Node” in the DIT Network Recommended by the CYER WG: Double Index Tagging and Escapement Recovery of Big Qualicum Chinook as an Audit of the CYER Analytical Methods being Implemented by the CTC, Fisheries and Oceans Canada | April 1, 2027 – March 31, 2030 | $176,986 CAD |
| Mass marking of hatchery produced Conuma River and Gold River Chinook salmon, Fisheries and Oceans Canada | November 1, 2024 – July 30, 2025 | $402,500 CAD |
| Mass marking capacity expansion for DFO (Fisheries and Oceans Canada) Hatchery program, Fisheries and Oceans Canada | October 1, 2024 – March 31, 2026 | $675,000 CAD |
| Phase 2 of Populating a Coastwide Salmon Fishing Regulations Database, Pacific States Marine Fisheries Commission Washington Department of Fish and Wildlife | November 1, 2024 – October 31, 2025 | $183,380 USD |

# Other Items

- Funding allocation
- 2025 spending amount
  - Balance of funds available: ~$850,000 USD approved at October Commission meeting
- 2025 Call for Proposals

# Yukon River Panel Restoration & Enhancement Fund

## 2024 Projects selected for funding

| # projects | Value of grants awarded ($USD) |
| --- | --- |
| 21 | 1,686,329 |

## Call for Proposals for projects beginning in 2025

| # project proposals received | $USD value of project requests |
| --- | --- |
| 29 | 2,245,310 |

# Thank you

- More information on all PSC Grant Programs is available on the PSC website.
- Contact funds@psc.org with any questions.

Sascha Bendt
Grant Program Manager
bendt@psc.org

PACIFIC SALMON COMMISSION

ESTABLISHED BY TREATY BETWEEN CANADA
AND THE UNITED STATES OF AMERICA
MARCH 18, 1985

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# Annual Report of the Southern Boundary Restoration and Enhancement Fund and the Northern Boundary and Transboundary Rivers Restoration and Enhancement Fund for the year 2024.

## *Introduction*

In June of 1999, the United States and Canada reached a comprehensive new agreement (the "1999 Agreement") under the 1985 Pacific Salmon Treaty. Among other provisions, the 1999 Agreement established two bilateral funds: the Northern Boundary and Transboundary Rivers Restoration and Enhancement Fund (Northern Fund); and the Southern Boundary Restoration and Enhancement Fund (Southern Fund). The purpose of the two funds is to support activities in both countries that develop improved information for fishery resource management, rehabilitate and restore marine and freshwater habitat, and enhance wild stock production through low technology techniques. The United States agreed to capitalize the Northern and Southern Funds in the amounts of $75 million USD and $65 million USD respectively. Canada also contributed $500,000 CAD. The 1999 Agreement also established a Northern Fund Committee and a Southern Fund Committee, each comprised of three nationals from each country, to oversee investment of the Funds' assets and make decisions about expenditures on projects. Only the earnings from investments can be spent on projects.

## *Committee Members*

**Northern Fund Committee**

**Canada:**

Mr. Steve Gotch
Chief Russ Jones
Mr. John McCulloch

**United States:**

Mr. Doug Vincent-Lang
Mr. Bill Auger
Dr. Jamal Moss

**Southern Fund Committee**

**Canada:**

Mr. Neil Davis
Dr. Don Hall
Mr. Mike Griswold

**United States:**

Mr. James Scott
Dr. Peter Dygert
Mr. Joe Oatman

*Executive Summary and Market Environment Summary*

- The market value of the fund on December 31, 2024, was approximately $265,694,000 USD or $382,121,000 CAD.
- In the beginning of 2024, interest rates in Canada remained elevated at 5% as the Bank of Canada was focused on controlling inflation. By June 2024, there were signs that inflation was at the target level, but the Canadian economy was relatively weak. Therefore, the Bank of Canada started cutting rates in an attempt to encourage economic growth; this resulted in five interest rate cuts occurring to reduce interest rates to 3.25% by the end of 2024. By contrast, the US economy remained surprisingly resilient. Rising unemployment rates in the second half of the year caused the US Federal Reserve to start cutting rates in September 2024, with three interest rate cuts by the end of 2024. Overall, changing expectations from market participants on interest rate movements and the US presidential election resulted in market volatility throughout the year in both stock and bond markets.
- In 2024 the Southern Fund supported 43 projects. Grants awarded totaled $3.66 million USD. The Northern Fund supported 40 projects and grants awarded totaled $5.36 million USD.
- Since 2004, the Northern and Southern Fund Committees have approved grants of $135.87 million USD to a total of 1721 projects. In addition, the Funds contributed $10 million USD to the Sentinel Stocks Program.
- In 2024 the Northern and Southern Fund Committee members met together as a Joint Fund Committee on two occasions (May 8 and 9, and November 13). The Joint Fund Committee Finance Sub Committee, comprised of members from the Northern and Southern Fund Committees, met on one occasion (April 23). The Northern Fund Committee met on three occasions, the Southern Fund Committee met on four occasions, including a two-day tour of a project site, hiłsyaqƛ̓is (Tranquil Creek), on the West Coast of Vancouver Island, British Columbia. Meetings were held in hybrid formats.
- In 2024, a Communications Implementation Plan was developed for the Joint Fund Committee. The Committees and Pacific Salmon Commission (PSC) Secretariat staff continued to undertake tasks associated with streamlining and improving the administration of grants.
- Mr. James (Jim) Scott was appointed to the U.S. Section of the Southern Fund Committee on May 1, 2024, replacing Mr. Larry Peck who retired in February 2024.

## *Investment Review*

Over the year, current available data shows the investment portfolio had net returns of approximately 15.0% in CAD (5.7% in USD). A weakening Canadian dollar meant the returns in USD were not as positive as those in CAD. Current data indicates that the portfolio exceeded its inflation plus 3.5% target in Canadian dollar terms but fell shy of it in US dollar terms. Canadian dollar depreciation relative to the US dollar was 8.1% over 2024.

Public equity markets had another year of strong performance in absolute terms in 2024, while fixed income markets had positive returns in Canadian dollar terms but negative returns in US dollars. Infrastructure investments remained stable and positive in CAD in 2024, although some investments experienced slight declines in USD. After a challenging 2023, US real estate markets continued to struggle in 2024 with properties generally going down in value again this year.

Building on its strong performance in 2023, the global stock market continued to perform well in 2024, with the MSCI World (Net) Index delivering a return of 29.4% (in CAD) for the year. The theme of equity markets being dominated by large U.S. technology firms has continued and made it a difficult environment for active fund managers. Both the portfolio's active global equity managers, Morgan Stanley and PH&N, failed to keep pace and underperformed their benchmarks over the past year. The portfolio's passive U.S. equity manager, BlackRock, continued to achieve its objective of replicating the performance of its benchmark index. The broad U.S. equity market return was around 35% for 2024 in Canadian dollar terms.

Fixed income performed well in response to rate cuts. Tighter credit spreads suggest investors expect a lower probability of recession than previously, with further decreases in interest rates priced into yields. In 2024 and in CAD, the FTSE Canada Short Term Bond Index returned 5.7%, the FTSE Canada Universe Bond Index returned 4.2%. Both the PH&N Core Plus Bond and ACM mandates added value compared to their benchmarks during the year.

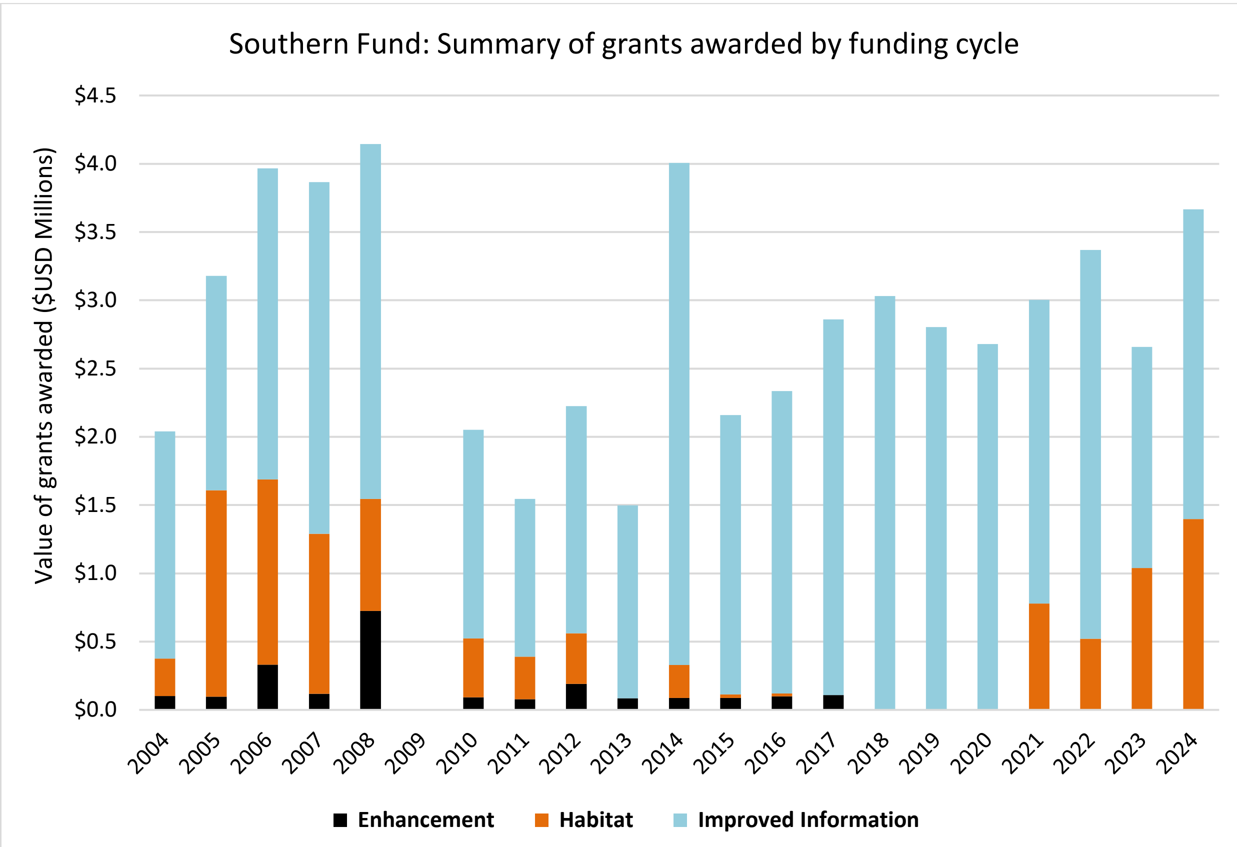
The portfolio's alternative investments provided mixed results in the year of 2024. For the infrastructure managers, IFM returned 7.9% in CAD in 2024, and Axium is also expected to report positive performance during that time period. The U.S. Real Estate manager, Invesco, showed negative absolute performance in USD in 2024 as the commercial real estate market continued to struggle during the year.

Contributed capital and asset value of the individual funds as of December 31st, 2024, stood as follows:

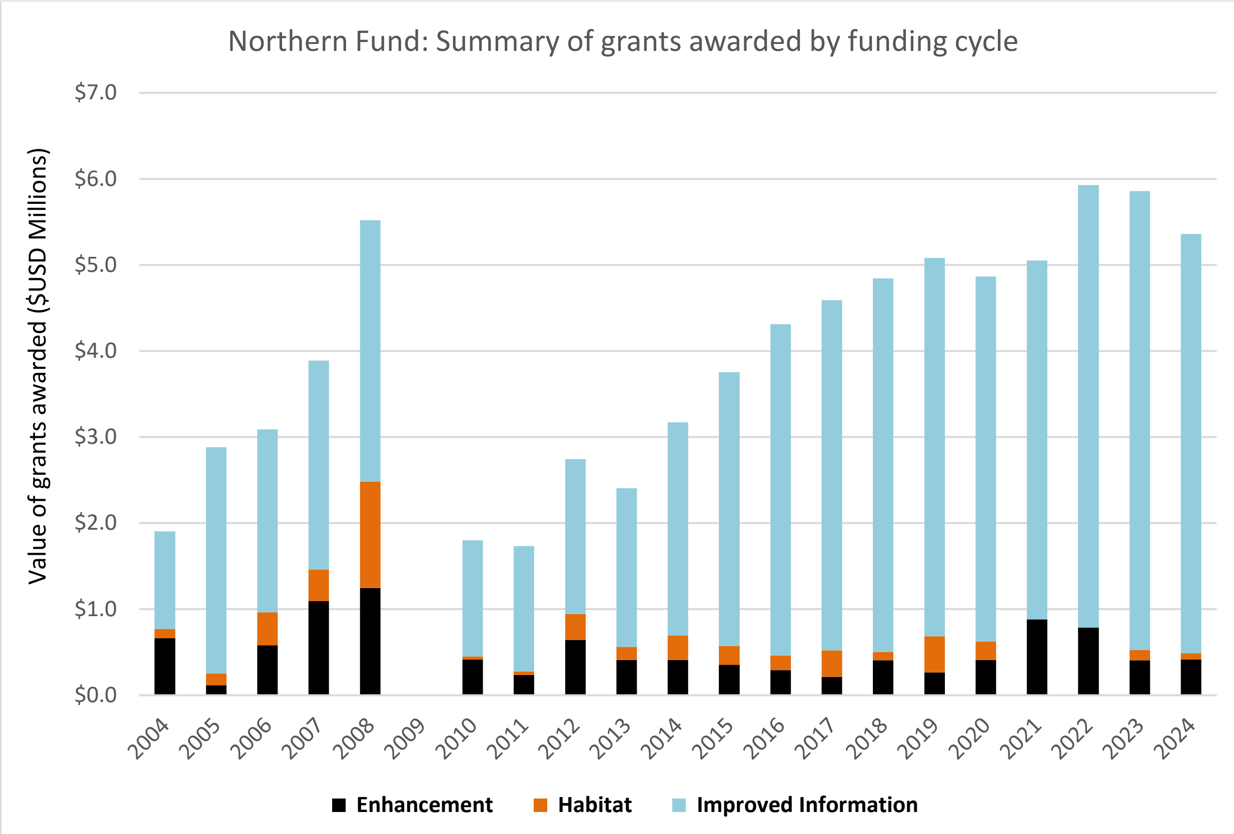
| | **Contributed Capital** | | **Asset Value** | |
|---|---|---|---|---|
| **Northern:** | $75,000,000 USD | $112,388,000 CAD | $139,975,000 USD | $201,312,000 CAD |
| **Southern:** | $65,000,000 USD | $97,408,000 CAD | $125,719,000 USD | $180,809,000 CAD |

### *2024 Project Funding*

In 2024 the Southern Fund supported 43 projects. Grants awarded totaled $3.66 million USD. Projects addressing specific priorities identified by the PSC's Fraser River Panel, Southern Panel, and Chinook Technical Committee accounted for $1.89 million USD of grants awarded (52%).

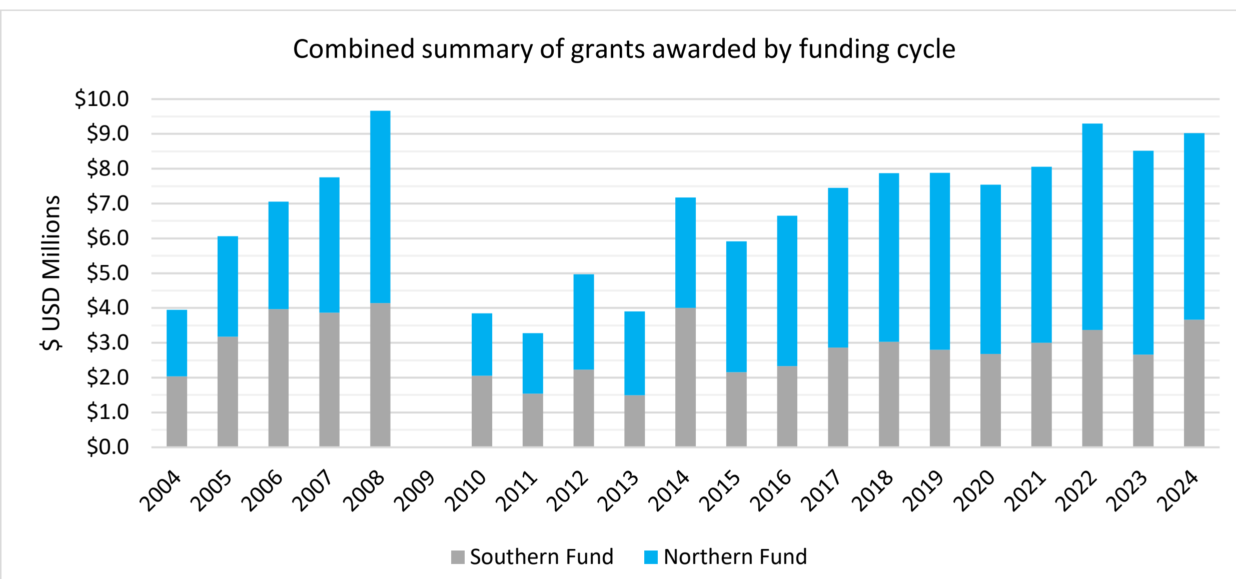



In 2024 the Northern Fund supported 40 projects. Grants awarded totaled $5.36 million USD. Four projects with a total value of $412,559 USD were classified as Enhancement projects, 35 projects with a total value of $4.87 million USD were classified as Improved Information projects, one project with value of $74,538 USD was classified as a Habitat project.




Between 2004 and 2024 the Northern Fund has awarded grants worth $78.79 million USD to 959 projects. Over this same period the Southern Fund has granted $57.08 million USD to 762 projects.

Total Fund project grants awarded to date are $135.87 million USD in support of 1,721 projects. Included in this total is $5 million USD from the Southern Fund to the Salish Sea Marine Survival Program. In addition to these amounts, the Chinook Sentinel Stocks Program was funded jointly by the Northern and Southern Funds between 2009 and 2014 for $10 million USD.



### ***Joint Fund Committee Meetings***

The Northern and Southern Fund Committees have agreed that given the congruent nature of their agendas, their decision to combine the funds into a single master account for investment management purposes, and the efficiencies involved with respect to interaction with investment advisors and managers, it is appropriate to meet periodically as a Joint Fund Committee. The two Fund Committees met together as a Joint Fund Committee twice in 2024.

*Spring Meeting: May 8 and 9, 2024*

Members attended the meeting both in-person at the PSC offices in Vancouver and virtually. The agenda included:

- Receipt and review of Q4 (2023) and Q1 (2024) investment performance reports and a comparison of global equities held by the Fund and associated investment manager fees from the Committee's investment consultants, George & Bell Consulting.
- An overview of the process taken for, and status of, recovering withholding tax paid on income received on investments with Morgan Stanley and PH&N Institutional for the years 2020-2022.
- Review of the updates to the PSC website.
- Presentation of the Communications Implementation Plan and update on communications activities for the prior year.
- Review of the costs of fund administration in the previous financial year, and review and approval of the budget for fund administration in FY 2024/25 under the new administration fee model.
- An update from the Joint Fund Committee Finance Sub Committee and discussion of future taskings of the Finance Sub Committee.
- A review of the workplan for the Grant Program Manager, and review of the Secretariat staff support provided in the prior year.

*Fall Meeting: November 13, 2024*

Members attended the meeting both in-person at the PSC offices in Vancouver and virtually. The agenda included:

- The receipt and review of Q2 and Q3 investment performance reports, and comparison of similar funds in terms of asset mix and returns, from George & Bell Consulting.
- Review of the Statement of Investment Policies and Procedures.
- Presentations / interviews with three of the Committees' current investment managers: Axium, IFM, and ACM.
- Review of the results of the FY 2023/2024 audit of the Funds and associated financial statements.
- Review of project amounts granted in comparison to discretionary administration fees for the period 2015-2024.
- An update on administration expenses for the current fiscal year and presentation of the budget for salaries and benefits for 2025/26 fiscal.
- Further discussion of outcomes from the Communications Implementation Plan, including a presentation on Grant Management Systems and next steps for implementation; and discussion and presentation of signage options for select project sites.

### *Joint Fund Committee Finance Sub Committee Meeting*

The Finance Sub Committee exists as a venue to have more detailed discussion on annual financial statements and create administrative efficiencies in the Joint Fund Committee process. The Finance Sub Committee met once in 2024.

*April 23, 2024*

This meeting was held virtually. The agenda included:

- Review of current year administration expenses.
- Review of the budget for the fiscal year 2024/25 under the new administration fee model.

### *Northern Fund Committee Meetings*

The Northern Fund Committee met on three occasions in 2024.

1. February 20 and 21 (hybrid meeting): The Committee met to make final decisions about the projects to support in 2024. The Committee also formally adopted adjustments to their spending policy; discussed the project presentation at the January 2024 PSC Meeting; considered a field trip for 2024; and reviewed items to incorporate in the Communications Implementation Plan.
2. May 10 (hybrid meeting): The Committee met to confirm the scope, priorities, and deadline for the 2025 Northern Fund Call for Proposals. The Committee also received updates on project reporting and project change requests.
3. October 2 and 3 (hybrid meeting): The Committee met to make decisions about the selection of project concepts to advance to the detailed proposal stage. The Committee also reviewed the detailed proposal application form; reviewed actual (vs. budgeted) expenditures on Northern Fund projects; discussed a standardized reporting approach; and inviting select project proponents to present at PSC post and pre-season meetings.

### *Southern Fund Committee Meetings*

The Southern Fund Committee met four times in 2024.

1. February 27 (hybrid meeting): The Committee met to make final decisions about the projects to support in 2024. The Committee also discussed PSC contribution agreements; and reviewed items to incorporate in the Communications Implementation Plan.
2. May 6 (virtual meeting): The Committee met to agree on the scope, priorities, and deadline for the 2025 Southern Fund Call for Proposals. The Committee also discussed possible changes to their spending policy and how the funds are managed in proportion to their original allocation. The Committee also received an update on overdue project reports, project change requests, and discussed potential field trips for 2024.
3. September 27 (hybrid meeting): The Committee met to make decisions about the project concepts to advance to the detailed proposal stage. The Committee reviewed the stage two application form and discussed late applications and proposal submission procedures. The

Committee also received presentations on fund unitization and allocation; and actual (vs. budgeted) expenditures of Southern Fund projects for 2014-2023.

4. October 16-17 (in-person): Three members of the Committee and Grant Program staff undertook a field trip to tour a project site in the hiłsyaqƛis watershed (Tranquil Creek), on the West Coast of Vancouver Island, British Columbia.

### *Committee Appointments*

Mr. James (Jim) Scott was appointed to the U.S. Section of the Southern Fund Committee in May 2024, replacing Mr. Larry Peck as the U.S. Co-Chair.

### *Call for Proposals for projects in 2025/26*

Both Fund Committees issued a Call for Proposals in May 2024 for projects starting in 2025.

The Southern Fund Committee focused its 2025 Call for Proposals on habitat restoration projects and specific priorities identified by the PSC's Fraser River and Southern Panels, Chinook Technical Committee, and Okanagan Work Group. In response, the Committee received 96 proposals requesting approximately $10.6 million USD. During the first-round review meeting the Committee selected 62 of these proposals to move to the second stage. The final decisions on 2025 funding will be made in February 2025.

The Northern Fund Committee focused its 2025 Call for Proposals on projects seeking to develop improved information for resource management; the rehabilitation and restoration of marine and freshwater fish habitat; the enhancement of wild-stock production through low technology techniques and proposals responsive to the recommendations and objectives set out within the PSC's Transboundary Panel Strategic Salmon Plan and the Northern Panel Strategic Salmon Plan. The Committee received a total of 70 concept stage proposals requesting approximately $8.2 million USD. 49 proposals were selected to move to the second-round detailed proposal stage. Bilateral technical reviews of the detailed proposals took place in January 2025 and final funding decisions will be made in February 2025.

PACIFIC SALMON COMMISSION

ESTABLISHED BY TREATY BETWEEN CANADA
AND THE UNITED STATES OF AMERICA
MARCH 18, 1985

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# Summary Report of the Mark Selective Fishery Fund 2024

## *Introduction*

In the 2019 amendments to the Pacific Salmon Treaty (PST), Chapter 3, paragraph 4(g)(v), led the U.S. to establish a Mark Selective Fishery (MSF) Fund (Fund) to assist fishery management agencies and partners with implementing MSFs in each country.

The highest priority of the Fund is to provide one-time equipment purchases or short-term (duration of ≤ 3 years) studies rather than supporting ongoing annual programs. The Fund supports a competitive grant program to a) mass-mark or sample hatchery-produced Chinook salmon, b) estimate incidental mortality, and c) maintain and improve the ability to estimate exploitation rates on Chinook salmon indicator stocks encountered in MSFs. This work could include improvements and development of bilateral analytical tools.

The U.S. provided $75,000 USD to initiate the Fund in 2019 and an additional $1.75 million USD in 2020 and 2021, respectively. The U.S. provided an additional $396,000 USD in September 2024. The U.S. may provide additional funding in subsequent years as needs are identified and if additional funding becomes available.

## *Committee Members*

**Canada:**

Dr. Rob Houtman
Mr. Janvier Doire
Mr. Laurie Milligan
Ms. Erika Watkins

**United States:**

Mr. Craig Bowhay
Ms. Danielle Evenson
Dr. Jake Kvistad
Ms. Marianne McClure

**Canada Alternates**

Mr. Peter Hall

**United States Alternates:**

N/A

### *Executive Summary*

- In 2024 the MSF Fund Committee's (Committee) Request for Proposals (RFP) was open between May 22 and August 1, 2024. The Pacific Salmon Commission (PSC) made the balance of funds estimated at $1.6 million USD available in this round of funding. The Fund fully supported five projects, partially supported one project, for a total of six projects supported. Grants awarded totaled $1,231,927 USD.
- Since 2021, at the recommendation of the Committee, the PSC has approved grants of $3,164,779 USD to a total of twenty projects.
- In September 2024, the U.S. Department of State advised the PSC Secretariat that the U.S. intended to make a voluntary contribution of $396,000 USD to support the Fund.
- The Terms of Reference for the Fund provide that 50% of the funding allocated each year shall be available to Canada and 50% to the U.S., unless otherwise determined by the Commission. At the October 2024 PSC Fall Meeting the PSC waived the 50% bilateral allocation for 2024. The Committee has noted it hopes to receive a greater proportion of U.S. applications in 2025.
- At the October 2024 PSC Fall Meeting the PSC approved the balance of funds remaining in the program (including interest) be made available for the 2025 RFP. The amount is estimated to be approximately $850,000 USD.

## *Project Funding and Summary*

In 2021 the Fund supported three projects, two completed in 2022, and one completed in 2024. In 2022 the Fund supported five projects, three completed in 2023, one completed in 2024, and one remains ongoing. In 2023 the Fund supported six projects, two completed in 2024, and four remain ongoing. In 2024 the Fund supported six projects. Grants awarded across all years' total $3,164,779 USD to twenty projects.

Eleven projects overall are ongoing or scheduled to begin in 2025. Final project reports and interim progress reports are attached as an appendix.

## *Completed Project Summary (2024)*

**MSF-06-21: Mass Marking of hatchery produced Sarita Chinook salmon, Huu-ay-aht First Nations Government**

This project was active from November 1, 2021, through June 30, 2024, and received funding of $165,000 CAD. The project was funded for the mass marking of hatchery produced Sarita River Chinook salmon which had been funded by Huu-ay-aht First Nations (HFN) since the 2017 brood year and sampling of returning adults. The work is part of a joint pilot effort by HFN and Fisheries and Oceans Canada (DFO) to increase returns of Chinook salmon to the Sarita River by improving survivability under optimal rearing strategies at the Nitinat Hatchery, enhancing habitat for natural spawners, increasing the proportion natural index (PNI) over time to maintain a viable natural spawning population, and to facilitate MSFs in terminal areas in the future.

Continued mass marking of the releases for brood years 2021, 2022, and 2023 enabled the completion of one full brood cycle (Sarita Chinook are between 3 and 6 years of age) and consisted of all fish being adipose fin clipped plus a percentage of those being coded wire tagged (CWT). Exact proportions of CWT versus adipose fin clipping only were determined each year based on the total number of Chinook surviving to release, research objectives, and available funds. However, the goal was that all fry released would be marked at least with an adipose clip.

The project is anticipated to make a significant contribution to our understanding of how terminal MSFs might be implemented and enhanced through collaborative efforts by DFO and a BC First Nation. The results of this research will have applicability to other salmon populations in the Pacific Northwest. The specific project objectives were:

1. Research and evaluate different rearing strategies that will improve survival, size, and age at return to fisheries and escapement;
2. Enable the use of predominantly natural origin broodstock for hatchery production;
3. Increase the PNI for Chinook returning to the Sarita River from the current level of 0.12 to 0.5 through selective removals of hatchery fish in terminal fisheries (i.e., Huu-ay-aht First Nation Treaty fishery in lower river);
4. Adapt hatchery production goals over time and in step with habitat restoration successes by the HFN Watershed Renewal Program;
5. Enable a viable and sustainable MSF on Sarita Chinook salmon in the future; and
6. Provide marine survival estimates for Sarita Chinook salmon.

**MSF-04-22: Evaluation of the Feasibility of Implementing a Mark Select Fishery in the Southeast Alaska Chinook Salmon Sport Fishery, Alaska Department of Fish & Game**

Due to administrative workflow hurdles, the start of the project was delayed until February 21, 2023. The Committee approved a no-cost extension, shifting the project end date to December 31, 2024. The project received funding of $108,720 USD.

The project objectives included:

1. Review the management, assessment, and hatchery enhancement programs associated with the king salmon sport fishery in SEAK to understand the implications of implementing MSFs as a management tool in SEAK;
2. Estimate the number of adipose-fin clipped (marked) fish in the SEAK king salmon sport fishery by time, area, and stock;
3. Engage SEAK fishing community members to synthesize community and regional perspectives on MSFs;
4. Evaluate potential costs and benefits of MSFs in the SEAK king salmon sport fishery, incorporating community perspectives; and
5. Develop an evaluation template, incorporating objectives 1, 2, 3, and 4, to assess the feasibility of implementing an MSF.

The first phase of the project focused on a literature review of MSFs in other areas subject to the PST outside Alaska to inform community engagement meetings and the development of the program review. The second phase included development of the program review and beginning the cost benefit analysis. A qualitative cost-benefit analysis drew from information generated throughout the project to describe positive and negative impacts of potential MSF implementation in the SEAK king salmon sport fishery. Finally, the feasibility assessment process utilized for this study was adapted into a feasibility template that other fisheries management agencies could incorporate into their MSF planning process.

Potential benefits and costs of MSF implementation in the SEAK king salmon sport fishery were organized into three categories: ecological, socioeconomic, and institutional. The primary ecological benefit of an MSF is the potential for reduced fishing mortality of wild king salmon stocks, when compared to a non-selective fishery operating within the same time and area. Both socioeconomic benefits and costs were found present when considering MSFs. Benefits were related to providing fishing opportunity and fishery assessment; however, costs were more varied and substantial. Potential institutional benefits could include improved data for monitoring king salmon harvest. However, a variety of institutional costs were identified, including costs to management agencies to implement, evaluate, and report on this more complex regulatory approach.

The project found that currently, a regionwide MSF is not likely to provide a net benefit to the SEAK king salmon sport fishery. MSFs applied in specific areas and times where Alaska hatchery stocks are more prevalent in the fishery may be a useful management tool, however there are costs and benefits for each scenario. Assessment tools and programs would need to be in place to ensure benefits are realized without negatively impacting wild stocks or compromising assessment and management of the sport fishery itself. These considerations and the specific fishery assessment and community-based issues identified in this feasibility study should be addressed before any MSF is advanced in the SEAK king salmon sport fishery. The MSF feasibility template developed as part of this study provides a systematic approach for management agencies to assess these important planning considerations.

**MSF-23-06: Best Practices for Improving CWT Sampling and Recovery Data, Pacific States Marine Fisheries Commission**

This project was active from November 1, 2023, through October 31, 2024, and received funding of $34,349 USD. This project focused on improving the quality of CWT data collected and submitted to the Regional Mark Processing Center Regional Mark Information System. This work was accomplished by compiling existing guidance on CWT lab procedures (e.g., extraction and reading), reviewing and revising this guidance with experts, and finalizing lab guidance in a document and lab poster.

The primary objectives of this project consisted of using a collaborative approach to succinctly develop a document on: (1) CWT lab guide procedures, including extraction and reading, (2) best methods for calculating expansion factors in the presence of MSF and complex regulations, and (3) best practices for subsampling and associated expansion calculations. A secondary objective was to develop visual posters that would effectively convey the main steps from the CWT lab guide.

The project was successful in producing the proposed CWT Lab Guide and Lab Posters. These final products reflected the expertise and input of Regional Committee on Marking and Tagging (RCMT) members and CWT lab experts. The RCMT is dedicated to several key objectives, including maintaining the integrity of data used for stock assessment, harvest management, and enhancement evaluation. The finalized CWT Best Practices document (including guidance on expansion rates) and the accompanying lab poster embody these objectives by ensuring the accurate extraction and recording of CWT data. This focus on consistency and data quality enhances the reliability of exploitation rate estimates. The production of the CWT Lab Guide and Lab Posters will aid in ensuring the quality of CWT data being provided by CWT labs and support the appropriate use of expansion calculations and related subsampling.

**MSF-23-08: Populating a Coastwide Chinook and Coho Fishing Regulations Database, Pacific States Marine Fisheries Commission (PSMFC) and Washington Department of Fish and Wildlife (WDFW)**

This project was active from November 1, 2023, through October 31, 2024, and received funding of $73,819 USD.

*WDFW summary report:*
This portion of the project was aimed at transitioning the prototype database and web application work conducted by WDFW staff to PSMFC staff and contractors over the course of fourteen days. Insights into database structure and user interface were shared between the two parties over a series of meetings. The transition was successful with the project being led by PSMFC staff.

*PSMFC summary report:*
This project aimed to address critical gaps in the ability to link fishery regulations to catch and release estimates by developing and populating a coastwide fishing regulations database for Chinook and Coho salmon. This effort builds on a 2022 feasibility study and prototype database, focusing on transitioning to a permanent location, refining the database structure, and integrating it into broader PSC data systems.

The project achieved significant progress toward its objectives, despite challenges that affected timelines. The relational database schema, informed by pilot data and feedback from stakeholders, has positioned the database for scalable, efficient data entry and retrieval. This directly supports PSC goals of assessing MSF impacts and enhancing the accuracy of exploitation rate analysis.

The project's success in launching a functional web application and compiling key regulation datasets demonstrates its value to the PSC and stakeholders. With continued refinement and collaboration, the project is well-positioned to address remaining challenges and deliver a comprehensive fishing regulations database.

This project represents a significant step forward in the development of a comprehensive fishing regulations database to support the PSC and its Chinook Technical Committee. Despite challenges, the project achieved several key milestones, including:

- Migration of the database to a permanent MSSQL platform at PSMFC.
- Completion of a relational schema restructuring to support hierarchical regulation structures.
- Development and launch of a functional web query application.
- Compilation and permanent storage of regulations literature from multiple states, tribal areas, and post-season reports.

These accomplishments underscore the project's alignment with PSC objectives, particularly in improving the accuracy of MSF assessments and exploitation rate analysis.

## *Ongoing Project Summary*

### MSF-03-22: Mass marking of Hatchery Produced San Juan Chinook Salmon, Pacheedaht First Nation (PFN)

This project began on March 1, 2023, and is active until January 30, 2026. Total funding is $163,834 CAD. This project includes three years of funding, with Year 1 beginning in brood year 2022, to mark hatchery-produced San Juan Chinook at the 4 Mile Hatchery, with the plan to mark all Chinook released from seapens and to increase the mark rate on the freshwater released Chinook (as hatchery infrastructure and staff capacity allow).

The project has met all objectives for Year 2; marks were applied to a total of 122,566 San Juan Chinook smolts (75,690 of those fish also received a CWT). The project is currently on track for Year 3; the 2024 broodstock has been collected and spawned successfully, with the intention to continue marking/tagging Chinook as per the first two years, and hopefully increasing the mark rate further for Year 3.

A new release strategy was piloted in Year 2 in the upper San Juan River. In recent years, PFN have observed Chinook spawning lower in the San Juan River which is thought to be due to most hatchery releases occurring in the lower San Juan (at Fairy Lake). We are planning to adopt this new upper river location for more of the 2025 freshwater release group, with the goal of encouraging more hatchery fish to spawn in the upper river spawning habitat. All fish released at the upper river site will be marked so as not to interfere with data collection on natural-origin Chinook at the downstream rotary screw trap.

There are currently no risks to the projects' completion. However, hatchery infrastructure and capacity are ongoing challenges due to climate change. The 4 Mile Hatchery's primary water source is surface water which dries up during severe drought, and the generator for the backup well system is costly to operate continuously. During drought conditions access to the San Juan River to release juveniles can also be challenging. The availability of CWT machines remains a challenge.

The project is on schedule, with no delays expected. Due to a slight budget increase for Years 2 and 3, the project is anticipated to stay within budget. The scope has not changed, other than plans to increase the total mark rate of hatchery-produced San Juan Chinook at the request of the Committee. We have completed Years 1 and 2 of 3, leaving less than one-third of the project to be completed. Work and discussions are underway to increase the overall mark rate of hatchery-produced San Juan Chinook in the final year.

**MSF-23-01: MSF Regulations Database – FRIS Query/Export Tool, Fisheries and Oceans Canada**

This project was scheduled to begin on November 1, 2023, and run until September 30, 2024. Due to internal financial issues, there were initial delays with starting the project, and a no-cost extension request was subsequently granted. The new end date is March 31, 2025. Total funding is $40,000 CAD.

The objective of the project is the development of queries and export tools on recreational management measures/regulations entered in DFO's Fishery Regulations Information System (FRIS). FRIS is the database where all BC tidal waters recreational fishing regulations are stored. Technical enhancements to FRIS are required to enable easier extraction of MSF regulations. The development of new technical tools to export the data will aid in the estimation of recreational catch by stock in MSF.

The project is behind schedule as financial documentation has not yet been complete. Documentation is drafted and going through approval processes. FRIS contractors have been briefed on the project and are ready to complete the work January to March 2025. Target completion date is March 31, 2025.

**MSF-23-03: Implementing a Canadian "Node" in the DIT Network Recommended in the CYER WG: Double Index Tagging and Escapement Recovery of Big Qualicum Chinook as an Audit of the CYER Analytical Methods being Implemented by the CTC, Fisheries and Oceans Canada**

This project began on March 1, 2024, and is active until November 30, 2026. Total funding is $170,330 CAD. This project will implement the first Canadian Chinook DIT indicator stock which will allow for an assessment of the accuracy of the CYER estimates developed using the adopted SIT methods for southern BC Chinook stocks impacted by MSFs. The stock selected to represent the DIT Indicator Network is Big Qualicum River (BQR), which meets several of the criteria specified in Recommendation 3.2 of PSC Tech. Rep. No. 50, 2023. This also provides an opportunity for enhanced monitoring of salmon stocks as the data collected from this program will be used to improve and validate the assumption that a CWT Indicator stock represents a naturally spawning Chinook salmon stock. Enhanced monitoring is essential to achieve accurate assessments of productivity and status of Chinook salmon stocks, particularly for vulnerable populations. Additionally, enhanced monitoring of MSFs is currently an initiative being pursued domestically to ensure salmon stocks are not negatively impacted by the implementation of MSFs.

The hatchery tagged and released an unmarked group of fish (200k) in the spring of 2024, which is the same number of releases as the regular marked CWT release group. The hatchery implemented new practices to avoid confounding variables during release, and to ensure that both the unmarked and marked CWT release groups were as identical as possible with the exception of mark status. A tag loss study was conducted to determine the retention rate of the tags that were applied to both the marked and unmarked CWT fish.

There were limitations with the availability of containers at the BQR hatchery which affected the number of fish that were retained after tagging to measure rates of tag loss. While the goal was to retain 2,000 fish total, due to tank renovations all fish had to be retained together for the 30-day holding period to measure tag loss. In the production AdCWT/Late Release fish group, 606/606 retained their tags, leading to a 100% tag retention rate. For the production CWT only group, one fish out of 515 lost their tag, resulting in a 99.8% tag retention rate. It is anticipated that similar tub restrictions will occur in 2025, which will lead to less than 2,000 fish retained. However, due to automatic tagging trailers and other upgraded equipment, it is not anticipated that tag loss will be a major issue and the smaller sample size for tag retention should not impact the results of this project.

The project is on schedule and on budget with no delays expected.

**MSF-23-04: Mass Marking of hatchery produced Sarita Chinook salmon, Huu-ay-aht First Nations (HFN) Government**

This project is a one-year continuation of MSF-06-21. This portion of the project began on August 1, 2024, and is active until July 31, 2025. Funding for this portion of the project is $75,000 CAD. The project proposed ongoing mass marking of hatchery produced Sarita River Chinook salmon. The work is part of a joint pilot effort by HFN and DFO to increase returns of Chinook salmon to the Sarita River by improving survivability under optimal rearing strategies at the Nitinat River Hatchery (NRH), enhancing habitat for natural spawners, increasing the PNI over time to maintain a viable natural spawning population, and to facilitate MSFs in terminal areas in the future. This project will make a significant contribution to our understanding of how MSFs might be implemented and enhanced through collaborative efforts by DFO and a BC First Nation. The results of this research will have applicability to other salmon populations in the Pacific Northwest.

Staff from NRH and HFN conducted beach seines at Sarita River in 2024. HFN was primarily focused on collecting surplus fish (primarily marked male) for harvest while NRH was focused on collecting fish for broodstock (primarily unmarked males and females). Additionally, any unmarked or marked fish not selected for broodstock or harvest purposes were released after being counted, sex and operculum punched. Due to September drought conditions, collection sites were limited to the lower reaches of Hunter Creek, Cable Car Pool, and Corder Pool for both broodstock and harvest collection efforts.

Goals achieved include:

- Research completed to evaluate different rearing strategies that will improve survival, size, and age at return to fisheries and escapement.
- Predominantly natural-origin broodstock used for hatchery production;
- Successful strategies utilized to increase PNI for Chinook returning to the Sarita River. Examples: natural origin brood stock, marked males removed for harvest, sampling protocols support PNI research goals
- Collaboration between hatchery production and habitat restoration in HFN Watershed Renewal Program.
- 3 years of successful sustainable MSF on Sarita Chinook salmon, Indigenous led fishery benefiting HFN citizens.

The project schedule continues to be met and the target of successfully marking the releases from the 2022-2024 brood years has been met. The project has not encountered any issues or roadblocks and there are no risks to the project being completed other than a complete collapse of returning adult Chinook. The 2024 return was very good and broodstock was once again successful, setting the stage for the final 100% marking under this funding arrangement.

**MSF-23-05: Mass marking of hatchery produced Conuma River and Gold River Chinook salmon and development of a complementary reference fishery in PFMA 25 (Nootka Sound and Esperanza Inlet), Fisheries and Oceans Canada**

This project began on April 1, 2024, and is active until February 1, 2027. Total funding is $878,136 CAD. The initial proposal was to 100% mass mark, via adipose clip, the entire production of Chinook from the Conuma (up to three million) and Burman (up to three hundred thousand) Rivers. Upon a closer review, after the proposal was submitted, an evaluation of the contribution of strays in the escapement into the Burman River increased our concern regarding the trajectory and rate of loss of native Burman ancestry. It was determined and agreed to by both the principal investigator and the Committee that a shift from mass marking the Burman stock to the Gold River Stock (near the Burman) was a prudent modification to the program. This pivot in the approach to the Burman stock will help to prevent complete loss of native population genetics. The revised plan was to attempt to mark 100% of the Conuma (~540 thousand), Gold and Robertson Creek Chinook which are the populations that comprise 98% of Burman stray-ins (2012-2022). In the future, this will allow for the near 100% exclusion of strays in our brood collection for Burman stock in future years while supporting a higher contribution of mass marked Chinook returns to Area 25.

In 2024, all 3- and 4-year-old Chinook from Conuma and Burman hatcheries were 100% hatchery-marked. These hatchery-origin stocks were expected to make up a considerable proportion of the stock composition of Chinook intercepted by the recreational fishery in Nootka Sound and Esperanza Inlet (Area 25) during July and August. To evaluate the potential of an MSF in Area 25, sampling occurred during 42 boat days conducted during those months. The reference fishery methods emulated typical recreational fishing trips targeting Chinook salmon. Professional fishing guides were contracted to maximize catch per unit effort, as the objective was to assess the composition of the fish vulnerable to the fishery rather than to evaluate effort. All fish caught during the reference fishery were released, with only Chinook brought on board for biological sampling. For each Chinook captured, data recorded included catch location, time to landing, fork length, adipose fin clip status, and a tissue sample for genetic stock identification.

The only issues encountered during this project was the shift from mass marking the Burman Chinook stock to the Gold River Chinook. Strong rationale for that shift was provided and the Committee supported the change in the project. This portion of the project is complete. For the Reference Fishery portion the project is on schedule and within budget as it moves into the 2025 sampling season.

**MSF-24-01: Assessment of post-release mortality in the recreational fishery: updating previous work and quantifying the use of best practices, University of British Columbia**

This project is scheduled to begin July 2, 2025, and runs until June 30, 2026. Total funding is $77,469 CAD.

**MSF-24-02: Estimating Chinook salmon incidental mortality in recreational fisheries in British Columbia, Fisheries and Oceans Canada**

This project began on November 1, 2024, and runs until October 31, 2025. Total funding is $85,000 CAD. No progress report required as the project is in initial stages.

**MSF-24-04: Maintaining a Canadian “Node” in the DIT Network Recommended by the CYER WG: Double Index Tagging and Escapement Recovery of Big Qualicum Chinook as an Audit of the CYER Analytical Methods being Implemented by the CTC, Fisheries and Oceans Canada**

This project is scheduled to begin April 1, 2027, and runs until March 31, 2030. Total funding is $176,986 CAD.

**MSF-24-06: Mass marking of hatchery produced Conuma River and Gold River Chinook salmon, Fisheries and Oceans Canada**

This project began on November 1, 2024, and runs until July 30, 2025. Total funding is $402,500 CAD. No progress report required as the project is in initial stages.

**MSF-24-07: Mass marking capacity expansion for DFO (Fisheries and Oceans Canada) Hatchery program, Fisheries and Oceans Canada**

This project began on October 1, 2024, and runs until March 31, 2026. Total funding is $675,000 CAD. No progress report required as the project is in initial stages.

**MSF-24-09: Phase 2 of Populating a Coastwide Salmon Fishing Regulations Database, Pacific States Marine Fisheries Commission Washington Department of Fish and Wildlife**

This project began on November 1, 2024, and runs until October 31, 2025. Total funding is $183,380 USD. No progress report required as the project is in initial stages.

# Mark Selective Fishery Fund
# Project Final Report

| | |
|---|---|
| **Project Title:** | Sarita River Chinook Mark Selective Fishery Pilot, 2021 - 2024 |
| **Period covered:** | November 1, 2021 to June 30, 2024 |
| **Name of Organization / Affiliation:** | Huu-ay-aht First Nations |
| **Principal Investigator / Project Lead:** | Christine Gruman / Robert Bocking |

## Contents

## Introduction

The Huu-ay-aht First Nations (HFN) have ongoing watershed-scale restoration and salmon rebuilding initiatives aimed at restoring and revitalizing the Sarita, Pachena and Sugsaw watersheds to improve salmon stock viability (https://huuayaht.org/watershed-renewal-project/ ). This includes upslope, in-river and riparian research and rehabilitation initiatives, extensive upland efforts to curtail impacts from past and present forestry-related activity, improving fish passage, rehabilitating estuary environments, and a collaborative focus on responsible hatchery enhancement with DFO. Together, these efforts have the potential to improve salmon populations. The HFN has made extensive investment (>$500k per year since 2017).

This project was funded specifically for the mass marking of hatchery produced Sarita River Chinook salmon which had been funded by Huu-ay-aht First Nations since 2017 brood year and sampling of returning adults. This work is part of a joint pilot effort by HFN and DFO to increase returns of Chinook salmon to the Sarita River by improving survivability under optimum rearing strategies at the Nitinat Hatchery (New and Brouwer, 2015), enhancing habitat for natural spawners, increasing the proportion natural index (PNI) over time to maintain a viable natural spawning population, and to facilitate mark selective fisheries in terminal areas in the future.

Continued mass marking of the releases for brood years 2021, 2022, and 2023 will enable the completion of one full brood cycle (Sarita Chinook are between 3 and 6 years of age) and will consist of all fish being adipose fin clipped plus a percentage of those being coded wire tagged (CWT). Exact proportions of CWT versus adipose fin clipping only were determined each year based on the total number of Chinook surviving to release, research objectives, and available funds. However, the goal was that all fry released would be marked at least with an adipose clip.

In addition to the 100% marking of releases, each year, DFO and HFN staff conduct broodstock collections and escapement enumerations in September and October as well as dead pitches and sampling of the HFN Mark Selective Fishery.

The project is anticipated to make a significant contribution to our understanding of how terminal mark selective fisheries might be implemented and enhanced through collaborative efforts by DFO and a BC First Nation. The results of this research will have applicability to other salmon populations in the Pacific Northwest. The specific project objectives were:

1. Research and evaluate different rearing strategies that will improve survival, size and age at return to fisheries and escapement;
2. Enable the use of predominantly natural origin broodstock for hatchery production;
3. Increase the proportion natural index (PNI) for Chinook returning to the Sarita River from the current level of 0.12 to 0.5 through selective removals of hatchery fish in terminal fisheries (i.e., Huu-ay-aht First Nation Treaty fishery in lower river);
4. Adapt hatchery production goals over time and in step with habitat restoration successes by the HFN Watershed Renewal Program;
5. Enable a viable and sustainable mark selective fishery on Sarita Chinook salmon in the future; and
6. Provide marine survival estimates for Sarita Chinook salmon.

This report covers the Mass Marking of Sarita Chinook Salmon releases from the 2021, 2022, and 2023 Brood Years and biological sample collection from the 2021, 2022, and 2023 escapements.

# Methods

## *Adult Returns, Anticipated Mark Status and Marking of Hatchery Releases*

As Sarita River Chinook salmon return as 2 yr olds (jimmies) to 6 yr olds, spawner returns to Sarita River in 2021, 2022 and 2023 were expected from BY2015 through to BY2022 (see Table 1). BY2015 and BY2016 were 100% unmarked (no adipose fin clip or CWT pin), while BY2017 had 39.3% of the fish released with adipose fin clipped and CWT pin inserted. BY2018, BY2020, BY2021 and BY2022 were 100% marked, and BY2019 was only 60.3% unmarked (due to COVID restraints).

**Table 1.** Summary of releases and marking for Sarita Chinook anticipated to return in 2021, 2022 and 2023.

| Brood Year | Total Released | # Ad & CWT | # AD Only | # Unmarked | % CWT | % AD | % Unmarked |
|---|---|---|---|---|---|---|---|
| 2015 | 337,242 | - | - | 337,242 | 0.0% | 0.0% | 100.0% |
| 2016 | 385,333 | - | - | 385,333 | 0.0% | 0.0% | 100.0% |
| 2017 | 510,458 | 199,494 | 1,018 | 309,946 | 39.1% | 0.2% | 60.7% |
| 2018 | 304,165 | 199,916 | 104,249 | - | 65.7% | 34.3% | 0.0% |
| 2019 | 489,499 | 98,713 | 95,435 | 295,351 | 20.2% | 19.5% | 60.3% |
| 2020 | 292,674 | 195,717 | 96,957 | - | 66.9% | 33.1% | 0.0% |
| 2021 | 410,051 | 200,096 | 209,955 | - | 48.8% | 51.2% | 0.0% |

River swims along with the data from the removals provided an estimated escapement of 2,382 adult salmon (2,411 including jacks) in 2021; 2,870 adult salmon in 2022 (3,032 including jacks); and 4,110 adult salmon in 2023 (4,164 including jacks). Total Juvenile Production and Marking status since is shown in Table 2.

**Table 2.** Marking status for Sarita Chinook plus total juvenile production, 2015 to 2021 brood years, including the % Experimental smalls at release.

| **Brood Year:** | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|
| Natural Production | 150,000 | 150,000 | 77,174 | 146,553 | 531,059 | 308,714 | 680,892 |
| Unmarked | 337,242 | 385,333 | 309,947 | 0 | 295,351 | 0 | 0 |
| Ad | 0 | 0 | 1,018 | 104,249 | 95,435 | 96,957 | 209,955 |
| Ad & CWT | 0 | 0 | 199,494 | 199,916 | 98,713 | 195,717 | 200,096 |
| Marked (Ad & CWT + Ad only) | 0 | 0 | 200,512 | 304,165 | 194,148 | 292,674 | 410,051 |
| Total Release | 337,242 | 385,333 | 510,458 | 304,165 | 489,499 | 292,674 | 410,051 |
| % Marked | 0% | 0% | 39% | 100% | 40% | 100% | 100% |
| % Experimental (smalls) | 49% | 50% | 52% | 53% | 0% | 57% | 53% |

Note: Experimental (smalls) were released in 2019 but not marked due to COVID.

### *Removals and Sampling*

In each year, in-river beach seining for adult Chinook Salmon took place to collect broodstock, conduct river counts and collect fish for the HFN Terminal Mark Selective Fishery. All fish captured were counted, sexed and assessed for the presence/absence of a fin clip for the first beach seine set at each different location. Fish that were clipped were further assessed for the presence/absence of a coded wire tag. During the collection efforts, excess marked males were selected for the HFN Mark Selective Fishery (MSF), unmarked males and females for the brood collection efforts (though marked fish were used). Those fish returned to the river were selected for unmarked males and females, although marked fish were also released.

All fish removed for broodstock were sampled for length, scales and otoliths and DNA. Fish with an AD clip, were scanned with a T wand. Any fish identified as having a CWT (pin detected) had the head removed and sent to the ageing lab. Any fish with an AD clip but not identified as having a CWT (pin not detected) was identified as No Pin.

In each year, HFN conducted a Mark Selective Fishery (MSF) at the same time as broodstock collection operations. In contrast, to broodstock collection objectives, the main objective of the MSF was to selectively harvest marked males. Initially, every fish was to be sampled for sex, length, presence or absence of an adipose fin clip and presence or absence of CWT for fin clipped fish. However, for later years, sampling was reduced to every 3$^{rd}$ fish due to capacity of lab for analysis.

Fish released back to the Sarita River were counted, sexed and identified for presence/absence of adipose fin clip. All fish released were given an operculum hole punch to identify as already counted and sampled if caught a second time. The operculum hole punch was used for DNA analysis for a concurrent DFO-HFN project looking at reproductive success.

### *Hatchery Activities*

Sarita Chinook taken as brood stock are taken to the Nitinat Hatchery for egg removal, fertilization, and rearing. Table 3 provides the overall production results for 2013 – 2023 brood years.

**Table 3** Nitinat Hatchery Production for Sarita Chinook, 2013 – 2023 Brood Years.

| Brood Year | # Green Eggs | # Eyed Eggs | Eyed Survival | # Ponded | Green to Ponded Survival | # Released | Green to Release Survival |
|---|---|---|---|---|---|---|---|
| 2013 | 347,649 | 319,361 | 91.9% | 312,197 | 89.8% | 306,090 | 88.0% |
| 2014 | 151,288 | 142,220 | 94.0% | 140,240 | 92.7% | 138,790 | 91.7% |
| 2015 | 366,873 | 334,742 | 91.2% | 339,738 | 92.6% | 337,242 | 91.9% |
| 2016 | 410,631 | 394,400 | 96.0% | 388,884 | 94.7% | 385,333 | 93.4% |
| 2017 | 556,008 | 527,453 | 94.9% | 516,926 | 93.0% | 510,450 | 91.8% |
| 2018 | 364,692 | 339,646 | 93.1% | 319,881 | 94.1% | 304,165 | 83.4% |
| 2019 | 543,106 | 508,124 | 93.6% | 497,069 | 91.5% | 489,498 | 90.1% |
| 2020 | 411,797 | 366,488 | 89.0% | 347,016 | 84.3% | 292,674 | 71.1% |
| 2021 | 519,882 | 475,293 | 91.4% | 420,898 | 80.9% | 409,991 | 78.86% |
| 2022 | 547,701 | 507,684 | 92.69 | 482,125 | 88.0 | 440,831 | 80.49 |
| 2023 | 601,394 | 559,523 | 93.0 | 593,294 | 98.7 | 581,598 | 96.7 |
| **Total** | **3,152,044** | **2,932,434** | **93.0%** | **2,862,041** | **90.8%** | **2,764,242** | **87.7%** |

## Results

### *Marked Status*

<u>2021</u>

In 2021, a total of 332 fish were removed for broodstock purposes (174 F; 158 M) and a total of 298 fish were successfully spawned (149 F; 149 M) (Table 4). Mortalities/Rejects were a total of 34 fish (10.2%). Of the 332 fish removed, 89 fish were adipose fin clipped (26.8%) of which 78 were CWT'ed. The remaining 243 were not adipose fin clipped (73.2%) but only 28 fish were identified as non-hatchery origin. Wild origin broodstock was 8.4%.

Of the 257 fish collected in the HFN MSF, 5 fish were unmarked (adipose fin present) and 252 were marked (adipose fin missing) (98%). Of the 252 fish that were marked, 250 were scanned for the presence of CWT. A CWT pin was found (in the field) in 163 fish. These samples were sent to the head lab for analysis. Of the 163 samples sent to the head lab, only 146 had a CWT. Of the 5 fish that were unmarked, no otolith samples were collected, therefore it can't be determined if these were hatchery fish or natural origin fish. A total of 235 fish were released back to Sarita River. The majority of the fish (n=180) released were unmarked (78%).

Combining the results for brood stock and the HFN MSF, a total of 818 fish were counted and the presence/absence of fin clip and CWT were recorded. A total of 390 fish were determined to be clipped (47.7%) and the remaining 428 were unmarked (52.3%) (Table 4). Of the 390 clipped fish, 268 were determined to also have a CWT.

In addition, a total of 67 fish were collected for dead pitch by HFN staff. Weather conditions (nonstop rain and flooding) made it very difficult to collect the samples. All fish were sampled for sex, length, scales (age), otoliths (Hatchery vs Wild and treatment group), presence/absence of fin clip and presence/absence of CWT.

**Table 4.** Mark Status of Removals (Broodstock, HFN Selective Fishery and Releases), 2021.

| Category | Tag Status | Jacks | Female | Males | Total | Mark Percent |
|---|---|---|---|---|---|---|
| Brood | AD Clip & CWT | 0 | 50 | 28 | 78 | |
| | AD Clip Only | | 7 | 4 | 11 | |
| | Total Clipped | 0 | 57 | 32 | 89 | 26.81% |
| | No Mark-TM | | 109 | 106 | 215 | |
| | No Mark-No TM | | 8 | 20 | 28 | |
| HFN | AD Clip & CWT | 12 | 8 | 126 | 146 | |
| | AD Clip Only | 14 | 0 | 90 | 104 | |
| | Total Clipped | 26 | 8 | 216 | 250 | 98.04% |
| | No Mark-TM Unknown | 0 | 4 | 1 | 5 | |
| Release | AD Clip & CWT | 0 | 36 | 8 | 44 | |
| | AD Clip Only | 0 | 6 | 1 | 7 | |
| | Total Clipped | 0 | 42 | 9 | 51 | 22.08% |
| | No Mark-TM Unknown | 49 | 43 | 88 | 180 | |
| **Total** | | **75** | **271** | **472** | **818** | |
| **Sex Ratio** | | **9.2%** | **33.1%** | **57.7%** | **100.0%** | |

Table 5 provides the mark status of samples collected from the dead pitch efforts. Nearly 46.3% of the fish were marked. This is very similar to the mark status of the removals and releases which was 47.68%.

**Table 5**. Mark Status of fish collected in dead pitch efforts, 2021.

| Category | Tag Status | Jacks | Female | Males | Total | Mark Percent |
|---|---|---|---|---|---|---|
| Deadpitch | AD Clip & CWT | 0 | 6 | 15 | 21 | |
| | AD Clip Only | 0 | 3 | 7 | 10 | |
| | Total Clipped | 0 | 9 | 22 | 31 | 46.27% |
| | No Mark-TM | 1 | 16 | 19 | 36 | |
| | No Mark-No TM | 0 | 0 | 0 | 0 | |
| **Total** | | **1** | **25** | **41** | **67** | |
| **Sex Ratio** | | **0.1%** | **3.1%** | **5.0%** | **8.2%** | |

2022

In 2022, a total of 409 fish were removed for broodstock purposes (191 F; 211 M: 7 J) (Table 6). A total of 338 fish were successfully spawned (166 F; 169 M; 3 J). Mortalities/Rejects were a total of 33 fish (7.3%). Of the 409 fish removed, 126 fish were AD clipped (30.8%) of which 73 fish were CWT'ed. Of the 781 fish collected in the fishery, 0 fish were unmarked (100% marked). Of the 781 fish that were marked, a CWT was found in 240 fish (30.7%). These samples were sent to the head lab for analysis. Of the 240 samples sent to the head lab, only 232 had a CWT. A total of 1,185 fish were released back to Sarita River. The majority of the fish (n=1,021) released were unmarked (86.2%).

A total of 56 samples were collected in the dead pitch. A total of 17 fish were marked (30.4%). Of the 17 marked fish, a CWT was found in 10 fish (58.8%).

The harvest objective was to sample primarily male, and all fin clipped. This goal was achieved though there were only 5 fish sampled that were female which is very minor in the scope of the number of fish actually harvested. While the broodstock goal was to collect fish that were mainly unmarked, it was necessary to use marked fish particularly for the females (nearly 50/50 split marked and unmarked). This reflects the sex ratio in the population (see First Set Data). Dead pitch sampling closely mirrored the broodstock collection with nearly the same marked percentage, and more males unmarked.

**Table 6.** Mark Status of Removals (Broodstock, HFN Selective Fishery and Releases), 2022.

| Category | Tag Status | Jacks | Female | Male | Unsexed | Total | % Marked |
|---|---|---|---|---|---|---|---|
| Brood | AD/CWT | 1 | 58 | 14 | 0 | 73 | |
| | AD | 1 | 38 | 14 | 0 | 53 | |
| | Total Clipped | 2 | 96 | 28 | 0 | 126 | 30.81% |
| | Not Marked | 5 | 95 | 183 | 0 | 283 | |
| Harvest | AD/CWT | 14 | 3 | 165 | 58 | 240 | |
| | AD | 4 | 2 | 167 | 368 | 541 | |
| | Total Clipped | 18 | 5 | 332 | 426 | 781 | 100% |
| | Not Marked | 0 | 0 | 0 | 0 | 0 | |
| Release | AD Clip | 8 | 62 | 94 | 0 | 164 | 13.84% |
| | Not Mark | 8 | 135 | 878 | 0 | 1021 | |
| Deadpitch | AD/CWT | 2 | 5 | 3 | 0 | 10 | |
| | AD | 1 | 3 | 3 | 0 | 7 | |
| | Total Clipped | 3 | 8 | 6 | 0 | 17 | 30.36% |
| | Not Marked | 0 | 7 | 32 | 0 | 39 | |
| **Total** | | **44** | **408** | **1,553** | **426** | **2,431** | |

2023

In 2023, a total of 444 fish were removed for broodstock purposes (237 F; 205 M: 2 J) (Table 6). A total of 383 fish were successfully spawned (192 F; 191 M; 1 J). Mortalities/Rejects were a total of 65 fish (14.6%). Of the 1,039 fish removed for broodstock or harvest, 637 fish were AD clipped (61.3%) of which 327 fish were CWT'ed. Of the 597 fish collected in the HFN MSF, 38 fish were unmarked (93.6% marked). Of the 559 fish that were marked, a CWT was found in 310 fish (55.5%). These samples were sent to the head lab for analysis. A total of 1,004 fish were released back to Sarita River. The majority of the fish released were unmarked (70.7%).

Unfortunately, due to the large number of fish not being marked for BY2019 (COVID restraints), some of the unmarked fish may be hatchery returns but this won't be known until otoliths have been read. As of mid July 2024, none of the otolith samples have been read.

The marked ratio for the small number of dead pitch samples was 42.9% which is similar to the combined broodstock, HFN MSF, and releases sample mark rate of 45.6%.

**Table 7.** Mark Status of Removals (Broodstock, Harvest, Releases, Dead pitch). Recaps are not included in overall total, 2023.

| Collection Type | Not Marked | Marked | Overall | % Marked |
|---|---|---|---|---|
| Brood | 364 | 78 | 442 | 17.6% |
| Harvest | 38 | 559 | 597 | 93.6% |
| Release | 710 | 294 | 1,004 | 29.3% |
| Recaps | 72 | 38 | 110 | 34.5% |
| Dead pitch | 8 | 6 | 14 | 42.9% |
| **Overall Total** | **1,192** | **975** | **2,167** | **45.0%** |

Combined 3 Years

The mark rate of adult returns to the river was very consistent across all three return years based on the combined sampling of broodstock, HFN MSF and releases back to the river each year: 47.7% in 2021, 45.1% in 2020, and 45.6% in 2023. However, because not all contributing age classes to these return years had the hatchery reared fish 100% marked, the proportion natural influence (PNI) cannot be assumed based on these results. It is anticipated that as we move into return years where 100% of the contributing age classes were marked, that we will gain confidence in the PNI.

*Sex Ratio Determination*

2021

In 2021, using the combination of brood stock and HFN removal plus releases to the river, the sex ratio was determined to be 7.7% jacks, 44.15% females and 48.14% males (using just the first capture data set).

2022

In 2022, using the combination of brood stock and HFN removal plus releases to the river, the sex ratio was determined to 1.9% jacks, 18.5% females and 79.6% males (using the first captured data set).

2023

In 2023, using the combination of brood stock and HFN removal plus releases to the river, the sex ratio was determined to 2.2% jacks, 37.9% females and 59.8% males (using only the first capture data set).

### *Age Composition from Scales*

2021

In 2021, of 332 samples collected from broodstock for scales (age composition) only 311 could be successfully read. The age composition is shown in Table 8. The dominant age class was Age-4 at 87.1%, followed by Age 3 (8.0%), and Age 5 (4.9%).

As noted above, scales have not been read for the sampling conducted in the HFN selective fishery, but age composition can be represented through the CWT collected. Based on the CWT analysis (146 samples), the HFN selective fishery had nearly 49% Age 3 followed an equal percentage of Age 2 and Age 4.

Overall age composition was Age 2 (8.08%), Age 3 (21.18%), Age 4 (67.47%) and Age 5 (3.28%).

**Table 8.** Age Classification for Brood stock and HFN Removal, 2021.

| Category | Age 2 | Age 3 | Age 4 | Age 5 | Unknown | Total |
|---|---|---|---|---|---|---|
| Brood | 0 | 25 | 271 | 15 | 19 | 330 |
| HFN | 37 | 72 | 38 | 0 | 0 | 147 |
| **Brood Total** | **0.00%** | **8.04%** | **87.14%** | **4.82%** | | **100.00%** |
| **HFN Total** | **25.17%** | **48.98%** | **25.85%** | **0.00%** | | **100.00%** |
| **Overall Removal** | **8.08%** | **21.18%** | **67.47%** | **3.28%** | | **100.00%** |

Of the 67 fish collected for dead pitch, 9 samples have not yet been read. Of the 58 samples that have been analyzed only 43 could be analyzed properly (regeneration of scales, upside down). The majority of the fish were Age 4 (34 fish; 79%) and the remaining 21% was divided equally among Age-2, Age-3 and Age-5. This age composition is different than the overall age composition noted in the collection efforts.

2022

Of 409 samples collected from broodstock for scales (age composition) only 393 could be successfully read. The age composition is shown in Table 9. The dominant age class for broodstock was Age-3 with 42.7%, followed by Age 4 (33.3%) and Age 5 (23.2%). Only a small percentage (2.1%) returned as jacks.

As noted above, a number of the scale samples were not collected, or scale books have been misplaced for HFN MSF. However, age analysis can be estimated using CWT analysis. A total of 239 samples were collected from the fishery of which all but 8 had a CWT and 1 CWT was not a Sarita fish (SVIAC code; ignored in analysis). Based on the CWT analysis (231 samples), the HFN selective fishery was predominantly Age 3 (59.3%), followed by Age 4 (27.3%) and finally 6.1% Age 5.

Of 56 samples collected from dead pitch efforts, 44 fish could be successfully aged. Dead pitch efforts had Age 3 being the dominant age class at 63.6% followed by Age 4(25.0%) and Age 5 (9.1%).

**Table 9.** Age Classification for Broodstock, Harvest and Dead pitch. *Note: age classification from scales for broodstock and dead pitch but CWT for harvest fish), 2022.*

| Category | Age 2 | | Age 3 | | Age 4 | | Age 5 | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | # | % | # | % | # | % | # | % | |
| Brood | 3 | 0.8% | 168 | 42.7% | 131 | 33.3% | 91 | 23.2% | 393 |
| Harvest | 17 | 7.4% | 137 | 59.3% | 63 | 27.3% | 14 | 6.1% | 231 |
| Deadpitch | 1 | 2.3% | 28 | 63.6% | 11 | 25.0% | 4 | 9.1% | 44 |
| **Overall** | **21** | **3.1%** | **333** | **49.9%** | **205** | **30.7%** | **109** | **16.3%** | **668** |

## 2023

In 2023, a total of 513 scale samples were collected from the various collections (brood, harvest, dead pitch). Table 10 summarizes the total number of samples taken and the age classification per collection activity. Based on the scale data, Age 4 was the predominant age class.

**Table 10.** Number of Scale Samples Collected and Age Classification, 2023.

| Collection Type | Samples Collected | Age Classification | | | | | | Samples Analyzed |
|---|---|---|---|---|---|---|---|---|
| | | Jack | Age-3 | Age-4 | Age-5 | Age-6 | NS | |
| Brood | 441 | 0 | 55 | 351 | 8 | 2 | 25 | 441 |
| Harvest | 58 | 5 | 18 | 23 | 0 | 0 | 12 | 58 |
| Dead pitch | 14 | 0 | 3 | 9 | 0 | 0 | 2 | 14 |
| **Total** | **513** | **5** | **76** | **383** | **8** | **2** | **38** | **513** |

## Age Composition Since 2013

Figure 1 depicts the age classification by return year since 2013. Typically, Age 4 has been the dominant year class but for RY2022 Age 3 was dominant age class. This can be explained partially by the larger release size for BY2019 of nearly 8 gm for the Larges and 4.5 gm for the Smalls. RY2022 also saw a good return for Age 5 (BY2017).

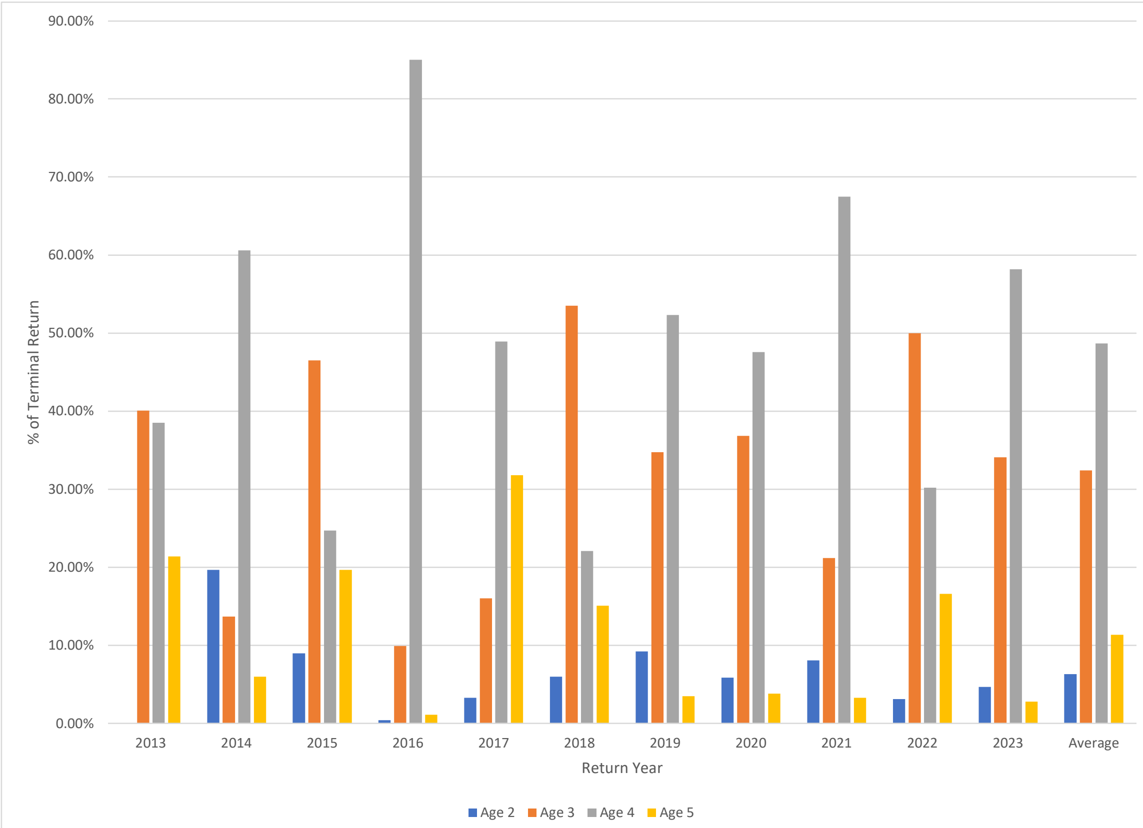


**Figure 1.** Historical Age Classification by Return Year (2013-2023).

### *Otolith Analysis*

2021

Table 11 summarizes the age composition along with the otolith mark (wild-hatchery composition) in 2021. Of the 332 otolith samples collected, only 3 samples could not be read (329 samples). A total of 8 samples (2.43% straying) were identified as hatchery fish but not from Sarita. These 8 samples were identified as Nitinat Chinook (BY2017 – 6 samples; BY2018 – 1 sample; Age Unknown – 1 sample). As mentioned above (Mark Status-Broodstock), 28 fish were identified as non-hatchery origin, leaving 293 as hatchery fish from Sarita (89.1%). Of the 293 fish identified as Sarita hatchery Chinook, 193 fish were from the Traditional Large (60.1%), 97 Enriched Smalls (30.2%) and 1 Enriched Large (0.3%) and 2 Traditional Small (0.6%). More discussion of these otolith groups will be discussed under release strategy section.

As noted in Table 5, 15 fish were identified as Age 5 from the brood removal. Of the 15 fish identified as Age 5 only 2 were natural origin while the rest were hatchery fish (7 fish Enrich Smalls; 1 Enrich Large; 2 Traditional Smalls and 3 Traditional Large). Traditional Large were the majority of Age-4 fish for broodstock collection.

A total of 83 otolith samples were collected from the HFN Fishery in 2021. As mentioned above only the CWT age is available for these fish as the scale samples have not been read. Otolith identification was similar to the broodstock collection with nearly 25% identified as Enrich Smalls and 75% as Traditional Larges.

A total of 66 otoliths were sent in for analysis of which 65 could be read successfully. Only 1 fish was identified as being non-Sarita fish (Nitinat Chinook; 1.5% straying rate). The majority (58.5%) were Traditional Large, and the rest (41.5%) were Enriched Smalls. This is slightly different than the collection efforts (more Enriched Smalls and less Traditional Larges).

**Table 11.** Otolith Analysis for Broodstock and HFN Fishery in 2021. Note Age for HFN Fishery is from CWTs recovered not scale samples. All broodstock were sampled but only 1 of every 3 fish for HFN Fishery.

| Category | Age Class | Enrich Smalls | Enrich Large | Trad. Small | Trad. Large | No Mark | Non-Sarita | Unknown | Total |
|---|---|---|---|---|---|---|---|---|---|
| Brood Removal | Age 3 | 7 | 0 | 0 | 10 | 6 | 1 | 1 | **25** |
| | Age 4 | 78 | 0 | 0 | 166 | 19 | 6 | 2 | **271** |
| | Age 5 | 7 | 1 | 2 | 3 | 2 | 0 | 0 | **15** |
| | Unknown | 5 | 0 | 0 | 14 | 1 | 1 | 0 | **21** |
| HFN Fishery | Age Unknown | 5 | 0 | 0 | 23 | 0 | 0 | 3 | **31** |
| | Age 2 | 0 | 0 | 0 | 13 | 0 | 0 | 1 | **14** |
| | Age 3 | 10 | 0 | 0 | 19 | 0 | 0 | 0 | **29** |
| | Age 4 | 4 | 0 | 0 | 3 | 0 | 0 | 2 | **9** |
| **Brood Total** | | **97** | **1** | **2** | **193** | **28** | **8** | **3** | **332** |
| **Brood Percent** | | **30.22%** | **0.31%** | **0.62%** | **60.12%** | **8.72%** | | | |
| **HFN Total** | | **19** | **0** | **0** | **58** | **0** | **0** | **6** | **83** |
| **HFN Percent** | | **24.68%** | **0.00%** | **0.00%** | **75.32%** | **0.00%** | **0.00%** | **7.79%** | |
| **Overall Total** | | **116** | **1** | **2** | **251** | **28** | **8** | **9** | **415** |
| **Overal Percent** | | **29.15%** | **0.25%** | **0.50%** | **63.07%** | **7.04%** | | | |

## 2022

Table 12 summarizes the age composition from otoliths along with the otolith mark (wild-hatchery composition) for 2022. Of the 398 fish for which samples were readable, 168 fish were from the Traditional Large (42.2%), 197 Enriched Smalls (49.5%), 7.3% were not thermally marked and 1% were non-Sarita releases. More discussion of these otolith groups will be discussed under release strategy section.

In contrast to previous years, more Enriched Smalls returned as Age 3(BY 2019) and more Traditional Larges as Age 5 (BY 2017). Data was checked to ensure that release information was recorded properly (thermal code and CWT) and lab data between CWT and thermal mark corresponded. While there were a few errors in comparing hatch code and CWT code, the majority of samples were correct. It should be noted that BY2019 release size for the Enriched Smalls was approximately 4.5 gm (historically it has been around 3.0 – 3.5) and this larger size may have influenced the return age.

As mentioned above a number of scales samples were either not taken or lost so only CWT age can be used. This combined with a number of otoliths also not taken, makes the age classification by hatchery code very weak. However, using the otolith data alone (not broken down by age) and using the overall age classification (noted in Table 9) we can reasonably estimate age classification by hatch code. With these adjustments, the Traditional Larges dominated the HFN MSF harvested fish with nearly 85% while the Enriched Smalls were 15%. These values do make sense as males were the dominant sex for harvest.

While the number of dead pitch samples was significantly lower than the HFN MSF and broodstock component the percentages for Enriched and Traditional were close to that recovered in the broodstock program but there was a higher number of unmarked fish. The increase in unmarked fish in the dead pitch does make sense as the majority of the fish released were not marked (see Table 6).

Overall, the Traditional group return in 2022 was approximately two times greater than the Enriched Smalls. However, in contrast to previous return years the Traditional Larges had more 5 year old returns than the Enriched Smalls.

**Table 12.** Otolith Analysis for Broodstock and HFN Fishery in 2022. Note Age for HFN Fishery is from CWTs recovered not scale samples. All broodstock were sampled but only 1 of every 3 fish for HFN Fishery.

| Category | Age | Enr. Small | Trad Lge | No Mark | Non-Sarita | Total |
|---|---|---|---|---|---|---|
| Brood | Age 2 | 10 | 1 | 2 | 0 | 13 |
| | Age 3 | 104 | 52 | 4 | 0 | 160 |
| | Age 4 | 46 | 63 | 15 | 1 | 125 |
| | Age 5 | 31 | 47 | 8 | 3 | 89 |
| | Unknown | 6 | 5 | 0 | 0 | 11 |
| | **Total** | **197** | **168** | **29** | **4** | **398** |
| | **%** | **49.5%** | **42.2%** | **7.3%** | **1.0%** | |
| Harvest | Age 2 | 0 (2) | 2 (12) | 0 | 0 | 2 (14) |
| | Age 3 | 0 (28) | 20 (180) | 0 | 0 | 20 (208) |
| | Age 4 | 6 (23) | 6 (104) | 0 | 0 | 12 (127) |
| | Age 5 | 0 (9) | 2 (54) | 0 | 0 | 2 (63) |
| | Unknown | 56 (0) | 320 (0) | 0 | 1 | 377 (1) |
| | **Total** | **62** | **350** | **0** | **1** | **413** |
| | **%** | **15.0%** | **84.7%** | **0.0%** | **0.2%** | |
| Deadpitch | Age 2 | 0 | 1 | 0 | 0 | 1 |
| | Age 3 | 13 | 9 | 5 | 1 | 28 |
| | Age 4 | 4 | 4 | 3 | 0 | 11 |
| | Age 5 | 0 | 2 | 1 | 0 | 3 |
| | Unknown | 6 | 5 | 1 | 0 | 12 |
| | **Total** | **23** | **21** | **10** | **1** | **55** |
| | **%** | **41.8%** | **38.2%** | **18.2%** | **1.8%** | |
| Overall | Age 2 | 12 | 14 | 2 | 0 | 28 |
| | Age 3 | 145 | 241 | 9 | 1 | 396 |
| | Age 4 | 73 | 171 | 18 | 1 | 263 |
| | Age 5 | 40 | 103 | 9 | 3 | 155 |
| | Unknown | 12 | 10 | 1 | 1 | 24 |
| | **Total** | **282** | **539** | **39** | **6** | **866** |
| | **%** | **32.6%** | **62.2%** | **4.5%** | **0.7%** | |

## 2023

A total of 574 otolith samples were collected from the various activities (brood, harvest, dead pitch) in 2023. As of mid July 2024, none of these samples have been analyzed. Table 12 below provides a summary of the samples taken based on the collection type. Note that for BY2019 otolith analysis is crucial since only the Traditional Larges were clipped and CWT. None of Enriched Smalls were clipped nor tagged. The only way to distinguish these fish is by analyzing all non-clipped fish for thermal marks.

**Table 12.** Number of Otolith Samples Collected per Collection Type in 2023.

| Collection Type | Number of Samples | | |
|---|---|---|---|
| | **Not Clipped** | **Clipped** | **Total** |
| Brood | 364 | 78 | 442 |
| Harvest | 10 | 108 | 118 |
| Dead pitch | 8 | 6 | 14 |
| **Total** | **382** | **192** | **574** |

### *CWT Analysis*

<u>2021</u>

In 2021, a total of 264 heads were sent to the lab for CWT analysis, of which 224 were determined to have a pin. Table 13 represents a summary of the tags recovered. Data closely resembles data obtained from the otoliths.

Summarizing CWT data collected in RY2019 through to RY2021, returns can be summarized for each brood year. Data is incomplete but is summarized below for BY2017 (Table 14; Age-2 to Age-4 data available) and BY2018 (Table 15; Age-2 and Age-3 data only).

For BY2017, the Traditional Larges are outperforming the Enriched Smalls. The same can be said for the 2018 brood year. However, the number of returns overall for BY2018 is significantly lower that BY2017. It does appear that there are some differences between the timing of release (BY2018) with the Traditional Larges doing slightly better with the earlier release while the opposite is true for the Enriched Smalls (later release better).

**Table 13.** CWT codes recovered from broodstock removal and HFN fishery.

| Brood Year | 2017 | | | | 2018 | | | | 2019 | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Traditional Large | | Enriched Smalls | | Trad Larg E | Trad Large L | Enr. Small E | Enr. Small L | Trad. L | Trad. L | Trad. L | Trad. L | |
| Tag Code | 18-52-88 | 18-52-89 | 18-52-90 | 18-52-91 | 18-58-83 | 18-58-84 | 18-58-85 | 18-58-86 | 18-49-64 | 18-49-65 | 18-49-66 | 18-49-67 | |
| Brood | 28 | 24 | 15 | 7 | 2 | 1 | 0 | 1 | | | | | **78** |
| HFN | 6 | 15 | 8 | 9 | 28 | 21 | 8 | 14 | 12 | 10 | 8 | 7 | **146** |
| Overall | 32.59% | | 17.41% | | 23.21% | | 10.27% | | 16.52% | | | | 224 |

**Table 14.** CWT Summary for BY2017. Data is incomplete.

| **OVERALL-CWT** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Stock/Species** | **Brood Year** | **# CWT** | **Return Year** | **Age 2** | **Age 3** | **Age 4** | **Age 5** | **Total** | **Proportion of Return** |
| Sarita CN | 2017 | 199,494 | 2019 | 16 | | | | 16 | |
| | | | 2020 | | 123 | | | 123 | |
| | | | 2021 | | | 112 | | 112 | |
| | | | 2022 | | | | | 0 | |
| | | | Total | 16 | 123 | 112 | | 251 | 0.12582 |

| **TRADITIONAL LARGE-CWT** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Stock/Species** | **Brood Year** | **# CWT** | **Return Year** | **Age 2** | **Age 3** | **Age 4** | **Age 5** | **Total** | **Proportion of Return** |
| Sarita CN | 2017 | 99,659 | 2019 | 14 | | | | 14 | |
| | | | 2020 | | 104 | | | 104 | |
| | | | 2021 | | | 73 | | 73 | |
| | | | 2022 | | | | | 0 | |
| | | | Total | 14 | 104 | 73 | | 191 | 0.19165 |

| **ENRICHED SMALLS -CWT** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Stock/Species** | **Brood Year** | **# CWT** | **Return Year** | **Age 2** | **Age 3** | **Age 4** | **Age 5** | **Total** | **Proportion of Return** |
| Sarita CN | 2017 | 99,835 | 2019 | 2 | | | | 2 | |
| | | | 2020 | | 19 | | | 19 | |
| | | | 2021 | | | 39 | | 39 | |
| | | | 2022 | | | | | 0 | |
| | | | Total | 2 | 19 | 39 | | 60 | 0.06010 |

**Table 15.** CWT Summary for BY2018. Data is incomplete.

ALL GROUPS

| Stock/Species | Brood Year | # CWT | Return Year | Age 2 | Age 3 | Age 4 | Age 5 | Total | Proportion of Return |
|---|---|---|---|---|---|---|---|---|---|
| Sarita CN | 2018 | 199,916 | 2020 | 27 | | | | 27 | |
| | | | 2021 | | 75 | | | 75 | |
| | | | 2022 | | | | | 0 | |
| | | | 2023 | | | | | 0 | |
| | | | Total | 27 | 75 | 0 | | 102 | 0.05102 |

OVERALL TRADITIONAL LARGE-CWT

| Stock/Species | Brood Year | # CWT | Return Year | Age 2 | Age 3 | Age 4 | Age 5 | Total | Proportion of Return |
|---|---|---|---|---|---|---|---|---|---|
| Sarita CN | 2018 | 100,046 | 2020 | 23 | | | | 23 | |
| | | | 2021 | | 52 | | | 52 | |
| | | | 2022 | | | | | 0 | |
| | | | 2023 | | | | | 0 | |
| | | | Total | 23 | 52 | 0 | | 75 | 0.07497 |

TRADITIONAL LARGE-Early

| Stock/Species | Brood Year | # CWT | Return Year | Age 2 | Age 3 | Age 4 | Age 5 | Total | Proportion of Return |
|---|---|---|---|---|---|---|---|---|---|
| Sarita CN | 2018 | 49,934 | 2020 | 11 | | | | 11 | |
| | | | 2021 | | 30 | | | 30 | |
| | | | 2022 | | | | | 0 | |
| | | | 2023 | | | | | 0 | |
| | | | Total | 11 | 30 | 0 | | 41 | 0.08211 |

TRADITIONAL LARGE-Late

| Stock/Species | Brood Year | # CWT | Return Year | Age 2 | Age 3 | Age 4 | Age 5 | Total | Proportion of Return |
|---|---|---|---|---|---|---|---|---|---|
| Sarita CN | 2018 | 50,112 | 2020 | 11 | | | | 11 | |
| | | | 2021 | | 22 | | | 22 | |
| | | | 2022 | | | | | 0 | |
| | | | 2023 | | | | | 0 | |
| | | | Total | 11 | 22 | 0 | | 33 | 0.06585 |

OVERALL ENRICHED SMALLS -CWT

| Stock/Species | Brood Year | # CWT | Return Year | Age 2 | Age 3 | Age 4 | Age 5 | Total | Proportion of Return |
|---|---|---|---|---|---|---|---|---|---|
| Sarita CN | 2018 | 99,870 | 2020 | 4 | | | | 4 | |
| | | | 2021 | | 23 | | | 23 | |
| | | | 2022 | | | | | 0 | |
| | | | 2023 | | | | | 0 | |
| | | | Total | 4 | 23 | 0 | | 27 | 0.02704 |

OVERALL ENRICHED SMALLS - Early

| Stock/Species | Brood Year | # CWT | Return Year | Age 2 | Age 3 | Age 4 | Age 5 | Total | Proportion of Return |
|---|---|---|---|---|---|---|---|---|---|
| Sarita CN | 2018 | 50,143 | 2020 | 1 | | | | 1 | |
| | | | 2021 | | 8 | | | 8 | |
| | | | 2022 | | | | | 0 | |
| | | | 2023 | | | | | 0 | |
| | | | Total | 1 | 8 | 0 | | 9 | 0.01795 |

OVERALL ENRICHED SMALLS - Late

| Stock/Species | Brood Year | # CWT | Return Year | Age 2 | Age 3 | Age 4 | Age 5 | Total | Proportion of Return |
|---|---|---|---|---|---|---|---|---|---|
| Sarita CN | 2018 | 49,727 | 2020 | 3 | | | | 3 | |
| | | | 2021 | | 15 | | | 15 | |
| | | | 2022 | | | | | 0 | |
| | | | 2023 | | | | | 0 | |
| | | | Total | 3 | 15 | 0 | | 18 | 0.03620 |

Of the 21 fish sampled in the dead pitch that were determined to have a CWT pin, 18 were read. Table 16 summarizes the tag codes for these fish. The breakdown percentages are different from the collection efforts during broodstock and HFN fishery.

**Table 16.** CWT codes collected in dead pitch efforts.

| Brood Year | 2017 | | | | 2018 | | | | 2019 | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group | Traditional Large | | Enriched Smalls | | Trad Larg E | Trad Large L | Enr. Small E | Enr. Small L | Trad. L | Trad. L | Trad. L | Trad. L | |
| Tag Code | 18-52-88 | 18-52-89 | 18-52-90 | 18-52-91 | 18-58-83 | 18-58-84 | 18-58-85 | 18-58-86 | 18-49-64 | 18-49-65 | 18-49-66 | 18-49-67 | |
| Deadpitch | 5 | 6 | 0 | 4 | 0 | 2 | 0 | 1 | 0 | 0 | 1 | 0 | 18 |
| Overall | 61.11% | | 22.22% | | 11.11% | | 5.56% | | 5.56% | | | | 18 |

## 2022

For BY2017, the Traditional Larges outperformed the Enriched Smalls in terms of number of fish returning (Table 17). While incomplete BY2018 seems to be trending in the same direction with the Traditional Larges having better returns than the Enriched Smalls. For BY2018, CWT codes were used to further differentiate times of releases. Both the Smalls and Larges were released at the same time (May 9 and May 27) just at different sizes, though release sizes were somewhat similar (Smalls 2.44 gm and 2.65 gm; Larges 5.91 gm and 6.72 gm). Comparing within groups, it does look like the earlier releases for the Traditional Larges did better than the later releases, but the opposite was true for the Enriched Smalls where the later release had better returns than the early May release.

**Table 17.** Terminal CWT Recovered and CWT Released. *Note: numbers in italics are incomplete brood years.*

| Brood Year | Group | # CWT Released | # CWT Recovered | Proportion of Return | Comments |
|---|---|---|---|---|---|
| 2017 | Trad. Lge | 99,659 | 217 | 0.21774 | All Age classes completed |
| | Enr Sm | 99,835 | 72 | 0.07212 | |
| | **Overall** | **199,494** | **289** | **0.14487** | |
| 2018 | Trad. Lge Early | *49,934* | *70* | *0.14019* | Up to Age 4 |
| | Trad. Lge Late | *50,112* | *64* | *0.12771* | |
| | **Trad. Lge Combined** | ***100,046*** | ***134*** | ***0.13394*** | |
| | Enr. Sm Early | *50,143* | *27* | *0.05385* | |
| | Enr. Sm Late | *49,727* | *50* | *0.10055* | |
| | **Enr. Sm Combined** | ***99,870*** | ***77*** | ***0.07710*** | |
| | **Overall** | ***199,916*** | ***211*** | ***0.10554*** | |
| 2019 | **Trad. Lge** | **98,713** | **181** | ***0.18336*** | Up to Age 3 |
| 2020 | Trad. Lge | 95,780 | 19 | ***0.01984*** | Up to Age 2 |
| | Enr. Sm | 99,937 | 0 | ***0.00000*** | |
| | **Overall** | **195,717** | **19** | ***0.00971*** | |

## 2023

BY2019 had no Enriched Smalls clipped or tagged due to COVID, hence without otolith analysis it is challenging to get an accurate picture of the representation of the different trial groups for that brood year. Table 18 summarizes the different brood years and treatment groups that returned in 2023. Data for RY2023 is similar to previous years where the Traditional Group is represented at a higher rate in Age 2, Age 3 but lower in Age 5 (Age 4 data is incomplete due to no clipping or tagging of the Enriched Smalls).

**Table 18.** Treatment Groups returns for RY2023 (Brood and Harvest)

| Brood Year | Treatment Group | # of Fish |
|---|---|---|
| 2021 | Traditional Large | 30 |
| | Enriched Small | 1 |
| 2020 | Traditional Large | 137 |
| | Enriched Small | 58 |
| 2019 | Traditional Large | 80 |
| | Enriched Smalls | Not applicable. No fish were clipped or tagged due to COVID |
| 2018 | Traditional Large Early | 2 |
| | Traditional Large Late | 0 |
| | Enrich Small Early | 2 |
| | Enrich Small Late | 6 |

Table 19 summarizes the aggregated return for BY2017 to BY2021. Again, as note above no BY2019 Enriched Smalls were clipped/tagged due to COVID. BY2017 and BY2018 are complete. The Traditional Larges experience the higher returns compared to the Enriched Smalls (BY2017 – 3x; BY2018 – 1.6x). For BY2018, the releases were further divided into Early and Late release for both groups (Traditional; Enriched). Results were comparable with Traditional Early and Late release (Traditional Early were slightly higher than Traditional Large). However, the Enriched Small Late release did about 2x better that Enriched Small Early.  Figure 2 shows the proportion of CWT returns by hatchery release group for BY2017 to BY2020.

**Table 19.** Aggregate CWT for BY2017 to BY2021. Note – BY2017 and BY2018 are complete. BY2019 is incomplete and no release of Enriched Small CWT/clipped. BY2020 – 2021 are incomplete.

| Brood Year | Group | # CWT Released | # CWT Recovered | Proportion of Return | Comments |
|---|---|---|---|---|---|
| 2017 | Trad. Lge | 99,659 | 217 | 0.21774 | All Age classes completed |
| | Enr Sm | 99,835 | 72 | 0.07212 | |
| | **Overall** | **199,494** | **289** | **0.14487** | |
| 2018 | Trad. Lge Early | 49,934 | *72* | 0.14419 | All Age classes completed |
| | Trad. Lge Late | 50,112 | *64* | 0.12771 | |
| | **Trad. Lge Combined** | **100,046** | ***136*** | **0.13594** | |
| | Enr. Sm Early | 50,143 | *29* | 0.05783 | |
| | Enr. Sm Late | 49,727 | *56* | 0.11261 | |
| | **Enr. Sm Combined** | **99,870** | ***85*** | **0.08511** | |
| | **Overall** | **199,916** | ***221*** | **0.11055** | |
| 2019 | **Trad. Lge** | **98,713** | **261** | ***0.26440*** | Up to Age 4 |
| 2020 | Trad. Lge | 95,780 | 156 | ***0.16287*** | Up to Age 3 |
| | Enr. Sm | 99,937 | 58 | ***0.05804*** | |
| | **Overall** | **195,717** | **19** | ***0.00971*** | |
| 2021 | Trad. Lge | 100,099 | 30 | ***0.02997*** | Up to Age 2 |
| | Enr. Sm | 99,997 | 1 | ***0.00100*** | |
| | **Overall** | **200,096** | **19** | ***0.00950*** | |

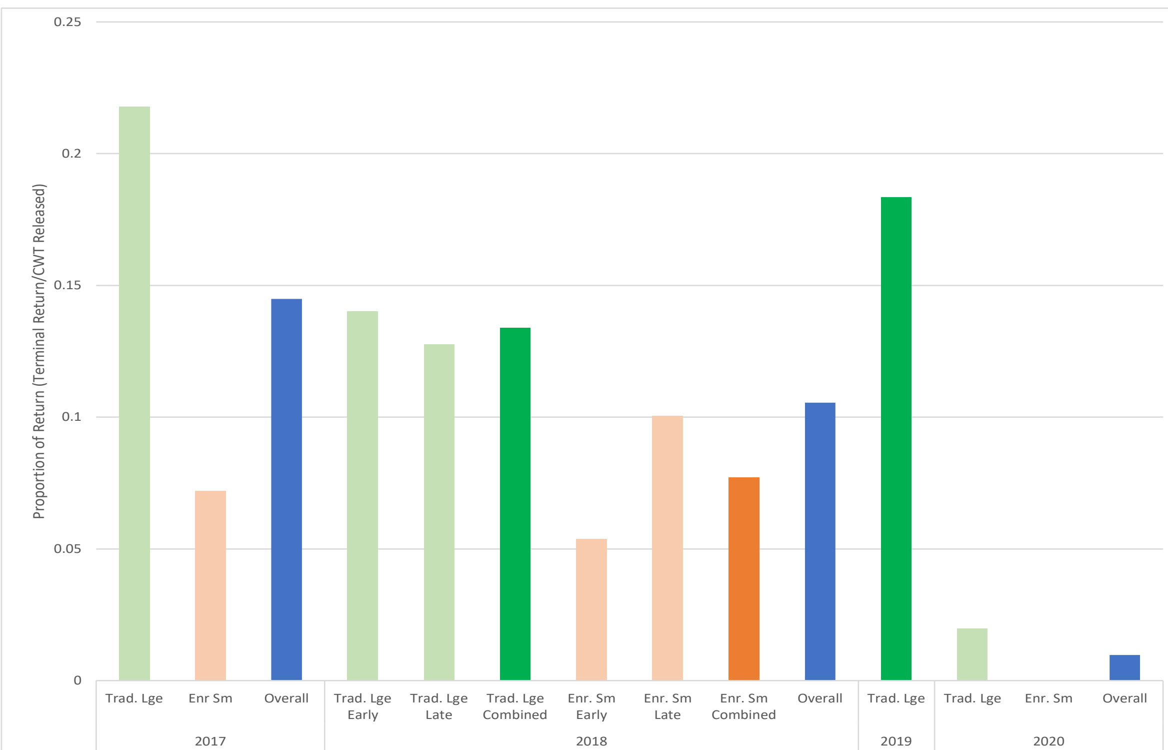


**Figure 2.** Graphical representation of proportion of returns (CWT) for BY2017 – BY2020. *Note – BY2018 – BY2020 are incomplete).*

## Hatchery Release Strategy Evaluation

Since 2012, Sarita River Chinook have been part of a trial looking at the effects of enrichment and size at release (see Appendix A for summary). Otolith data has been entered for RY2015 through to RY2021 by age and sex. Data has been corrected for sex ratio and expanded based on terminal returns and proportion of return with respect to release number is calculated. Only data from completed brood years are discussed below (BY2012 to BY2017). For BY2012 to BY2016 wild chinook migration is estimated at 100,000. However, from BY2017 onward HFN/LGL Limited has been performing outmigration counts and their average estimate number has been used. See Figures 3 and 4 below.

### *BY2012 – BY2014*

For these three brood years, a comparison between Production Larges, Production Smalls and Enriched Smalls can be performed. For all three brood years, the Production Larges outperformed the other two groups in terms of number of fish returning (nearly double). In two of the three brood years the Enriched Smalls significantly outperformed the Production Smalls. This would indicate that size plays a large role in the survival. However, there are also differences in survival due to culture methods of fish released at similar sizes with the enriched group performing better. Additionally, the smaller release size also tended to have older fish (more Age 4 and Age 5) predominantly female in comparison to the larger fish. However, comparing the culture method, the production fish had more older fish with the exception of BY2012.

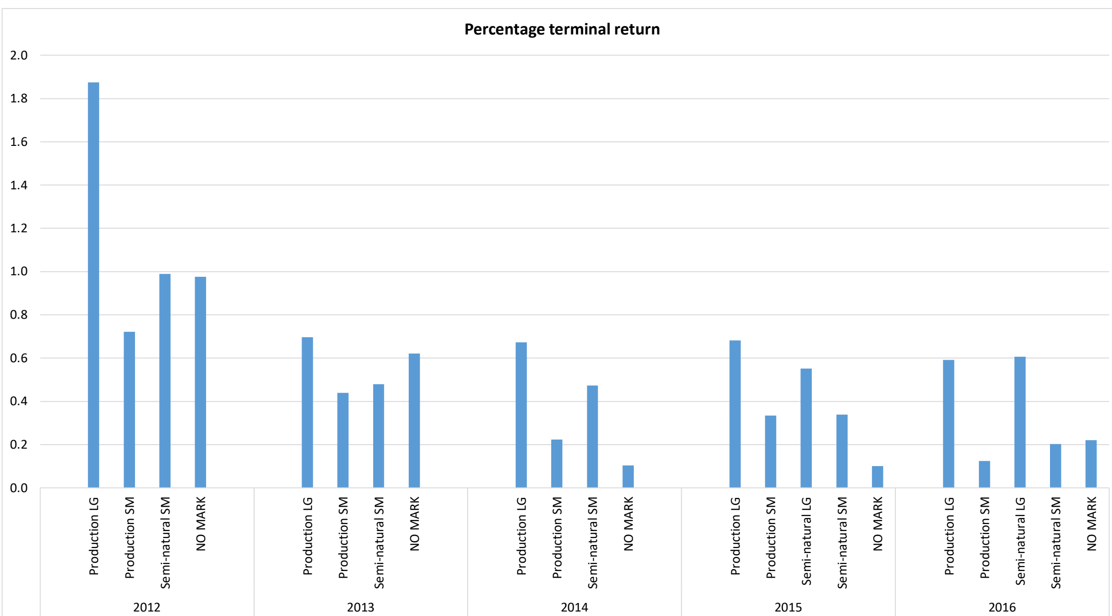


**Figure 3.** Terminal return to hatchery for different culture methods and sizes at release. Completed brood years only.

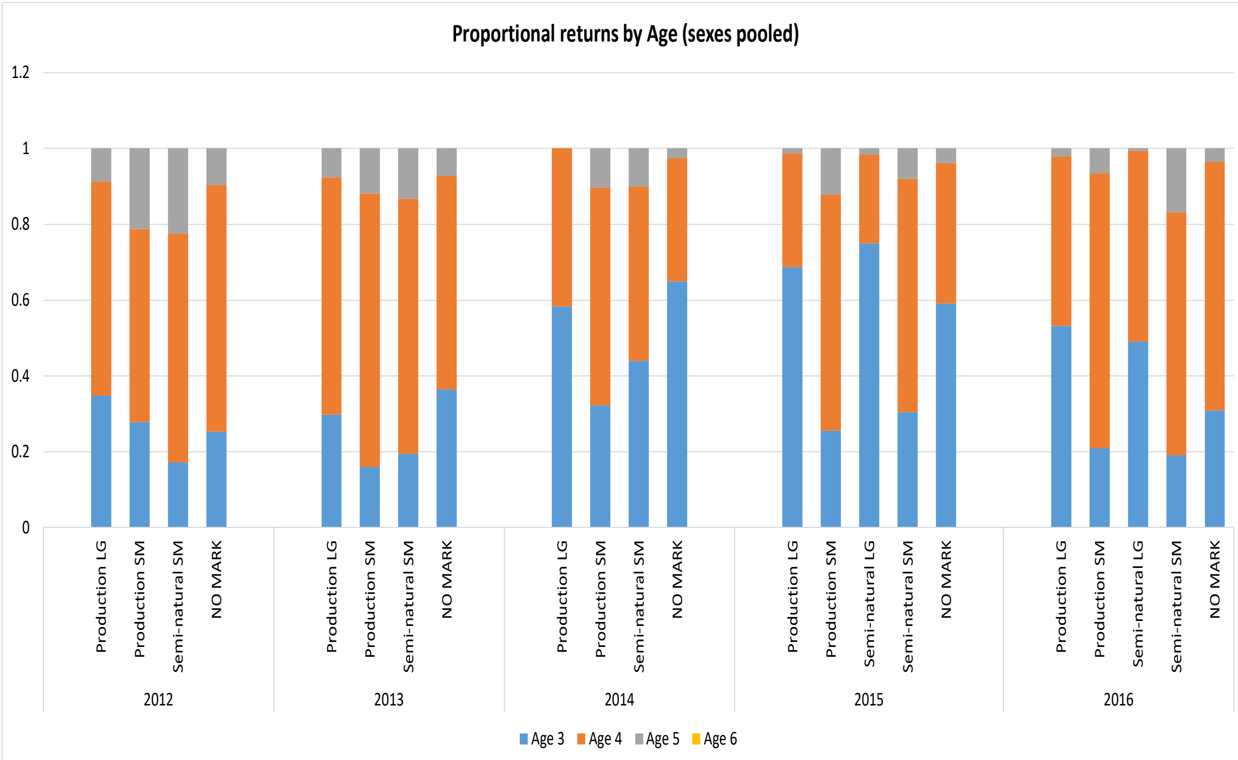


**Figure 4.** Age returns for different culture methods and sizes at release. Completed brood years only.

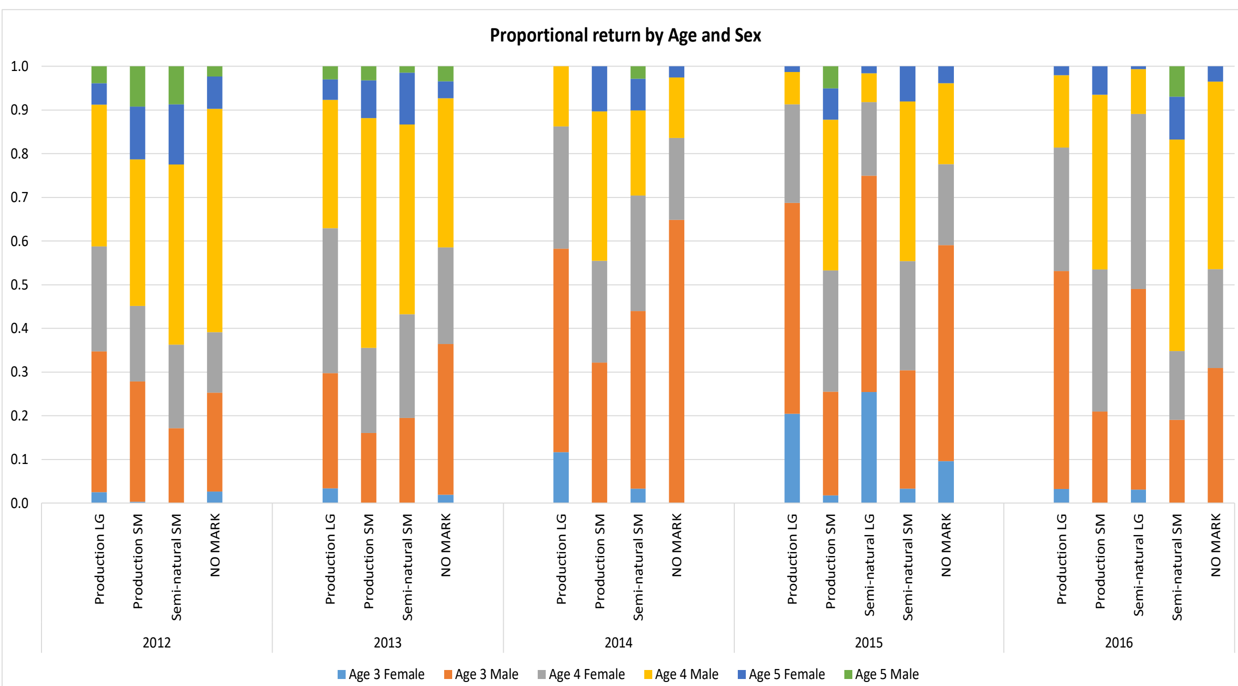


**Figure 5.** Age and Sex breakdown for different culture methods and sizes at release. Completed brood years only.

*BY2015 & BY2016*

For these two broods, the number of groups was expanded to allow comparison between Production Larges and Smalls and Enriched Larges and Smalls. It was once again noted that the Production Larges outperformed the Production Smalls and Enriched Smalls but also outperformed the Enriched Larges particularly for BY2015. Again, suggesting there is a large influence in survival based on fish size at release and to a lesser extent of culture methodology. As with the previous brood years the smaller fish tended to have more older fish (predominantly female) than the larger fish. While there does seem to be some differences when comparing culture methods for BY2015, there is less of a difference with BY2016.

*BY2017 – BY2021*

Only BY2017 has a full return of cohorts. While different culture methods are being used there are no comparison sizes so no comparison on culture method differences can be done.

Comparing Production Larges to Production Smalls, results would indicate that the smaller fish have a tendency for less Age-3 (mostly males) but more Age-4 and Age-5 (mostly females) fish. Comparing Production Smalls to Semi-Natural Smalls, age compositions are very similar with the exception of BY2016 were Semi-Natural Smalls had more Age 5 fish than the Production Smalls.

# Appendices

**APPENDIX A. Summary of Treatment Groups for Sarita CN BY2012 to BY2021**

| Brood Year | Groups | Thermal Mark | CWT | Non CWT Finlcipped | PBT | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | Production Large | Y | N | N | N | x | x | x | | | | | | | | | | Direct comparison with BY2013 & BY2014. Prod Lge vs Prod Sm and Prod Sm vs Semi-Natural Sm |
| | Production Small | Y | N | N | N | x | x | x | | | | | | | | | | |
| | Semi-Natural Small | Y | N | N | N | x | x | x | | | | | | | | | | |
| 2013 | Production Large | Y | N | N | N | | x | x | x | | | | | | | | | Direct comparison with BY2012 & BY2014. Prod |
| | Production Small | Y | N | N | N | | x | x | x | | | | | | | | | |
| | Semi-Natural Small | Y | N | N | N | | x | x | x | | | | | | | | | |
| 2014 | Production Large | Y | N | N | N | | | x | x | x | | | | | | | | Direct comparison with BY2012 & BY2013. Prod Lge vs Prod Sm and Prod Sm vs Semi-Natural Sm |
| | Production Small | Y | N | N | N | | | x | x | x | | | | | | | | |
| | Semi-Natural Small | Y | N | N | N | | | x | x | x | | | | | | | | |
| 2015 | Production Large | Y | N | N | N | | | | x | x | x | | | | | | | Direct comparison with BY2016. Prod Lge vs Prod |
| | Production Small | Y | N | N | N | | | | x | x | x | | | | | | | |
| | Semi-Natural Large | Y | N | N | N | | | | x | x | x | | | | | | | |
| | Semi-Natural Small | Y | N | N | N | | | | x | x | x | | | | | | | |
| 2016 | Production Large | Y | N | N | N | | | | | x | x | x | | | | | | Direct comparison with BY2015. Prod Lge vs Prod |
| | Production Small | Y | N | N | N | | | | | x | x | x | | | | | | |
| | Semi-Natural Large | Y | N | N | N | | | | | x | x | x | | | | | | |
| | Semi-Natural Small | Y | N | N | N | | | | | x | x | x | | | | | | |
| 2017 | Production Large | Y | Y | N | **Y** | | | | | | x | x | x | | | | | Direct comparison with BY2018, BY2019, BY2020, 2021. Not able to determine if difference are due to enrichment or size |
| | Semi-Natural Small | Y | Y | N | Y | | | | | | x | x | x | | | | | |
| 2018 | Production Large | Y | Y | **Y** | Y | | | | | | | x | x | x | | | | Direct comparison with BY2018, BY2019, BY2020, 2021. Not able to determine if difference are due to enrichment or size |
| | Semi-Natural Small | Y | Y | Y | Y | | | | | | | x | x | x | | | | |
| 2019 | Production Large | Y | Y | Partial | Y | | | | | | | | x | x | x | | | Direct comparison with BY2018, BY2019, BY2020, 2021. Not able to determine if difference are due to enrichment or size |
| | Semi-Natural Small | y | y | N | Y | | | | | | | | x | x | x | | | |
| 2020 | Production Large | Y | Y | Y | Y | | | | | | | | | x | x | x | | Direct comparison with BY2018, BY2019, BY2020, 2021. Not able to determine if difference are due to enrichment or size |
| | Semi-Natural Small | Y | Y | Y | Y | | | | | | | | | x | x | x | | |
| *2021* | Production Large | Y | Y | Y | Y | | | | | | | | | | x | x | x | Direct comparison with BY2018, BY2019, BY2020, 2021. Not able to determine if difference are due to enrichment or size |
| | Semi-Natural Small | Y | Y | Y | Y | | | | | | | | | | x | x | x | |

**Final Performance Report to the Mark Selective Fishery Fund Committee for project MSF-04-22**

# Assessing the Feasibility of a Mark-Selective Fishery for King Salmon in the Southeast Alaska Sport Fishery

## Submitted by the Alaska Department of Fish and Game, Division of Sport Fish

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# EXECUTIVE SUMMARY

Mark-selective fisheries (MSFs) are an increasingly common fishery management tool utilized in the Pacific Northwest to allow for the selective harvest of hatchery-origin salmon marked with an adipose fin clip. The commonly cited goal of MSFs is to provide or maintain harvest opportunity of hatchery fish while protecting wild stocks that have experienced declines (Peterson and Baltzell 2012, SFEC 2016). While MSFs have been implemented in other fisheries within the geographic scope of the Pacific Salmon Treaty (PST), they have not occurred in the Southeast Alaska (SEAK) king salmon sport fishery and the potential implications of implementing an MSF are not well understood.

The Alaska Department of Fish and Game (ADF&G) Division of Sport Fish (DSF) utilized grant funding from the Pacific Salmon Commission (PSC) to examine the feasibility of implementing MSFs in the SEAK king salmon sport fishery. ADF&G contracted a team of researchers from the University of Washington (UW) with experience in SEAK fisheries and community engagement to lead the project and collaborate with ADF&G on all aspects of this study.

## OBJECTIVES

1) Review the management, assessment, and hatchery enhancement programs associated with the king salmon sport fishery in SEAK to understand the implications of implementing MSFs as a management tool in SEAK;
2) Estimate the number of adipose-fin clipped (marked) fish in the SEAK king salmon sport fishery by time, area, and stock;
3) Engage SEAK fishing community members to synthesize community and regional perspectives on MSFs;
4) Evaluate potential costs and benefits of MSFs in the SEAK king salmon sport fishery, incorporating community perspectives; and
5) Develop an evaluation template, incorporating objectives 1, 2, 3, and 4, to assess the feasibility of implementing an MSF.

## STUDY APPROACH

The first phase of the project focused on a literature review of MSFs in other areas subject to the PST outside Alaska to inform community engagement meetings and the development of the program review. The second phase included development of the program review and beginning the cost benefit analysis. Community engagement occurred throughout both phases through a series of in person and online meetings. These meetings were facilitated by the UW research team and provided opportunities for feedback from community members, fishery stakeholders, and ADF&G staff, which was integrated into the feasibility study.

ADF&G staff developed an analysis of the number of marked fish in the SEAK king salmon sport fishery and integrated that analysis and other new information into this technical report. A qualitative cost-benefit analysis drew from information generated throughout the project to describe positive and negative impacts of potential MSF implementation in the SEAK king salmon sport fishery. Finally, the feasibility assessment process utilized for this study was adapted into a feasibility template that other fisheries management agencies could incorporate into their MSF planning process.

## RESULTS

Potential benefits and costs of MSF implementation in the SEAK king salmon sport fishery were organized in three categories: ecological, socioeconomic, and institutional.

The primary ecological benefit of an MSF is the potential for reduced fishing mortality of wild king salmon stocks, when compared to a non-selective fishery operating within the same time and area. Ecological costs include direct and incidental mortality and sub-lethal effects of wild or unmarked fish that are caught and released.

Both socioeconomic benefits and costs were found present when considering MSFs. Benefits were related to providing fishing opportunity and fishery assessment, however costs were more varied and substantial. This study found very limited public support for MSFs by SEAK community members, Alaska Native organizations, hatchery associations, and other fishery stakeholders.

Potential institutional benefits could include improved data for monitoring king salmon harvest. However, a variety of institutional costs were identified, including costs to management agencies to implement, evaluate, and report on this more complex regulatory approach. These costs would take the form of direct expenditure of staff time and reduced capacity for other management tasks.

This study evaluated whether current and projected mark fractions in the SEAK king salmon sport fishery are sufficient to support a mark-selective fishery. Using catch-sampling and coded wire tag (CWT) recovery data, both current and modeled mark fractions were estimated across different sport fish management areas. The model incorporated stock-specific harvest data and a range of marking scenarios, revealing significant temporal and spatial variation in the percentage of marked fish harvested. Areas with higher contributions from SEAK hatcheries were more sensitive to changes in hatchery marking levels.

The analysis found that inside-waters sport fish management areas (Haines/Skagway, Juneau, Petersburg/Wrangell, Ketchikan) showed the greatest increases in mark fraction when the mark policy was adjusted, with Wrangell Narrows–a terminal harvest area in the Petersburg area which is designed to target hatchery-origin fish–exceeding 50% mark fractions under the 50% mark scenario. However, the spatial and temporal resolution of the results in this analysis may be limiting, and data from SEAK commercial fisheries could offer further insights. Overall, the mark fraction analysis suggests that increasing hatchery marking levels, especially in inside areas, could support an MSF, but further refinement of data resolution may be needed for more precise management decisions.

## CONCLUSION/RECOMMENDATIONS

Currently, a regionwide MSF is not likely to provide a net benefit to the SEAK king salmon sport fishery. MSFs applied in specific areas and times where Alaska hatchery stocks are more prevalent in the fishery may be a useful management tool, however there are costs and benefits for each scenario and ADF&G already selectively manages king salmon fisheries in these areas to focus harvest on hatchery fish using time and area controls rather than marks. Providing sport harvest opportunity in these select times and areas provides a similar benefit of focusing harvest on Alaska hatchery-produced stocks, but without the negative impacts of increased incidental mortality, increased complexity of regulation, and fiscal resources to comply with international obligations, which must be considered. The balance of these considerations could be shifted if external processes, such as PST renegotiations, litigation, or Endangered Species Act (ESA) designations, arose in a way that severely limited SEAK sport fishery king salmon harvest opportunity. In the future, should fisheries be severely limited by conservations concerns, MSFs may be a useful tool to maintain king salmon fishing and harvest opportunity. Assessment tools and programs would need to be in place to ensure benefits are realized without negatively impacting wild stocks or compromising assessment and management of the sport fishery itself. These considerations and the specific fishery assessment and community-based issues identified in this feasibility study should be addressed before any MSF is advanced in the SEAK king salmon sport fishery. The MSF feasibility template developed as part of this study provides a systematic approach for management agencies to assess these important planning considerations.

# ABSTRACT

In this report, we evaluate the feasibility of implementing a mark-selective fishery (MSF) in the Southeast Alaska (SEAK) king salmon (*Oncorhynchus tshawytscha*) sport fishery. MSFs allow for the selective retention of hatchery-origin salmon marked with an adipose fin clip. Although implemented in other areas and fisheries within the geographic scope of the Pacific Salmon Treaty (PST), the implications of a MSF occurring in the SEAK king salmon sport fishery are not well understood. To assess feasibility, we reviewed relevant ADF&G management, assessment, and enhancement programs, engaged with SEAK fishing communities, and estimated the number of marked fish in the fishery for specific times and areas under different mass marking scenarios. This information was synthesized to examine the costs and benefits of MSFs and inform future evaluations of potential MSFs in SEAK. A regionwide MSF would likely not be beneficial as stock composition varies significantly across time and area, and many other mass marked (non-Alaska hatchery) stocks transit through SEAK and are commonly intercepted in the sport fishery. While some locations in SEAK currently may have returns of mass-marked Alaska hatchery-produced fish in sufficient quantity to reasonably implement an MSF, increased harvest opportunity is already provided in these locations by applying increased bag and annual limits in times and areas where Alaska hatchery-produced fish are known to comprise the majority of the harvest. MSF may be a tool to increase harvest opportunity in select areas and scenarios; however, the impacts to incidental mortality, complexity of regulation, and cost of compliance with international obligations may outweigh the potential benefits. Additionally, a MSF feasibility template was developed to serve as a starting point for management agencies considering MSF implementation; this template could precede and complement existing Pacific Salmon Commission (PSC) MSF proposal requirements.

Keywords: Chinook salmon, king salmon, *Oncorhynchus tshawytscha*, sport fishery, coded wire tag, mark selective fishery, non-selective fishery, escapement, Southeast Alaska

# PROJECT BACKGROUND

The PSC, an international decision-making body with representation from Canada and the United States, was formed in 1985 to implement the PST, which establishes conservation and management measures to conserve Pacific salmon, to cooperatively achieve optimum production through research, management and enhancement, to allocate harvest in proportion to production, and to prevent overfishing. A key component of king salmon management under the PST is the coded-wire tag program. In response to the proliferation of MSFs in the late 1990s when several stock in the Pacific Northwest were identified as conservation concern, the PSC adopted an "Understanding of the PSC Concerning Mass Marking and Selective Fisheries- 2004 Policy Statement" which established policies and procedures for implementing MSFs. When SEAK wild stocks experienced persistent declines which precipitated fishery restrictions, the use of MSFs was discussed as a management tool to maintain some level of fishing opportunity during times and areas where wild stocks are present. The Alaska delegation involved in the negotiations of the 2019-2028 PST Annex asked ADF&G to explore the possibility of implementing a MSF in the SEAK king salmon (*Oncorhynchus tshawytscha*) sport fishery. Funding was provided through a grant from the PSC's Mark-Selective Fishery Fund to examine the feasibility of implementing MSFs in the SEAK king salmon sport fishery.

Although MSFs have been implemented in other areas and fisheries within the geographic scope of the PST, the implications of an MSF occurring in the SEAK king salmon sport fishery are not well understood. This study provides an evaluation of the feasibility of implementing a MSF in the SEAK king salmon sport fishery.

Through a formal procurement process, ADF&G contracted a team of researchers from UW with experience in SEAK fisheries and community engagement to lead the project and work with

ADF&G on all aspects of the study. They delivered a final report to ADF&G in February 2024[1]. This Special Publication incorporates components of their final report and additional analyses to evaluate MSF feasibility for the Mark Select Fisheries Fund Committee of the PSC.

# OBJECTIVES

The goal of this study was to evaluate the feasibility of implementing a MSF in the SEAK king salmon sport fishery within the mandates of the PST and domestic management, and with specific consideration of assessment, monitoring, and community and stakeholder perspectives. The objectives of this study are to:

1) Review the management, assessment, and enhancement programs associated with the king salmon sport fishery in SEAK to understand the implications of implementing MSFs as a management tool in SEAK;
2) Estimate the number of adipose fin clipped (marked) fish in the SEAK king salmon sport fishery by time, area, and stock;
3) Engage SEAK fishing community members to synthesize community and regional perspectives on MSFs;
4) Evaluate potential costs and benefits of MSFs in the SEAK king salmon sport fishery, incorporating community perspectives; and
5) Develop an evaluation template, incorporating objectives 1, 2, 3, and 4, to assess the feasibility of implementing an MSF.

Additionally, the Mark Select Fisheries Fund committee of the PSC, which funded this study, requested specific information on potential SEAK king salmon MSF fishing strata, mark rates, mortality estimates, fishery assessment data sources, catch estimates, and stock composition, as well as identification of the most likely and practicable specific MSF scenarios. We address each of these information needs, however, in several instances the request was beyond the scope of this feasibility study.

## STUDY APPROACH AND TIMELINE

The timeline for UW contractor work extended from March 2023 through February 2024 (Figure 1). The first phase of the project focused on a literature review of MSFs in other areas subject to the PST outside Alaska to inform community engagement meetings and the development of the program review. The second phase included development of the program review (Objective 1) and initializing the cost benefit analysis (Objective 4). Community engagement (Objective 3) occurred throughout both phases through a series of in person and online meetings. These meetings provided opportunities for feedback from the community members, fishery stakeholders, and ADF&G staff, which was integrated into the feasibility study and is summarized in this report (Figure 1).

[1] Scalisi E.D., Beaudreau A.H., Catterson M., Fowler P., Lum J., Nichols J., Nordal R., Peterson R. (2024). Understanding the feasibility of a mark-selective sport fishery for Chinook salmon in Southeast Alaska. Final Report prepared for Alaska Department of Fish and Game under contract no. IHP 23-035. University of Washington, School of Marine and Environmental Affairs, Seattle, WA. 60 pp.

After the UW contractor work was completed, ADF&G staff developed an analysis of the number of marked fish in the SEAK king salmon sport fishery (Objective 2) and integrated that analysis and other new information into this technical report (Figure 1). A qualitative cost-benefit analysis (Objective 4) drew from information generated throughout the project.

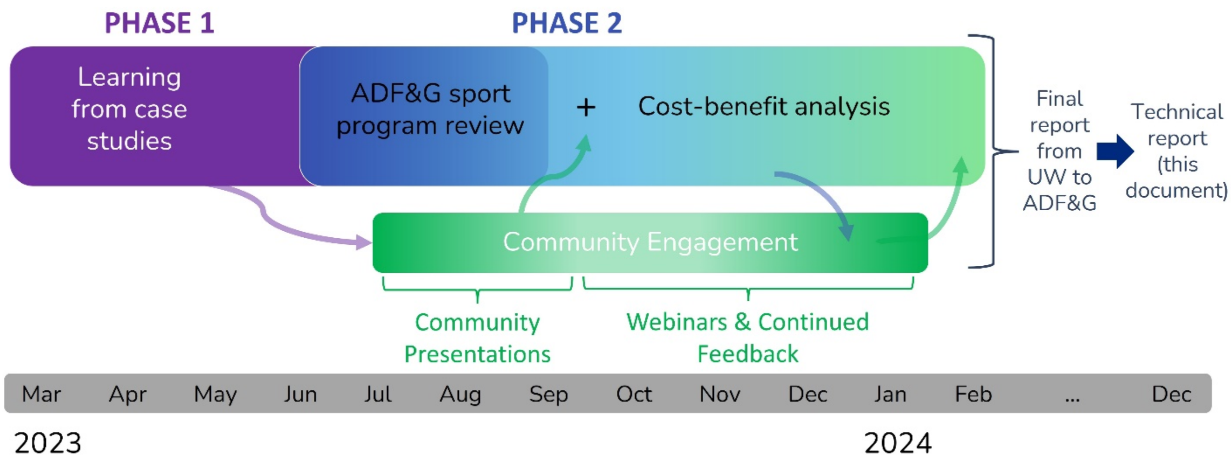


Figure 1.–Project approach and timeline.

# INTRODUCTION

King salmon are highly sought after in sport and commercial fisheries in SEAK, and have strong social, cultural, and economic importance in the region. ADF&G manages the SEAK sport king salmon fishery according to provisions of the PST and national and domestic policies, each of which share similar overarching principles of meeting escapement goals and providing sustainable levels of harvest opportunity consistent with the sustained yield principle (Fowler et al. 2021). Due to recent declines, conservative management measures have been utilized in SEAK waters to protect wild king salmon stocks experiencing poor productivity, resulting in reduced harvest opportunity for all user groups (Hagerman et al. 2022, Meredith et al. 2022, Salomone et al. 2022). While MSFs have seen limited application in Alaska, there has been interest in exploring this management tool for use in the king salmon sport fishery in SEAK. The history of MSFs in the Pacific Northwest and Canada are presented to set the stage for understanding the conditions under which MSFs may be feasible or infeasible in SEAK.

## MARK-SELECTIVE SALMON FISHERIES IN THE UNITED STATES AND CANADA

Mark-selective fisheries were initially developed in the Pacific Northwest in the late-1990s and early-2000s to allow for fishing opportunity while protecting natural-origin, or wild, stocks that had experienced declines to the point of conservation concern (Peterson and Baltzell 2012, SFEC 2016). Since that time, MSFs have become a widely used management tool for recreational (sport) and commercial Pacific salmon fisheries in the U.S. and Canada (SFEC 2016). The majority of MSFs in the U.S. are in Washington and Oregon for both marine and freshwater sport fisheries.

The first king salmon MSF was established in Washington State, following the listing of multiple king and coho stocks for protection under the ESA (50 CFR §223-224, 1999). This context is central for understanding the proliferation of MSFs as a management tool for king and coho salmon over the next decade. By the mid-2000s, most king and coho salmon produced in hatcheries in Washington, Oregon, and Idaho were being mass marked by removal of the adipose fin to allow for use of MSFs (Johnson 2004).

The process for MSF implementation requires coordination between the international governing body (the PSC) and federal, tribal, or state fisheries management agencies. Agencies proposing and implementing MSFs submit a formal proposal to the Selective Fishery Evaluation Committee (SFEC) prior to the start of any new MSF and are required to fulfill yearly reporting requirements. SFEC's charge is to coordinate, evaluate, and report on mass-marking and MSFs to the PSC. The *Management Program* section of this report provides additional details.

Currently, dozens of MSFs are prosecuted annually. For instance, the SFEC received 80 MSF proposals for the 2023 fishing season, including 44 for king salmon (SFEC 2023). Proposals were submitted by federal, state, and tribal governments in British Columbia, Washington, and Oregon; however, no proposals were submitted by Alaska. The only MSF that has occurred in SEAK to date was an experimental commercial troll MSF with a goal to "increase harvest rates on hatchery stocks including those of Alaska origin…while reducing impacts on natural origin Chinook salmon" and was only implemented when the troll fleet was targeting other species and closed to king salmon retention (Hagerman et al 2017, p. 12).

Overall, the design of MSFs, as well as the monitoring and assessment of these fisheries, are highly specific to time and area (Beaudreau et al., in prep.). MSFs for king and coho salmon are designed using a variety of regulations, including specifications for gear, timing and locations of fishery openings, and bag limits. For example, in 2023 the ocean salmon fishery along the Washington-Oregon border was open June 24 - August 25 (season close date based on quotas), with regulations allowing for a mixed-bag limit of two total salmon retained per day; of these, just one may be a king, and any coho retained must be marked (ODFW 2023). Additionally, this fishery has gear restrictions requiring barbless hooks, and size limits (coho minimum length of 16" and king minimum length of 22") (ODFW 2023). In British Columbia, Canada, several pilot mixed-bag MSFs were implemented in 2023, with the retention of one marked king salmon allowed in specific locations for several weeks at a time during the summer (DFO 2023). These MSF regulations layer on top of standardized salmon regulations in British Columbia that specify a combined daily limit of 4 fish for all species of Pacific salmon, a possession limit of double the daily limit, and an annual limit of 10 king salmon per person (DFO 2024), as well as the use of barbless hooks.

A more extensive history of MSFs outside of Alaska was reviewed by Beaudreau et al. (*In prep.*[2]).

## SUMMARY OF LESSONS LEARNED FROM MSFS

The SFEC published an extensive report synthesizing benefits and concerns related to MSFs in the Pacific Northwest and British Columbia. Briefly, we summarize the key considerations related to implementation of MSFs highlighted in the report (SFEC 2016) and by other authors, under four broad themes: potential impacts on wild stocks; challenges for the coded-wire tagging (CWT)

[2] Beaudreau, A.H., Scalisi, E.D., and Nordal, R. Ecological, social, and institutional dimensions of selective fisheries for hatchery-produced Pacific salmon (*Oncorhynchus* spp.) in North America. In preparation for submission to *Reviews in Fisheries Science and Aquaculture*.

program, stock assessment, and monitoring; costs of implementation and monitoring; and fishery effects.

*1. Potential impacts on wild stocks*

One of the major concerns is the potential impacts of continued fishing activity under MSF regulations on wild (or natural-origin) stocks as opposed to a closure due to conservation concerns. These impacts occur from incidental mortality of caught and released fish (SFEC 2016). In order to successfully implement an MSF with minimal impacts on wild stocks, the encounter rate of marked fish by anglers must be substantially higher than the incidental hook and release mortality rate (Hoffmann and Pattillo 2008). Catch and release mortality can be variable due to effects of handling practices, fish size, temperature, and other factors (e.g., Gjernes et al. 1993). SFEC (2016) recommended better coordination among agencies to develop estimation methods for MSF impacts on unmarked fish.

*2. Challenges for the CWT program, stock assessment, and monitoring*

Under the PST, the parties are required to maintain a CWT program, in which a percentage of hatchery-produced salmon are implanted with tags that have a unique identifying code linked to their hatchery of origin (PST 1985). Coastwide, the target sampling goal for CWT is 20% of the harvest (PSC 2005). The CWT program is a key component of understanding salmon stocks, as it "is the only means currently available to obtain data necessary to estimate and monitor coastwide exploitation rates on individual stocks of coho and Chinook salmon" (PSC 2024a). The SFEC identified the impact of mass-marking on the CWT program as a major concern to program viability (SFEC 2016).

Prior to mass-marking, the adipose fin clip was paired with a CWT to facilitate visual sampling. With the advent of mass-marking, only a fraction of adipose fin clipped fish also contained a CWT. This resulted in complications for sampling because tagged fish could no longer be visibly distinguished from untagged fish. To address this concern, most agencies are now using electronic tag detection (ETD) through the use of tube detectors and handheld wands (SFEC 2016). British Columbia maintains a voluntary program to recover CWTs from sport and First Nations fisheries (DFO 2022). Under the Sport Head Recovery Program (SHRP) fishers voluntarily deposit heads of marked fish into depot collection points (e.g., at boat launches), which are then retrieved by Canada's Department of Fisheries and Oceans for processing (DFO 2022).

Stock assessment is also complicated by mass-marking and MSFs, because the number of estimated parameters and uncertainty in those estimates tends to increase (Peterson and Baltzell 2012, SFEC 2016). The numbers of harvested and released fish by size and mark status must be accounted for, requiring new quantitative methods and additional data inputs (Peterson and Baltzell 2012). Catch monitoring is more extensive in some areas where MSFs are implemented. For example, the Washington Department of Fish and Wildlife monitors recreational harvest through dockside creel sampling, test fishing, on-water or aerial effort surveys, catch record card reporting, and angler-completed voluntary trip reports (McHugh et al. 2009, Peterson and Baltzell 2012, Garber and Kloempken 2022).

*3. Costs of implementation and monitoring*

MSFs increase costs for agencies and hatcheries due to a range of factors. These include, but are not limited to: (1) initial purchase and continuing maintenance costs of automated tagging trailers; (2) ETD equipment (e.g., tube detectors, hand-held wands); (3) handling and shipping larger numbers of heads from marked fish, most of which do not have CWTs; (4) implementation of double index tag programs (see *Assessment and Monitoring Programs* section); and, (5) staffing for mass-marking, monitoring, and CWT recovery. An additional administrative cost is the review and processing of MSF proposals each year by the PSC. Due to these costs and other challenges, Hoffmann and Pattillo (2008) recommended that "alternative management strategies for achieving the same objectives for less cost should also first be considered" prior to implementation of MSFs (p. 594).

*4. Fishery effects*

A commonly stated goal of MSFs is to provide fishing opportunity which would otherwise be limited or closed entirely due to conservation concerns; however, the extent to which MSFs increase actual harvest depends on the specific mix of marked hatchery and unmarked wild fish. Overall, reductions in retention of unmarked catch since MSFs have been used are indicative "that angler behaviour has been modified to harvest selectively for marked fish" (SFEC 2016, p. 11). MSF benefits to anglers can lead to increased public support for resource management agencies and enhancement programs (SFEC 2016).

Conservation and fishery benefits of MSFs can be variable and uncertain. MSFs increase complexity of regulations, which can lead to challenges in compliance and enforcement (SFEC 2016). They can also change angler behavior in ways that affect monitoring and management, such as voluntary release of fish even when they can be retained, increasing the challenge of quantifying MSF impacts (SFEC 2016). Additionally, critiques of MSFs have been expressed by tribal co-managers on the U.S. west coast related to inequitable distribution of benefits arising from MSFs (CRITFC 2014).

# SPORT FISH PROGRAM REVIEW: CONSIDERATIONS FOR MSFS

## MANAGEMENT PROGRAM

As summarized in the *Overview of the Sport Fisheries for King Salmon in Southeast Alaska through 2020* (Fowler et al. 2021, p. 3), "the marine king salmon sport fishery is managed to achieve 3 primary goals: (1) sustainable SEAK wild stocks, (2) compliance with the provisions of the PST, and (3) providing opportunity for Alaska hatchery-produced king salmon when possible." In accordance with the provisions and agreements of the PST, the *Southeast Alaska King Salmon Management Plan* (*5 AAC 47.055*), directs the management of the king salmon sport fishery in SEAK. This management plan was developed and can be modified by the Alaska Board of Fisheries (BOF) (ADF&G 2024a). The domestic allocation of king salmon between various fisheries in SEAK is also determined by the BOF through the *Allocation of king salmon in the Southeastern Alaska-Yakutat Area* (5 AAC 29.060). Upon implementation of any MSFs, all current obligations (detailed below) must still be fulfilled, and additional measures will likely be required, with specific details dependent on the corresponding regulations of any planned MSFs.

### International Management: Pacific Salmon Treaty

The PST "includes provisions for management and conservation of king salmon stocks along the Pacific Coast, north of southern Oregon up to Cape Suckling in SEAK" (PST 2023, summarized by Fowler et al. 2021, p. 7). Every 10 years the PST is renegotiated, with the most recent renegotiation setting provisions for 2019-2028. The PSC was formed in 1985 by the U.S. and

Canada to implement the PST (PSC 2024b). There are four regional panels that work to provide technical and regulatory advice to the PSC, two of which encompass SEAK: 1) Northern Panel—for stocks originating in rivers situated between Cape Suckling in Alaska and Cape Caution in British Columbia, and 2) Transboundary Panel—for stocks originating from the Alsek, Stikine, and Taku river systems (PSC 2024c). These panels are informed by technical committees, which "provide the Panels with the timely scientific data and information needed in order to make effective decisions. These committees rely upon information provided by Canadian and United States fishery management agencies" (PSC 2024c). The following PSC Committees are most relevant to the implementation of an MSF:

- Selective Fishery Evaluation Committee (SFEC): Assesses the impacts of mass marking, MSFs, and the viability of the CWT system. Develops tools that agencies can use in proposals and data analysis (PSC 2024a)
- Chinook Technical Committee (CTC): Responsible for evaluating, reviewing, and making recommendations for conduct of fisheries, escapement objectives, and research projects specifically relevant to implementing the Chinook salmon chapter 3 of the PST. Reports to the PSC (PSC 2024d)
- Transboundary Technical Committee: Assembles and refines information on migratory patterns, exploitation, and spawning requirements of relevant transboundary stocks; Examines management regimes to determine suitability of achieving escapement goals; Maintains an enhancement subcommittee; Reports to the Transboundary Panel (PSC 2024e)
- Northern Boundary Technical Committee: Provides stock status information and evaluates management action efficacy for pink, chum, sockeye and coho salmon stocks of interest within the Northern Boundary area (PSC 2024f). Reports to the Northern Boundary Panel.

The PSC is responsible for setting the SEAK all-gear catch limit, which excludes most Alaska hatchery-produced king salmon. While the specifics of setting the catch limit have changed over time, the PSC establishes the Alaska all-gear catch limit which is then allocated based on domestic policy (5 AAC 29.060). The PSC has also adopted specific provisions for District 8 (Petersburg/Wrangell-Stikine River) and District 11 (Juneau/Taku River) that have implications for sport fishery management and harvest accounting in these areas.

## Domestic Management

Domestically, the SEAK king salmon sport fishery is managed by ADF&G following regulatory and statutory authority while complying with the provisions and agreements of the PST. The BOF has provided specific guidance for management of the SEAK sport fishery (*Southeast Alaska King Salmon Management Plan*, 5 AAC 47.055) and the domestic allocation of king salmon between various fisheries (*Allocation of king salmon in the Southeastern Alaska-Yakutat Area*, 5 AAC 29.060).

The annual SEAK all-gear catch limit, established by the PSC, is allocated between fisheries in accordance with *Allocation of king salmon in the Southeastern Alaska-Yakutat Area* (5 AAC 29.060). Under this regulation, "the commercial net fisheries allocation is first subtracted from the SEAK all-gear catch limit (1,000 is first allocated to the set gillnet fishery and the remaining drift gillnet and seine fisheries each are allocated 2.9% and 4.3%, respectively, of the remaining all-gear catch limit) and the remainder is allocated 80% to commercial troll fisheries and 20% to sport fisheries" (ADF&G 2024c). The "hatchery add-on" provision of the PST stipulates that most Alaska hatchery-produced king salmon harvested by SEAK sport and commercial king salmon fisheries do not count against the annual harvest limit (PST 2023). All wild, natural, and non-Alaska hatchery origin king salmon harvested in SEAK are counted towards the SEAK all-gear catch limit (Fowler et al. 2021).

The *Southeast Alaska King Salmon Management Plan* (5 AAC 47.055) directs ADF&G to "implement specific management actions according to the annual allocation of king salmon to the sport fishery. Emergency order (EO) authority is used to establish bag, possession, annual limits, and other provisions annually in accordance with the management plan" (Fowler et al. 2021, p. 3). Management measures are implemented via EOs, and sport fishing opportunity for king salmon generally increases as the number of fish allocated to the sport fishery increases. EOs can be used to provide opportunity for Alaska hatchery-origin king salmon at times and in areas when these stocks are returning. Special provisions designed to provide additional opportunity for Alaska hatchery-origin king salmon are limited by time and area to focus harvest on the intended stock and avoid interception of nontarget king salmon stocks. These areas, near hatcheries or release sites, may utilize management measures such as increased bag and possession limits, reduced size limits, removal of annual limits, and open time periods when harvest would otherwise be prohibited (Fowler et al. 2021).

The *Policy for the Management of Sustainable Salmon Fisheries* (5 AAC 39.222) directs ADF&G to provide the BOF with "reports on the status of salmon stocks and identify any salmon stocks that present a concern related to yield, management, or conservation during regularly scheduled board meetings" (summarized within Meredith et al. 2022, p. 1). Currently in SEAK, the BOF has adopted three action plans in response to select king salmon stocks (or aggregate stocks) within SEAK being identified as a stock of concern (i.e., Unuk and Chickamin, Meredith et al. 2022; Northern Southeast Alaska, Hagerman et al. 2022; and Stikine River and Andrew Creek, Salomone et al. 2022). These action plans, developed by ADF&G and adopted by the BOF, provide additional guidance to ADF&G in the implementation of management actions designed to conserve these stocks of concern.

## Management Considerations for Developing an MSF

Planning and implementation of an MSF will require consideration of domestic and international obligations. The following section provides an overview of the key management considerations for developing an MSF.

<u>International considerations</u>. SFEC requests that domestic managers submit a proposal for any MSF prior to implementation. (SFEC 2004; Appendix A). These proposals include information related to the specifics of management (e.g., time and area, target species, gear) and assessment (e.g. CWT sampling rates, catch monitoring). There are several proposal criteria that are particularly relevant to management considerations: 1) Determining whether the fishery implemented will be "MSF", "Mark-mixed bag", or "Mark and size-mixed bag" (SFEC 2023); and 2) Detailing "alignment of time/area strata boundaries of regulations and catch estimation and CWT sampling programs", "indicator stocks expected to be impacted by the fishery", and "double index tag (DIT) release groups expected to be impacted by the fishery" (SFEC 2023).

Additionally, SFEC requests two post-season tables from agencies annually for all implemented MSFs (Appendix B). The first table is most relevant to assessment (SFEC 2023). The second table requires information on fishery area, sector, start date, end date, and target species, as well as specific MSF regulations, including species, bag limits by mark status and size (if applicable), minimum and maximum size limits, and other regulations.

Domestic considerations. In order to execute an MSF in the sport fishery, regulatory language guiding the management of the fishery must be adopted by the BOF with consideration towards the existing management plan in 5 AAC 47.055 or included in ADF&G's emergency order authority. In order for a proposal to be taken up by the BOF, it must be submitted during the call for proposals for the appropriate meeting and generally accepted between December and April for the upcoming cycle (ADFG 2024a). This step in the process of MSF implementation must occur prior to submission of a proposal to SFEC.

The effects of any executed MSFs on domestic management plans will be highly dependent on the specifics of the proposal made to and approved by the BOF. It might involve changes to sections of the Alaska Administrative Code, including but not limited to the *Southeast Alaska King Salmon Management Plan* (5 AAC 47.055), the *Allocation of king salmon in the Southeastern Alaska-Yakutat Area* (5 AAC 29.060), and modifications to the action plans currently in place to conserve select king salmon stocks in SEAK.

Implementing any MSF fishery for the SEAK king salmon sport fishery will increase the complexity of regulations. This may have impacts on accessibility, angler satisfaction, and compliance. Compliance and enforcement of Alaska's fish and wildlife laws, statutes, and regulations is the primary responsibility of the Division of Alaska Wildlife Troopers (DPS 2024).

While the existing framework of the BOF process incorporates opportunities for the users of the resource and the general public to provide input, additional outreach and collaboration in advance of the BOF process would be beneficial given the complexity of interactions between hatchery facilities, user groups, and domestic and international management obligations. If a MSF is adopted, outreach and education to anglers in SEAK would be paramount for mitigating some of the challenges of implementing new and more complex regulations. Potential strategic outreach topics may include identification of marked fish, what fish are marked and why, best practices in fish handling to reduce release mortality, additional reporting requirements, and the purpose of MSF fisheries.

## Summary of Implications and Considerations for Management

Broadly, any MSF must address international, national, and domestic obligations regarding conservation, allocation, and management of king salmon. Developing an MSF would require the following:

- Proposal to SFEC based on requested timeline with all details complete;
- Proposal to BOF in accordance with BOF schedule, ideally with appropriate stakeholder outreach in advance;
- Public outreach to communicate regulations and educate anglers;
- Upon completion of domestic fishery planning processes, agencies conducting MSFs providing final selective fishery plans to SFEC; and,
- Post-season MSF results to SFEC submitted on requested schedule.

# STOCK ASSESSMENT PROGRAM

## Stock Assessment Overview

The ADF&G SEAK king salmon stock assessment program, which has been in existence since the 1970’s, is used to meet multiple domestic, national, and international management obligations including, but not limited to, requirements of stock-specific action plans, Alaska’s *Policy for the Management of Sustainable Salmon Fisheries* (5 AAC 39.222), and PST obligations. Most often, the mandates set by these policies are based around meeting escapement goals.

Domestic policies require ADF&G to report on salmon stock status and escapement goals to the BOF, document and review existing salmon escapement goals, establish goals for stocks for which escapement can be reliably measured, and prepare scientific analyses with supporting data when goals are created, modified, or recommended for elimination.

At present, 11 of 34 SEAK king salmon stocks have established biological escapement goals (BEGs) and projects designed to monitor escapement (Priest et al. 2024); additionally, 4 of the 34 king salmon stocks are also assessed to estimate exploitation rates (Courtney et al. 2023; Elliott and Peterson 2023; Frost et al. 2023; Williams et al. 2023). Currently, not all SEAK king salmon stocks are monitored because of cost and logistical constraints.

Each stock assessment project is designed to meet management and research objectives using the most appropriate methods for that system. Escapement is quantified in-river using counting methods (e.g., aerial, foot, weir) or statistical methods (i.e., mark-recapture). Index counts, paired with occasional census weir counts or census estimates from mark-recapture studies, are the most common methods used. Notable exceptions include the weir count on the Situk River and mark-recapture projects on the Chilkat, Taku, Stikine, and, more recently, the Alsek River. The other assessed stocks use index-expanded escapement estimates (Richards et al. 2020).

The pertinent details of king salmon stock assessment are summarized below, followed by a synopsis of the attributes that may be affected by an MSF.

## Indicator Stocks and Use of Coded Wire Tag Data

Under the management regime of the PSC, the 11 SEAK king salmon systems consist of two types of indicator stocks: escapement indicator stock (EIS) and exploitation rate indicator stock (ERIS). Of the 11 wild stocks monitored for escapement by ADF&G, 6 of the 11 are recognized as EISs, and 4 of the 11 are recognized as ERISs. EIS programs are used to estimate escapements in the stock's region. ERIS programs are designed to calculate production, survival, harvest, and exploitation rates and patterns (Table 1). The two, in concert, are used to estimate stock productivity and to develop forecasts.

Table 1.–Assessed SEAK king salmon stocks.

| Origin | Stock | ADF&G Escapement Indicator Stock | PST Escapement Indicator Stock | Exploitation Rate Indicator Stock |
|---|---|---|---|---|
| Wild | Alsek River | yes | yes | no |
| | Taku River | yes | yes | yes |
| | Stikine River | yes | yes | yes |
| | Situk River | yes | yes | no |
| | Andrew Creek | yes | no | no |
| | Chilkat River | yes | yes | yes |
| | King Salmon River | yes | no | no |
| | Unuk River | yes | yes | yes |
| | Chickamin River | yes | no | no |
| | Keta River | yes | no | no |
| | Blossom River | yes | no | no |
| Hatchery | Crystal Lake Hatchery | No | No | Yes |
| | Little Port Walter | No | No | Yes |
| | Whitman Lake Hatchery | No | No | Yes |
| | Deer Mountain Hatchery | No | No | Yes |
| | Neets Bay Hatchery | No | No | Yes |

Hatchery releases make up many of the SEAK ERISs because tagging hatchery releases is more efficient than wild stock tagging and can provide more CWT recoveries and contemporary results compared to wild indicator stocks that require complete brood information. SEAK king salmon hatchery exploitation rate indicator releases include Little Port Walter (National Marine Fisheries Service), Crystal Lake (SSRAA), Deer Mountain (SSRAA), Whitman Lake (SSRAA), and historically Neets Bay (SSRAA). However, hatchery indicator programs have limitations, as hatchery fish may not have the same life history as wild fish, e.g., differences in early marine survival due to fish culture and release practices and may not be representative of their wild stock counterparts. The established wild CWT projects (Chilkat, Unuk, Taku, Stikine) in conjunction with assessed hatchery production provides the ability to test for representativeness.

ADF&G uses results from its wild ERISs to inform escapement goals, develop forecasts, tailor management actions for stocks of concern, make inseason management decisions, and fulfill PST obligations. SEAK king salmon wild exploitation rate indicator stocks include Unuk River (Southern Southeast Alaska; Frost et al. 2022), Chilkat River (Northern Southeast Alaska; Elliott and Peterson 2022), Taku River (Taku; Williams and Peterson 2022), and Stikine River (Stikine; Courtney et al. 2022). In the PST context, the results from these ADF&G projects are compared against results from the hatchery indicators to assess the utility of hatchery ERISs and in the evaluation of stock status.

ADF&G's use of both wild and hatchery stocks as ERISs forms a bridge between enhancement and wild stock assessment. One of the most important results from the hatchery ERIS projects is the estimate of fishery contribution, which is used by the PST via the SEAK hatchery add-on and domestically in the calculation of the Salmon Enhancement Tax. Data from the hatchery ERIS projects are also used by the PSC Chinook Model to represent wild production (CTC 2023).

### Summary of Implications and Considerations for Stock Assessment

Impacts to wild stock ERIS programs and projects. MSF implementation may impact SEAK ERIS projects and necessitate an evaluation of these projects to ensure continued fulfillment of international and domestic obligations. A MSF could violate project assumptions for juvenile CWT projects on the Chilkat, Unuk, Taku, and Stikine rivers. Specifically, a key assumption of these projects is that marked and unmarked fish have equal probability of survival (Williams and Peterson 2022). The extent to which an MSF would violate this assumption is dependent on where and when the MSF is implemented, including its proximity to the wild indicator stock.

Impacts to hatchery stock assessment. For hatchery stocks, a consideration is whether a DIT program would be needed. DIT programs were developed as a method to estimate release mortality of unmarked fish in a MSF (Johnson 2004, SFEC 2016). DIT programs administer a CWT and adipose clip to one group of hatchery-produced fish and only a CWT (no external mark) to a second group that is released at the same time (SFEC 2016). If it was determined that DIT groups were necessary, a collaborative effort between ADF&G and PNP hatchery operators would be needed for implementation to occur.

Another consideration is the complication a MSF would pose to estimating Alaska hatchery harvest. Estimation of Alaska hatchery harvest employs CWT analysis methods. A MSF would alter the fraction of marked fish over time, violating an assumption of the CWT analysis methods (Benard and Clark 1996). While solutions could be devised, this violation is likely to increase uncertainty in the Alaska hatchery add-on estimate. This could require additional sampling at the point of hatchery return.

## FISHERY MONITORING PROGRAM

### Sport Fishery Monitoring

The SEAK sport fishery is monitored to support domestic and international management objectives. Data are collected primarily through three programs: Statewide Harvest Survey (SWHS), SEAK Marine Harvest Studies (MHS), and Saltwater (Charter) Logbook. Together, data collected in these programs provide information on fishing participation, effort, spatial distribution and location of fishing, species and numbers of fish caught (fish handled but released) and harvested (fish kept), fish size category (SWHS: Romberg et al. 2018; Saltwater Charter Logbook: Powers and Sigurdsson 2016), and biological information on the catch such as presence of CWTs, genetic tissue, length, and sex (MHS: Jaenicke et al. 2023). The details of each program pertinent to king salmon are summarized below, followed by a synopsis of the attributes that may be affected by an MSF.

#### *Statewide Harvest Survey (SWHS)*

The SWHS is a mail survey administered annually by ADF&G since 1977 to a random stratified sample of households with at least one licensed angler (Kirsch et al. 2022). The survey is mailed to approximately 10% of Alaska sport fishing license holders annually and is designed to achieve a response rate sufficient to address statewide and regional needs for harvest estimation (Kirsch et al. 2022). Overall response rates have ranged from 31% to 46% over the last 15 years (Kirsch et al. 2022). Summarized estimates derived from the survey are publicly available through an online reporting tool (ADF&G 2024d).

The SWHS generates data annually on sport fishery participation, catch, and harvest in freshwater and saltwater for all areas in the state. The survey breaks apart effort, catch, and harvest by residency (Alaska resident, nonresident) and angler type (guided, unguided) (Kirsch et al. 2022). For king salmon, annual estimates of effort, catch, and harvest for freshwater and saltwater are available at the spatial resolution of the seven SEAK management areas. Due to the mechanics of a mail survey and associated analysis, data produced by the SWHS are not available until at least one year after the survey year. SWHS does not capture biological or mark/tag information for king salmon.

### *Saltwater (Charter) Logbook Program*

Since 1998, all SEAK charter operators and guides have been required to report guided fishing activity in saltwater (Powers 2014, ADF&G 2024e). Electronic reporting of logbook data has been mandatory in SEAK since 2021 (ADF&G 2024e). Detailed trip-level information is collected for guided (charter) saltwater fishing through the logbook program.

The charter logbook program provides a census of guided sport fishing trips in saltwater. A trip is defined as the "time period between the first deployment of fishing gear from a vessel providing sport fishing guide services and the offloading of one or more anglers or any harvested fish from the vessel" (Powers 2014 p. 26). Trip-level data recorded in the logbook include the date fished, hours fished for salmon and bottomfish (recorded separately), statistical area(s) fished for salmon and bottomfish (recorded separately), and information about the charter operation including specific licenses held (Powers 2014).

The logbook program captures information on the number and species of salmon and bottomfish kept and released, separately for each individual angler (Powers 2014, Powers and Sigurdsson 2016). For king salmon, the number of fish kept and released is reported by size class [small (<28 in) and large (≥ 28 in)] (Powers 2014). Angler names, license numbers, and residency (Alaska resident or nonresident) are recorded (Powers 2014). Estimates of saltwater effort, catch, and harvest are available at the statistical area, management area, and regional (Southeast) levels annually. Charter logbooks do not capture biological or mark/tag information for king salmon.

### *Southeast Alaska Marine Harvest Studies (MHS) Program*

The SEAK MHS project, also referred to as the marine boat creel survey, includes collection of data at primary sport fishing access points (e.g., boat launches, harbors) through interviews with anglers and biological sampling of their catch (Jaenicke et al. 2023). Data collected include numbers of fish by species (catch, harvest), hours fished, and number of anglers (effort). Biological sampling goals vary depending on the species or specific data needed for assessment and management purposes and may be defined in terms of target sample sizes (e.g., number of biological samples) or sampling rates (e.g., percentage of anglers surveyed). Creel sampling provides for in-season and early post-season estimates of harvest and catch for multiple species (Jaenicke et al. 2023).

Creel sampling is time- and resource-intensive, so spatiotemporal resolution of sampling varies depending on data needs for assessment and management. The finest temporal resolution for all estimates of effort, catch, and harvest is biweekly (every two weeks), with the exception that statistical week reporting is available under limited data-heavy situations (Jaenicke et al. 2023).

Spatial resolution is variable, with declining precision at finer scales. The finest spatial resolution for which effort, catch, and harvest are estimated by the MHS program is at the statistical area level, also referred to as a sub-district. Sub-districts represent the most granular level of fisheries management area definition (ADF&G 2024g), with the exception of special harvest areas which may be encompassed within a single sub-district.

For king salmon, biological sampling includes inspecting for CWT, collecting of genetic tissue samples and scale samples. The coastwide standard for CWT estimation is to sample 20% of the total regional sport harvest for the presence of CWTs in king salmon (PSC 2005). Creel samplers visually assess every king salmon they encounter for marks, and the heads of marked salmon are removed and shipped to ADF&G's Mark-Tag-Age Laboratory for tag reading (Jaenicke et al. 2023). The MHS program has observed a regional CWT sampling rate of approximately 17% for the last 10 years (2014-2023); spatial variability in the CWT sampling rate is greater than interannual variation (Mike Jaenicke, ADF&G, personal communication, January 2024). CWT data are used in combination with genetic mixed-stock analysis to estimate the percentage of hatchery fish caught in SEAK sport fisheries (Table 2).

The annual regional operational plan of the MHS program (Jaenicke et al. 2023) identifies precision criteria for primary objectives related to estimates of effort, catch, and harvest at varying time and area strata. For king salmon, the following preliminary estimates are generated: (1) total marine sport harvest; (2) total Alaska hatchery and total non-Alaska hatchery contributions, such that the estimates are within 50-90% of the true values 90% of the time for each port; (3) relative Alaska hatchery and relative non-Alaska hatchery contributions, such that the estimates are within 5-25% of the true values 90% of the time for each port; and (4) early season (late April to mid-July) PST harvest of king salmon for commercial salmon Districts 108 (Petersburg/Wrangell) and 111 (Juneau; Jaenicke et al. 2023). Harvests of king salmon at all sampled ports are recorded by angler residency type and by size class of fish (large ≥ 28 in, small < 28 in; Jaenicke et al. 2023).

Table 2.– Percent of Alaska-origin hatchery king salmon in SEAK sport fisheries, 2005–2023.

| Sport fish management area | Range | Mean |
|---|---|---|
| SEAK Sport Fishery (region) | 9-40% | 22% |
| Ketchikan area | 14-74% | 40% |
| Northern inside area | 36-90% | 55% |
| Petersburg and Wrangell area | 17-84% | 48% |
| Outside area | 2-14% | 7% |

## Commercial Fishery Monitoring

Along with data collected in the sport fishery monitoring program, data from the commercial fishery monitoring program contributes to stock and fishery assessments. Commercially harvested king salmon are sampled from commercial fisheries throughout SEAK by the Port Sampling Project (Reynolds Manney et al. 2023). For king salmon, the objectives for data collection include: collecting genetic and scale samples from individual fish during troll retention periods (winter, spring, and summer); and sampling a minimum of 20% of the total commercial harvest for CWTs stratified by gear, fishing area, and statistical week (Reynolds-Manney et al. 2023).

## Summary of Implications and Considerations for Monitoring

Upon implementation of an MSF, ADF&G may consider changes to sport fishery monitoring programs to more fully evaluate the MSF and meet PSC requirements. These include:

- SWHS: no anticipated changes to current status
- Charter Logbook Program: add a logbook question to document mark status of harvested and released fish
- Southeast Alaska MHS Program: review sampling needs and staffing levels in locations where MSFs are used to ensure sampling goals for harvest and CWTs can be met; record marked status for released fish (already captured for fish harvested); full electronic sampling for DITs

Implementing an MSF in the sport fishery may also necessitate electronic sampling for marked and unmarked fish in commercial fisheries, especially if a DIT program is required.

Increased reporting and coordination with management. The PSC requires agencies that prosecute MSFs to provide information about the fishery. Preseason proposals and postseason reports would need to be prepared by ADF&G research staff. This includes harvest estimates by size, mark, and retention status; DIT release groups expected to be impacted by the fishery; estimated CWT composition of harvest; and method for catch and release estimation. These tasks are not trivial and will obligate ADF&G beyond domestic accounting needs and likely require additional staff.

## Incidental Mortality

Incidental mortality (IM) is mortality caused by the act of fishing, excluding mortality associated with harvest. It can be defined as the difference between harvest (landed catch) and total fishing mortality (CTC 2021). Incidental mortality varies with regulations and can occur in any fishery regardless of retention requirements. An MSF could incur dropoff mortality (mortality of fish that encounter fishing gear but are not landed) and release mortality (mortality of fish that encounter fishing gear that are landed and released), with each IM component comprised of legal or sub-legal fish.

Estimating IM requires information from several sources and can be partitioned into stock-specific and fishery-specific estimates. Stock assessment programs tag the fish that form the basis of IM estimation in combination with information of recoveries of tagged fish encountered in fishery assessment programs. Fishery assessment programs enumerate the number of fish harvested and released and provide estimation of release mortality rates. The current sport fishery IM rate is 15.9%, which is the sum of the release mortality rate (12.3%) and dropoff mortality rate (3.6%) (CTC 1997, 2004, 2022).

## Summary of Implications for Incidental Mortality

Incidental mortality for the SEAK king salmon fishery must, under the PST, be managed to not exceed 59,400 king salmon (2019 PST Agreement, Chapter 3 paragraph 4(g)). MSF implementation would increase incidental mortality in the sport fishery, which may increase the risk of exceeding the PST all-gear IM limit.

IM Rates. A MSF could result in changes to fishing behavior, including retention and release of fish. MSF implementation may also warrant changes to gear regulations impacting IM rates.

Therefore, a re-examination of the incidental mortality rates currently used in assessments, potentially including an updated release mortality study, may be informative.

## ENHANCEMENT PROGRAM

### Southeast Alaska Chinook Salmon Enhancement Overview

Fisheries enhancement is a core function of the ADF&G Division of Sport Fish (DSF). The ADF&G DSF enhancement program uses federal and state funding to support and diversify fishing opportunities in SEAK by releasing king and coho salmon, and triploid rainbow trout at specific fresh and saltwater locations. Each year the ADF&G DSF enhancement program directs approximately $1.2M to release over 2.5M salmon and 50K rainbow trout (ADF&G 2024h). These stockings occur through contractual agreements with local private non-profit (PNP) hatchery operators, which are DIPAC in Juneau and SSRAA in Ketchikan and Petersburg. Program details are available for public review and comment each year in the *ADF&G Statewide Stocking Plan for Sport Fish* (ADF&G 2024i).

Funding for the numerous salmon enhancement activities occurring in SEAK comes from DSF and other sources including but not limited to an enhancement tax imposed on commercial salmon landings and federal funding. These other funding sources support a greater level of enhanced king salmon production than the DSF program.

### Policies Governing Alaska's Enhancement Programs

The *Comprehensive Salmon Enhancement Plan for Southeast Alaska: Phase III* was developed by the Joint Northern/Southern Southeast Regional Planning Team and published in 2004 (Joint Northern/Southern Southeast Regional Planning Team 2004). Phases I and II of the plan were completed in the early- to mid-1980s, which established and prioritized specific salmon enhancement objectives for the region consistent with overarching department statewide policies. The Phase III plan assessed future changes to salmon enhancement at a regional scale, specified future goals and objectives for salmon enhancement, and provided a comprehensive overview of the salmon enhancement program in SEAK at the time. The plan has not been updated with regional enhancement and fisheries management information, nor has it been updated to remove potential release sites that are no longer considered appropriate locations.

The Phase III plan also summarizes technical guidelines and best practices for enhancement planning to help provide a systematic approach to the development of new enhancement projects that benefit fisheries and minimally impact wild salmon resources. For potential MSFs, the most relevant areas to this plan include release site selection, harvest contribution, and terminal areas. The *ADF&G Genetic Policy* is a foundational policy that supports and guides many of the enhancement planning best practices outlined since inception of the Phase III plan (Davis et al. 1985).

### Impacts of Automated Marking and Tagging Trailers

Marking and tagging rates for some king salmon releases around the SEAK region have increased in recent years due to the use of two automated marking and tagging trailers (hereafter "trailers") beginning in 2021-2022. One trailer is located at Macaulay Salmon Hatchery (DIPAC, Juneau) and another is shared between Whitman Lake Hatchery (SSRAA, Ketchikan) and Crystal Lake Hatchery (SSRAA, Petersburg). The two trailers were purchased at a cost of $2.7M using funds from the Southeast Alaska Chinook Salmon Fishery Mitigation Program, which was established during 2009 PST negotiations and revised in 2019 renegotiations (ADF&G 2024j). NSRAA declined a trailer and continues to mark and tag at historical rates.

SSRAA began using the trailer for mass marking king salmon in 2021 (2020 brood year), while DIPAC began in 2022 (2021 brood year). With the use of trailers, king salmon mark rates for both associations increased to 100% (Figure 2). Mark rates for NSRAA releases remain below 20%.

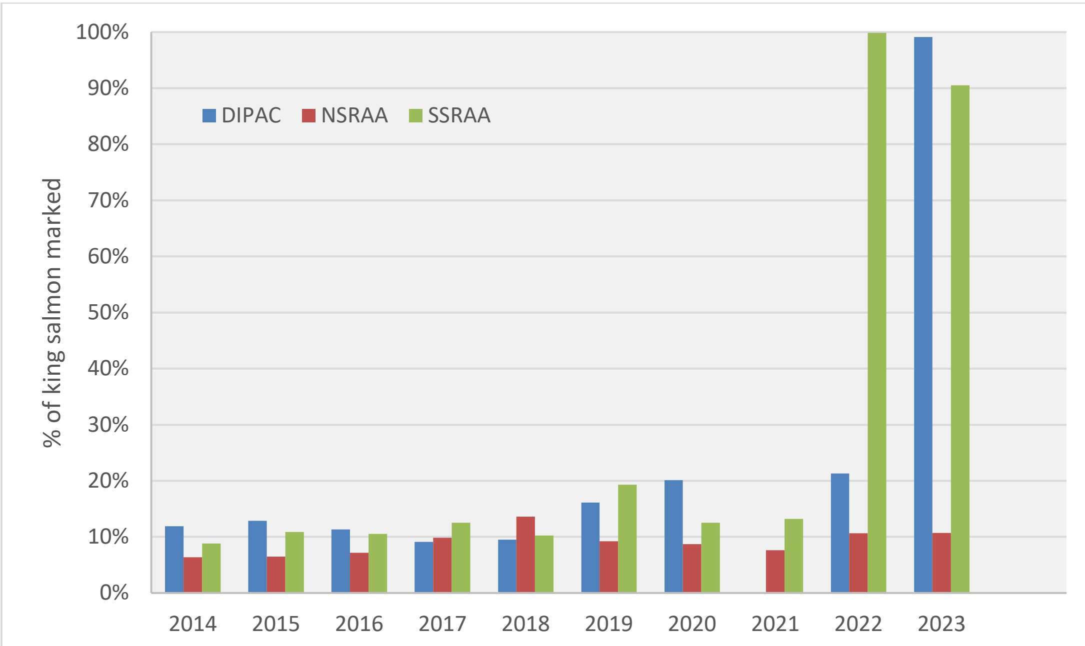


Figure 2.–Southeast Alaska king salmon mark (adipose fin clip) rate for release years 2014-2023 (DFGCWTOTOP Database).

Increased tagging rates, although not a pre-requisite for MSF implementation, occurred through the use of these trailers (Figure 3). Coded wire tagging allows estimation of stock composition, which is beneficial to identifying the Alaska hatchery component.

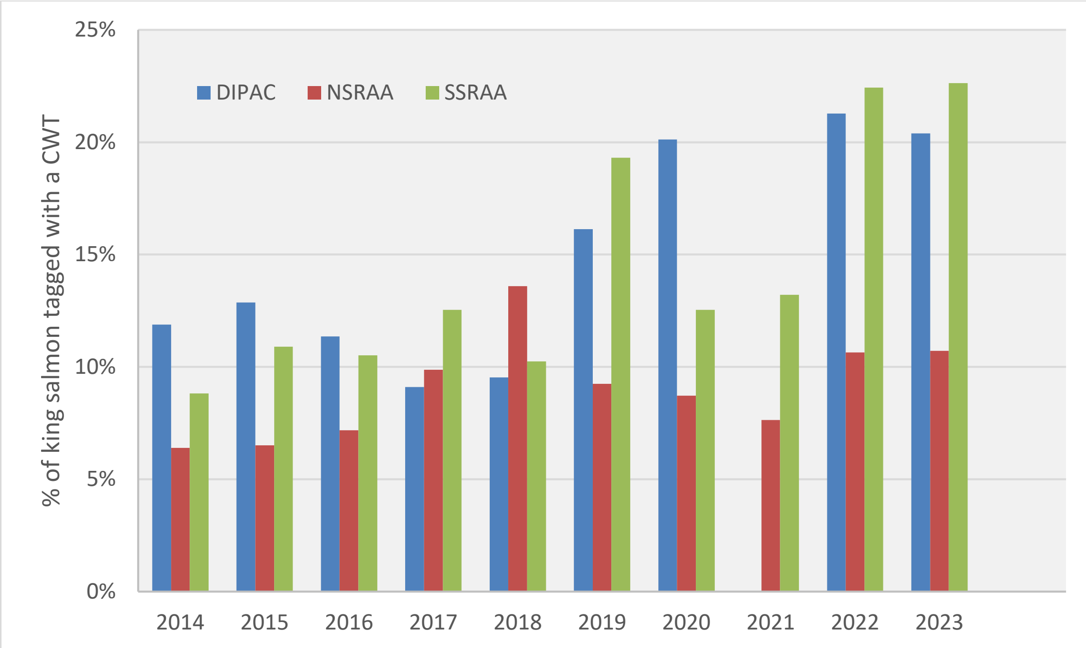


Figure 3.–SEAK king salmon tag (CWT) rate for release years 2014-2023 (DFGCWTOTOP Database).

Over 7 million king salmon were released from SEAK hatcheries in 2023[3], which is the most recent year for which complete information is available, of which about 3.79M or 53% were marked with an adipose fin clip (Figure 4a). There were 17 locations around SEAK where king salmon releases occurred, and mass marked fish (100%) were released from 10 of those release sites (Figure 4b)[3]. Additional release, marking, and tagging information for all SEAK hatchery king salmon can be found in Appendix F.

[3] This estimate of king salmon release by SEAK hatcheries does not include production by hatchery facilities in Metlakatla.

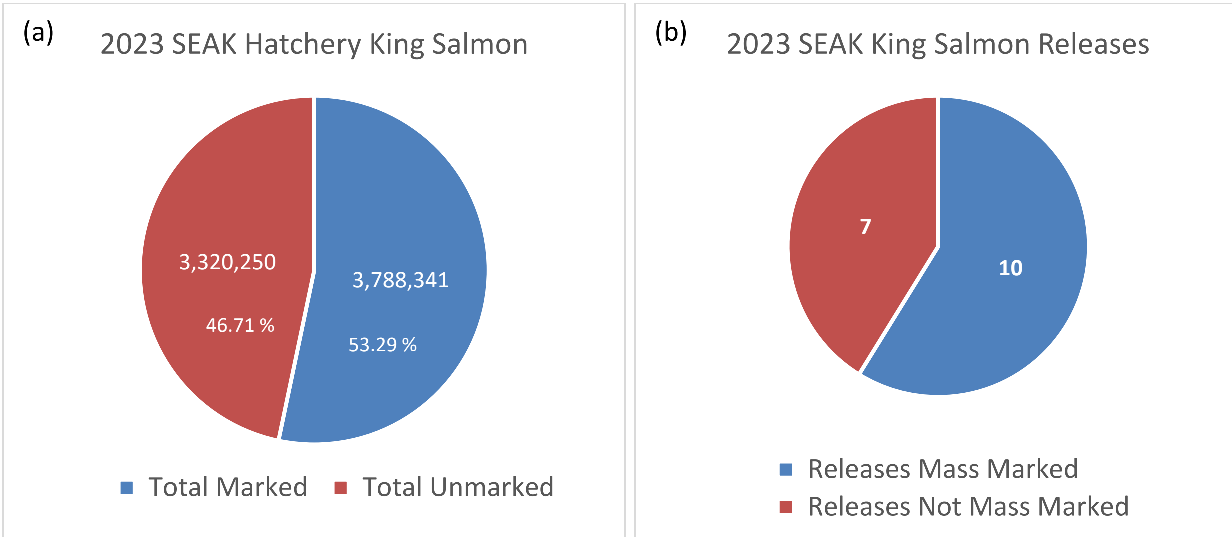


Figure 4.–(a) 2023 SEAK king salmon release amounts by mark status, and (b) 2023 king salmon releases that were mass marked or not mass marked.

*Note:* Estimates of marked and unmarked king salmon does not include production by hatchery facilities in Metlakatla.

DIPAC and SSRAA (personal communication K. Harms, DIPAC, January-February 2024; T. Frost, SSRAA, January-February 2024) have both noted benefits to using these trailers, most notably the increased mark and tagging efficiency which can lead to fewer staff hours. Additionally, fish processed through the tagging trailers do not need to be anesthetized, which results in a faster recovery time, reducing handling mortality, compared to fish anesthetized and marked by hand. The ability to process 100% of the king salmon produced at each of these hatcheries also leads to more accurate release numbers, as each individual fish is counted as it goes through the trailer. Higher mark rates may also facilitate the visual identification of hatchery fish in fisheries by anglers, which may increase public understanding of the extent of which hatchery production contributes to sport catch, but this is an untestable assumption, and the department has employed direct education on the subject for over 20 years.

Several costs associated with tagging trailers have been identified by hatchery staff. Financial costs include the cost of insurance for days when the trailer is moved, as well as general upkeep, staffing, and maintenance costs, and one-time costs necessary to integrate the trailer into existing hatchery operations (e.g., DG Fisheries Services and McDowell Group 2019, ADF&G 2020). While the DIPAC trailer stays in one location year-round, SSRAA's trailer is moved between two locations, resulting in relatively higher insurance costs and logistical complexity (ADF&G 2020).

Both DIPAC and SSRAA have recognized efficiencies and other benefits gained by the use of the trailers to mass mark, however both organizations have expressed concerns and opposition to MSF implementation in the SEAK king salmon sport fishery.

## Summary of Implications and Considerations for Enhancement

Rates of marking. While DIPAC and SSRAA have recently implemented mass-marking using the trailers, other SEAK hatcheries continue to mark other king salmon releases around the region at historic rates. Continuation of historic mark rates for king salmon will impact the feasibility of

MSFs in different times and areas. According to a white paper by ADF&G, "for MSFs to be a viable option, mark rates must be high, ideally greater than 50%, to outweigh the costs associated with the increased fishing effort required and the incidental mortality on unmarked fish" (ADF&G 2020, p. 5).

DIT group implementation. MSF implementation may require the use of DIT groups to better assess the incidental mortality associated with the fishery. A DIT group would require administering a CWT and adipose fin clip to one group of hatchery-produced fish and only a CWT (no visual mark) to a second group that is released at the same time (SFEC 2016). This would require coordination between ADF&G staff and the relevant hatchery associations, and possible additional costs to hatcheries and department infrastructure (such as the MTAL and MHS).

Coordination and engagement with hatcheries. Successful implementation of an MSF would require coordination with hatcheries and a stable funding source, as MSFs are heavily contingent upon high mark fractions (ADF&G 2020, Hoffman and Pattillo 2008). Accordingly, ample communication and agreement between ADF&G and hatchery associations would need to occur prior to MSF implementation, and ideally prior to the proposal stage, in order to gain a complete understanding of any changes hatcheries may need to make in order to fully implement a MSF.

# MARK FRACTION ANALYSIS

The efficacy of a MSF depends largely on the fraction of marked (i.e., adipose-clipped) fish available to the fishery. A key question in this study was whether the current mark fractions observed in the SEAK king salmon sport fishery are high enough to implement a MSF. A second related question was whether increasing the marking of king salmon released from the DIPAC and SSRAA hatchery facilities could raise mark fractions to levels high enough for a MSF. A third question investigated whether a regionwide policy to increase marking of all SEAK hatcheries could support an MSF.

To address these questions, catch-sampling data from the SEAK king salmon sport fishery were used to assess the current mark fraction. A model was developed to answer the latter two questions, as empirical data were unavailable (i.e., mass marked fish from DIPAC and SSRAA facilities began recruiting into fisheries in 2024, and most other SEAK hatcheries have not been mass marking). The model was calibrated using both catch-sampling and coded wire tag recovery data.

These results were used to evaluate whether current or modeled mark fractions would be high enough to support a MSF. The threshold for what constitutes a "high enough" mark fraction depends on management objectives. If the goal is simply to provide fishing opportunity, then even a low mark fraction (e.g., 0%) would be acceptable, resulting in a catch-and-release fishery. However, a mark fraction of 50%–meaning one in every two fish is adipose-clipped–is generally considered sufficient for implementing a MSF. Since this study was a feasibility assessment with no specified management objectives, the 50% mark fraction was used as the benchmark.

## METHODS

Both current and modeled mark fractions were estimated using catch-sampling and coded wire tag recovery data from the SEAK king salmon sport fishery. Harvest estimates were obtained from the statewide harvest survey (SWHS[4]) and the SEAK marine harvest studies (MHS) program

[4] Alaska Sport Fishing Survey database [Internet]. 1996– . Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish. Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

(Jaenicke et al. 2017). Catch-sampling data were collected by the SEAK MHS program, while coded wire tag recovery data were collected by both the MHS program and the ADF&G Mark, Tag, and Age Lab (MTAL).

All data used in this analysis were retrieved from the MTAL database via its online interface (DFGCWTOTOP[5]). Two queries were run: (1) the sport expansion report, which lists catch, sample, and recovery statistics, and (2) the contribution summary report, which provides contribution (harvest) estimates by tag code (stock). Strata without catch-sampling data or before 2005 were excluded from the analysis, as data prior to 2005 were collected at a coarser spatial resolution, limiting the ability to analyze data at the finest spatial resolution possible. A summary of the data used in this analysis is presented in Table 3.

Table 3.–Average catch-sampling and coded wire tag recovery data statistics from the Southeast Alaska king salmon fishery by sport fish management area, 2005–2023.

| | | | | | **Stock** | | |
|---|---|---|---|---|---|---|---|
| Sport fish management area | Harvest | Sample | Clips | Tags | SEAK hatchery | SSRAA/ DIPAC | Other |
| Craig | 2,675.0 | 739.7 | 69.1 | 33.3 | 4.5 | 2.3 | 28.6 |
| Glacier Bay | 1,127.5 | 222.7 | 30.8 | 12.2 | 1.9 | 0.7 | 10.1 |
| Haines and Skagway | 267.3 | 55.1 | 6.7 | 6.5 | 4.2 | 4.0 | 2.3 |
| Juneau | 1,887.7 | 252.7 | 20.4 | 16.7 | 14.5 | 9.6 | 2.2 |
| Ketchikan | 3,109.9 | 451.9 | 35.1 | 25.6 | 16.9 | 14.4 | 8.7 |
| Petersburg and Wrangell | 1,192.0 | 198.8 | 9.7 | 8.0 | 5.6 | 3.8 | 2.4 |
| Sitka | 7,882.8 | 1,750.8 | 189.8 | 78.6 | 14.1 | 3.8 | 64.2 |
| Wrangell Narrows | 1,835.1 | 78.7 | 8.1 | 7.6 | 7.6 | 7.5 | 0.0 |
| Yakutat | 287.2 | 77.6 | 8.6 | 3.6 | 0.3 | 0.1 | 3.3 |

The current mark fraction was estimated using catch-sampling data. When estimates were derived by combining multiple strata, the overall mark fraction, $\hat{P}$, was calculated as a weighted average:

$$\hat{P} = \frac{\widehat{Mark}}{\widehat{Harvest}} \tag{1}$$

where:

- $\widehat{Mark}$ is the sum of marked fish harvested, $\widehat{Mark} = \sum_h \widehat{Mark}_h$ ,
- $\widehat{Harvest}$ is the sum of fish harvested, $\widehat{Harvest} = \sum_h \widehat{Harvest}_h$ .

The number of adipose-clipped fish harvested in stratum *h*, $\widehat{Mark}_h$, was estimated as:

$$\widehat{Mark}_h = \hat{P}_h \widehat{Harvest}_h \tag{2}$$

where:

- $\hat{P}_h = a_h / n_h$ is the proportion of marked fish harvested in stratum *h*,
- $a_h$ is the number of marked fish sampled in stratum *h*,
- $n_h$ is the number of fish sampled for marks in stratum *h*,

[5] DFGCWTOTOP database [Internet]. 1976 – present. Juneau, AK: Alaska Department of Fish and Game, Division of Commercial Fisheries, Mark, Tag and Age Laboratory. [cited YYYY]. Available from: https://mtalab.adfg.alaska.gov/CWT/reports/default.aspx.

- $\widehat{Harvest}_h$ is the number of fish harvested in stratum *h*.

Modeled mark fractions required additional information, which was obtained using coded wire tag recovery data. Stock-specific (i.e., DIPAC and SSRAA, or all SEAK hatcheries) harvests (equation 3) and harvests of marked fish (equation 4) were estimated using the methods of Bernard and Clark (1996). The results from equations (1)–(4) were combined and used to determine the proportion of marked fish available to a fishery, as expressed in equation (5). Uncertainty in the modeled mark fractions was quantified by applying equation (5) over the years 2005–2023 and assessing the resulting interannual variability.

The harvest of fish from stock *S*, $\widehat{Harvest}_S$, was estimated as:

$$\widehat{Harvest}_S = \sum_j \sum_h \frac{x_{jh}}{\lambda_h \phi_h \theta_j} \tag{3}$$

where:

- $x_{jh}$ is the number of decoded CWTs from cohort *j* recovered in stratum *h*,
- $\lambda_h = \frac{a'_h d'_h}{a_h d_h}$ is the decoding rate for CWTs recovered in stratum *h*,
- $\phi_h = \frac{n_h}{\widehat{Harvest}_h}$ is the fraction of fish sampled for CWTs in stratum *h*,
- $\theta_j = \frac{t_j}{T_j}$ is the fraction of a fish released with a CWT and adipose-clip from cohort *j*,

Similarly, the harvest of marked fish from stock *S*, $\widehat{Mark}_S$, was estimated as:

$$\widehat{Mark}_S = \sum_j \sum_h \frac{x_{jh}}{\lambda_h \phi_h} \tag{4}$$

Further details about the notation and variance formulas used for uncertainty estimation are provided in Appendix E.

Results from equations (1)–(4) were combined to determine the proportion of marked fish available to a fishery, $\tilde{P}$, modeled as:

$$\tilde{P} = \frac{[(Harvest_S - Mark_S)Mark\ Policy + Mark]}{Harvest} \tag{5}$$

where:

- $Harvest_S$ is the harvest of stock *S*,
- $Mark_S$ is the harvest of adipose-clipped fish from stock *S*,
- $Mark\ Policy$ is the change to the current mark fraction,
- $Mark$ is the harvest of all adipose-clipped fish in the fishery,
- $Harvest$ is all the fish harvested in the fishery.

The tilde on $\tilde{P}$ indicates a model-based mark fraction as opposed to an empirical estimate, $\hat{P}$, which is directly derived from catch-sampling data.

To understand equation (5) intuitively, consider two examples:

- When $Mark\ Policy = 0\%$ (no change), the model simplifies to $\tilde{P} = \frac{Mark}{Harvest} = \hat{P}$, reflecting the current, or status quo, mark fraction.

- When $Mark\ Policy = 100\%$ (mass marking), the equation simplifies to $\tilde{P} = \frac{Harvest_S + Mark_{SC}}{Harvest}$, where $Mark_{SC}$ represents all adipose-clipped fish *not* from stock *S*, showing that the maximum mark fraction is limited by the contribution of the stock of interest and the number of marked fish from other stocks.

Equation (5) was used to evaluate four marking scenarios, corresponding to marking approximately 10%, 20%, 50%, and 100% of SEAK or DIPAC/SSRAA hatchery production (Table 4). The 10% scenario reflects historical marking and tagging guidelines, where approximately 10% of hatchery production is marked. This scenario serves as a baseline for comparison against higher marking levels. The 20% and 50% scenarios represent increases to the current mark fraction by 11% and 44%, respectively, assuming that 10% of hatchery production is already marked.

Why 11% and 44%? To achieve a mark fraction scenario of $\theta_2$, the current hatchery mark fraction ($\theta_1$) must increase by $\frac{(\theta_2 - \theta_1)}{1-\theta_1}$ = *Mark Policy*. For example, to reach a 50% mark fraction scenario ($\theta_2 = 50\%$) from a 10% current mark fraction ($\theta_1 = 10\%$), the required increase is $\frac{(50\% - 10\%)}{1-10\%} = 44\%$.

The 100% marking scenario considers the case where all SEAK or DIPAC/SSRAA hatchery production is massed-marked. Results from equation (5) were used to examine how varying marking levels might affect the encounter rates of marked fish in the SEAK king salmon fishery, using historical data to assess the outcomes for each scenario: approximately 10% (status quo), 20%, 50%, and 100%.

Table 4.–Mark scenarios considered in the retrospective mark fraction analysis.

| *Mark Scenario* | *Mark Policy* | Formula |
|---|---|---|
| ≈10% (status quo) | 0% | $= Mark/Harvest$ |
| 20% | 11% | $= [(Harvest_S - Mark_S)11\% + Mark]/Harvest$ |
| 50% | 44% | $= [(Harvest_S - Mark_S)44\% + Mark]/Harvest$ |
| 100% | 100% | $= [Harvest_S + Mark_{SC}]/Harvest$ |

## RESULTS

Current and modeled mark fractions were estimated by time and sport fish management area: Craig, Glacier Bay, Haines and Skagway, Juneau, Ketchikan, Petersburg and Wrangell, Sitka, Wrangell Narrows, and Yakutat. Results are presented in Table 5, Figures 5–6, and Appendix E.

Empirical estimates highlight significant temporal and spatial variation in the percentage of marked fish harvested by the SEAK king salmon sport fishery. The modeled mark fraction analysis supports these findings, with varying outcomes across different scenarios. Specifically, times or areas with higher contributions from SEAK-hatcheries (Table 3) were more impacted by changes in hatchery marking.

Substantial spatial variability was observed in the modeled mark fractions (Figure 5–6, Appendix E). The impact of increasing the mark policy was less pronounced in the outside sport fish management areas (Yakutat, Sitka, Craig, Glacier Bay) compared to the inside areas (Haines and

Skagway, Juneau, Petersburg and Wrangell, Ketchikan, and Wrangell Narrows), where the mark fractions increased more notably. This is likely due to the differing contributions from SEAK hatcheries in these areas. In the inside areas, only the 100% mark scenario resulted in mark fractions exceeding 50%, with some temporal variability.

Model results by hatchery show that changing the mark scenario at DIPAC and SSRAA facilities (Figure 5) led to outcomes similar to those of a regionwide policy (Figure 6). This indicates that the majority of Alaska hatchery-produced king salmon harvested in the SEAK king sport fishery originate from DIPAC and SSRAA.

Wrangell Narrows was the only sport hatchery terminal area isolated in this analysis. As a terminal harvest area, it is designed to target hatchery-origin fish due to its proximity to the hatchery release site. Estimated mark fractions in Wrangell Narrows align closely with those reported by Crystal Lake Hatchery. The modeled mark fractions increased proportionally with the mark scenario, as expected for a terminal fishery targeting a single stock. Notably, Wrangell Narrows was the only sport management area to exceed 50% mark fractions under the 50% mark scenario.

One limitation of this analysis is the spatial and temporal resolution of the results, which are presented by sport fish management area and sport period. The relatively coarse spatial-temporal resolution reflects the data collection and analysis methods (see Fishery Monitoring Program). While this resolution is sufficient for current management (see Management Program), it may not support a MSF. An alternative source of information could be data from SEAK commercial fisheries, which are available at a finer spatial and temporal resolution (ADF&G statistical area and week). Although not part of this analysis, commercial fishery data could offer more detailed estimates.

Table 5.–Average estimated mark fractions in the Southeast Alaska king salmon fishery by sport fish management area and Sport Period.

| | Sport Period 1 | | Sport Period 2 | | Sport Period 3 | |
|---|---|---|---|---|---|---|
| Sport fish management area | Average | SD | Average | SD | Average | SD |
| Craig | 8.6% | 4.0% | 9.4% | 4.9% | 8.8% | 5.8% |
| Glacier Bay | 11.7% | 5.4% | 14.0% | 5.9% | 12.0% | 7.2% |
| Haines and Skagway | 10.0% | 2.4% | 8.2% | 3.2% | 9.2% | 1.2% |
| Juneau | 7.2% | 4.5% | 9.6% | 2.9% | 10.8% | 4.9% |
| Ketchikan | 7.7% | 2.0% | 8.3% | 2.4% | 10.2% | 5.6% |
| Petersburg and Wrangell | 4.1% | 2.8% | 8.4% | 2.4% | 8.8% | 3.1% |
| Sitka | 11.3% | 5.0% | 12.7% | 6.0% | 12.6% | 6.4% |
| Wrangell Narrows | 13.1% | 4.5% | 13.1% | 4.5% | | |
| Yakutat | 8.5% | 4.2% | 9.2% | 6.1% | 9.4% | 1.7% |

*Note:* Exact dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. Years included in the average vary by sport fish management area.

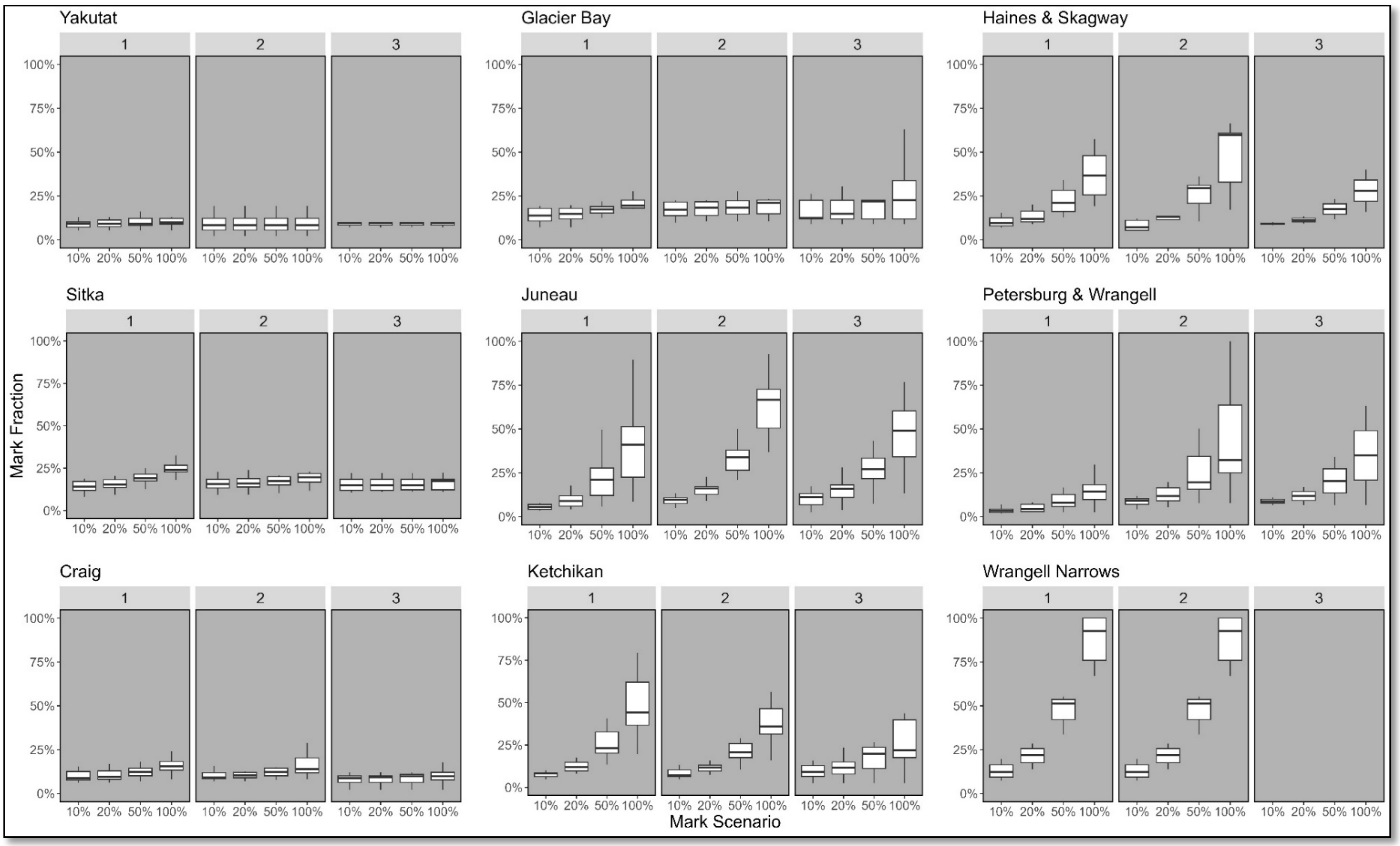


Figure 5.–Boxplots displaying estimated (10%; status quo) and modeled (20%, 50%, and 100% DIPAC and SSRAA mark scenarios) mark fractions by sport fish management area and Sport Period.

*Note:* Calculation and equations defining mark fractions provided under Model section; mark scenarios are not an estimated quantity, but rather one of four marking rate levels applied to hatchery production yielding estimates of the expected mark fraction in the sport fishery by area.

*Note:* Exact dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. Years displayed vary by sport fish management area.

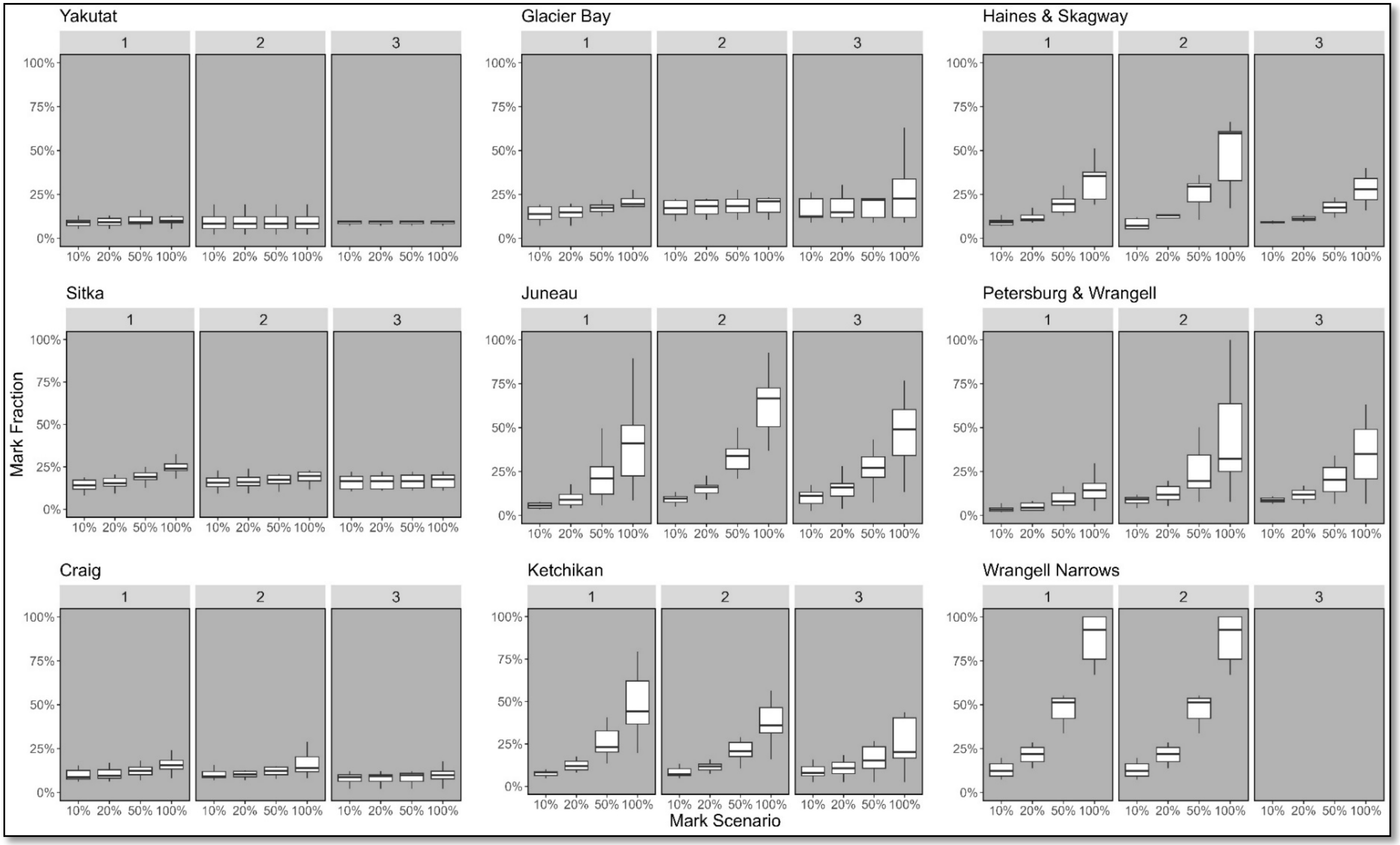


Figure 6.–Boxplots displaying estimated (10%; status quo) and modeled (20%, 50%, and 100% SEAK mark scenarios) mark fractions by sport fish management area and Sport Period.

*Note:* Calculation and equations defining mark fractions provided under Model section; mark scenarios are not an estimated quantity, but rather one of four marking rate levels applied to hatchery production yielding estimates of the expected mark fraction expected or observed in the sport fishery by area.

*Note:* Exact dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. Years displayed vary by sport fish management area.

# COMMUNITY ENGAGEMENT AND PERSPECTIVES ON MARK-SELECTIVE FISHERIES

A key component of this feasibility study was to engage SEAK fishing community members to gather local perspectives on MSFs. This was done not only to communicate the study goals and findings directly with community members, but also to incorporate their ideas and concerns into the qualitative assessment of potential costs and benefits of MSFs in the SEAK king salmon sport fishery.

## METHODS

Two series of community meetings were held in conjunction with each phase of the study (Figure 1). In Phase 1, four meetings were held in SEAK communities and one meeting online in summer and fall of 2023. During these meetings, the project team presented the goals of the feasibility study and a summary of MSFs in British Columbia, Washington, and Oregon, highlighting their benefits and challenges. In Phase 2, two virtual meetings were held in February 2024 to share findings from the program review and cost-benefit assessment with ADF&G staff and the public. Information about the meetings was shared via an email distribution list of more than 400 individuals and organizations, and through social media channels. Summaries of Phase 1 and Phase 2 meetings were distributed to meeting participants via the email list and are publicly available (Appendix C). These summaries served as the basis for incorporating community perspectives into a synthesis of potential costs and benefits of MSFs.

Meetings were facilitated by UW researchers and ADF&G staff attended to answer questions and engage in discussion with the public. At each meeting, note-takers (2-3 individuals from UW and ADF&G) took detailed notes during the discussion portion to capture questions and topics raised by participants. The detailed meeting notes were evaluated using thematic analysis, a common method in the social sciences (e.g., Creswell and Creswell 2023), to synthesize key themes from community discussions as well as questions raised at these meetings. Approximately 166 community members attended the meetings, including university and agency researchers and management staff; sport, commercial, personal use, and subsistence fishers; hatchery association employees; and other members of the public (Appendix C).

## RESULTS

Meeting participants discussed a variety of topics and questions related to MSFs in the Pacific Northwest (British Columbia, Washington, and Oregon) and their potential use in SEAK. This section summarizes common themes and questions raised by participants at community meetings, which we acknowledge may not necessarily be representative of views held by SEAK community members overall.

A primary concern raised by SEAK community members in meetings held as part of this study was the potential for higher release mortality of wild king salmon under an MSF than directed mortality in the absence of an MSF. Some community members expressed skepticism about the accuracy of release mortality rates currently used in models and noted that mortality can vary by fish size, time of year, angler experience, fish handling, where fish are caught (freshwater or saltwater), and hook type (e.g., barbed vs. barbless; Grover et al. 2002). Community meeting participants suggested that new, Alaska-specific studies on incidental mortality effects of MSFs could be needed prior to MSF implementation to gain a greater understanding of the ecological impacts of an MSF.

Some community members who attended the meetings raised ethical concerns about catch and release fishing (i.e., moral opposition to injuring fish through catch and release) that would reduce their satisfaction. Community members also wondered whether MSF regulations would result in altered fishing behavior, such as shifts in fishing locations and/or increased crowding in areas with MSFs. Speaking from previous experiences fishing under MSF regulations in Washington, several community members expressed that MSFs can result in reduced efficiency and increased costs, including longer time to catch a legal fish, due to various factors such as a high ratio of unmarked to marked fish.

At community meetings, some participants raised concerns that MSFs could disproportionately affect rural and Alaska Native residents by reducing access and increasing costs, complicating regulations, and shifting charter effort into fishing areas currently used by local residents. Several community members commented that subsistence priorities are not adequately recognized with respect to king salmon in SEAK and raised concerns about a lack of Alaska tribal representation in the PST arena.

Some meeting participants expressed concerns that initial increased opportunity afforded by a MSF could lead to greater restrictions in the future, such as retention of only marked hatchery fish. However, community members also noted that an MSF could result in Alaska fishers harvesting more hatchery fish originating in Alaska, thus increasing the return on SEAK hatchery investment. Because the harvest of Alaska hatchery fish does not count towards Alaska’s all-gear catch limit set by the PSC, an MSF may provide a way to mitigate king salmon harvest reduction that resulted from the last treaty agreements (ADF&G 2024j).

Institutional concerns raised during community meetings were in regard to implementation, feasibility, and applicability within the SEAK context of the SEAK sport fishery. Specifically, reduced trust in management agencies due to negative perceptions of MSFs by the public, based on previous efforts to implement MSFs in SEAK (e.g., in commercial troll fisheries), and the concern that the investment required to develop an MSF for the sport fishery would eventually lead towards MSFs in all sectors. Many community members commented that the design and outcomes of MSFs elsewhere may have limited applicability to Alaska, noting impacts of habitat degradation, dams, and urbanization that affect king salmon and their fisheries in Washington that are less relevant in Alaska.

Overall, more opposition than support was expressed for the potential use of MSFs as a management tool for the sport fishery. The meetings also provided an opportunity for information sharing between ADF&G staff and community members on relevant details of the current SEAK sport fish program and the potential effects of implementing MSFs. Community members requested technical information to better inform their understanding of how a potential MSF might work, including the percentage of marked fish caught by sport and commercial fisheries and mark rates and number of marked fish released coastwide. When possible, team members provided answers to these questions either during the meetings, or with follow-up emails afterwards. Additionally, these questions better informed subsequent presentations. The meeting attendees were given a schedule of expected publications, which include answers to many of these questions.

# SYNTHESIS OF COSTS AND BENEFITS OF MARK-SELECTIVE SPORT FISHERIES FOR SEAK KING SALMON

Assessing the feasibility of MSFs for the SEAK king salmon sport fishery requires consideration of the potential costs and benefits from a programmatic perspective, but also on perceptions of this management tool and its outcomes by communities and other fishery stakeholders. In this section, we bring together findings from a literature review of the history and use of MSFs (see *Introduction*), the program review, the retrospective mark fraction analysis, and community perspectives to synthesize the benefits and challenges of MSFs as a management approach in SEAK.

Cost-benefit analyses are decision-making tools that can take a wide range of forms, from qualitative, descriptive narratives to quantitative approaches that use a common metric (usually monetary) to assess both costs and benefits (Sinden 2015). In environmental management, the range of social, economic, and ecological impacts of particular policies are often evaluated within impact assessment frameworks using a mix of qualitative and quantitative data (e.g., Clay and Colburn 2020). Similarly, thematic analysis of qualitative data has been used to identify trade-offs and incorporate stakeholder and community perspectives in evaluation of fisheries policy and management (Lorance et al. 2011, Rees et al. 2013, Glass et al. 2015). Qualitative analysis may be the most appropriate and informative approach in contexts with high uncertainty about outcomes of a particular policy (Sinden 2015) or that require evaluation of social concerns (Mkindi et al. 2021).

Because the design and impacts of MSFs are highly place-based and context-dependent (Beaudreau et al., in prep.), we used a qualitative approach to characterize the range of potential impacts, the conditions under which they might be realized, and who might be affected. We synthesized predominant themes emerging from a literature review of MSFs in the United States, the program review, and community engagement. Themes were grouped into three categories of impact: ecological, socioeconomic, and institutional (Glass et al. 2015, Clay and Colburn 2020). Ecological impacts include factors such as changes in fishing mortality and sublethal effects on fish stocks (e.g., behavior change). Social impacts may include angler behavior, norms, community relationships, well-being, and equity. Economic impacts consider financial costs of implementation, effects on income or employment, and other effects on local businesses. Institutional impacts encompass bureaucratic processes and agency roles and responsibilities arising from the action. For each category, the potential positive and negative impacts are described. *Positive impacts* are conceptualized as positive outcomes gained or negative outcomes avoided, whereas *negative impacts* include resources expended (i.e., time, financial capital) and other negative outcomes.

## ECOLOGICAL IMPACTS

The primary ecological benefit of an MSF is the potential for reduced fishing mortality of wild king salmon stocks, when compared to a non-selective fishery operating in the same time and area. Based on a review of MSFs outside Alaska, a common goal of selective fisheries is to allow for harvest of hatchery fish while alleviating pressure on wild populations (Peterson and Baltzell 2012, DFO 2015, WDFW 2022). Assessing the ecological trade-offs of MSFs on wild stocks is a key aspect of evaluating their effectiveness. While MSFs are generally designed to alleviate pressure on wild populations, incidental mortality of unmarked (presumed wild) fish that are caught and released has been widely raised as a concern (Hoffmann and Pattillo 2008, CRITFC 2014, SFEC 2016). The extent to which an MSF results in lower mortality on wild king salmon than would have occurred without an MSF depends on the ratios of marked and unmarked fish, marking rates of hatchery-produced fish, fish handling practices, and fishing effort (e.g., Pyper et al. 2012, SFEC 2016).

Additionally, an MSF could result in repeated catch and release of the same individual. Limited information exists regarding the impact of repeated injuries from catch and release. Sublethal effects of MSFs on wild fish, such as impact on spawning success, are also poorly understood

## SOCIOECONOMIC IMPACTS

Broadly, MSFs could benefit the sport fishery by providing fishing opportunity where it otherwise may have been restricted or closed entirely. In Alaska, this could occur as time and/or area openings or bag limit increases. An additional benefit from increased tagging of Alaska hatchery fish, which could happen with or without an MSF, may be improved accounting of the origin of harvested king salmon.

Potential socioeconomic costs were identified by this study, especially based on concerns raised at community meetings. These include potential negative impacts of MSFs on the quality of fishing by complicating regulations, creating crowding issues, increasing the financial cost of harvesting a fish, and decreasing angler satisfaction through catch and release practices. MSFs often result in increased complexity of regulations, which can be difficult for anglers to interpret and complicate enforcement (SFEC 2016).

The harvest of king salmon for food, which is a culturally important activity for all SEAK community members, primarily occurs under sport regulations in SEAK. Alaska Native community meeting participants expressed concerns that MSFs could lead to added challenges in accessing king salmon that may create or exacerbate food security issues in their communities. Tribes in Washington and Oregon have expressed similar concerns about the ability of MSFs to allow for non-treaty fisheries to access a greater share of hatchery salmon, while resulting in the same impacts on wild fish (CRITFC 2024). Depending on the structure of the specific MSF, benefits may be disproportionately distributed geographically between segments of sport fishing anglers or fishery sectors. Shifts in harvest and effort after implementation of an MSF may occur and require modification to management provisions over time, potentially resulting in more restrictive regulations than originally implemented before the MSF.

## INSTITUTIONAL IMPACTS

The potential benefits of mass-marking and/or MSFs could extend to management institutions in Alaska, by providing improved data for monitoring king salmon harvest. However, there are costs to management agencies to implement more complex regulations, including direct expenditure of staff time and the opportunity costs for other management tasks. Additionally, increased encounter rates of mass-marked fish can lead to non-compliance by anglers and charter operators to meet reporting and sampling requirements, which can degrade the quality of fishery information collected by these programs. A number of potential impacts on the ADF&G Sport Fish program in SEAK were identified through the program review and are summarized in Appendix D.

Institutional impacts include issues of implementation, feasibility, and applicability in the context of the SEAK sport fishery. Specifically, reduced trust in management agencies due to negative perceptions of MSFs by the public based on previous efforts to implement MSFs in SEAK (e.g., in commercial troll fisheries), and the concern that the investment required to develop an MSF would eventually lead towards a "total MSF" in all sectors.

# DISCUSSION

By conducting this feasibility study, ADF&G was not advocating for the use of MSFs in the SEAK king salmon sport fishery. MSFs have never been employed in SEAK sport fisheries and their use in Alaska has been extremely limited, which contrasts with their increasing use in Pacific Northwest (British Columbia, Washington, Oregon) sport fisheries. The purpose of this study was to better understand the potential impacts of MSF implementation on the SEAK king salmon sport fishery within the context of domestic and international management mandates, and with specific consideration of current assessment and monitoring programs and community perspectives. This study also modeled hatchery mark fractions in the SEAK king salmon sport fishery on relatively coarse geographic and temporal scales to characterize the proportions of marked hatchery fish that would be available to sport fisheries at different marking rates. This assessment of existing hatchery production, marking rates, and potential changes that could be undertaken was intended to help characterize the current feasibility of MSF implementation. However, this analysis was not designed to identify and/or recommend specific MSF scenarios for the SEAK king salmon sport fishery. This feasibility study provides a more complete understanding of the needs, impacts, concerns, and potential benefits of MSF implementation that would inform the evaluation of any future MSF proposals for the SEAK king salmon sport fishery.

Taken together, the literature review of MSFs in the US, the program review, and community engagement provided a more complete picture of the implications of MSFs for SEAK sport fisheries and are key to assessing feasibility. Potential positive outcomes include reduced fishing mortality for wild stocks (ecological), maintaining fishing opportunity in particular times and/or areas (socioeconomic), and improved data due to increased tagging and sampling (institutional; Table 6).

Table 6.–Potential positive outcomes of MSF implementation, categorized according to ecological, socioeconomic, and institutional impacts.

| Positive impacts | Type | | | Source |
|---|---|---|---|---|
| | Ecological | Socioeconomic | Institutional | |
| Reduced fishing mortality for wild stocks | X | | | LR |
| Maintain fishing opportunity in particular times and/or areas | | X | | LR, CE, PR |
| Improved data quality due to increased tagging | | | X | CE |

*Note:* The source is indicated for each impact (LR = literature review of MSFs outside Alaska; PR = program review; CE = community engagement). *It is important to note that these outcomes—including the magnitude and direction of impact (positive or negative)—will depend on the specific details of the MSF program design and implementation.*

Potential negative outcomes include increased release mortality of unmarked wild fish (ecological), reduced efficiency (longer time, and/or higher cost to catch a harvestable fish (socioeconomic), more complex regulations and impacts to fishing experience (socioeconomic), inequitable distribution of costs and benefits among communities and/or fishery sectors (socioeconomic), intensive data needs and impacts to the CWT and stock assessment programs (ecological, institutional), and diversion of resources and attention away from other priority salmon issues (institutional, socioeconomic; Table 7).

The commonly cited goal of MSFs is to provide or maintain harvest opportunity of hatchery fish while protecting wild stocks. An assumed context for this goal is that the alternative management approach to an MSF would be fishery restrictions due to wild stock conservation concerns or changes to the SEAK king salmon allocation from the PSC. In this context, the purported benefits of MSFs are straightforward: allow anglers to fish and harvest hatchery fish. However, it is unclear that this benefit would be realized in the SEAK king salmon sport fishery. The SEAK sport fishery harvests king salmon across a large geographical area and intercepts a large number of king salmon stocks as they transit through SEAK waters. The contribution of Alaska hatchery-produced stocks is variable in time and location, generally increasing near terminal release locations and following known trends in run timing. Several other mass marked king salmon stocks (non-Alaska hatchery) are intercepted in the SEAK sport fishery and would be indistinguishable to the angler. Harvest of these marked but non-Alaska hatchery produced stocks would not provide intended benefits of an MSF since this harvest would continue to be counted against the Alaska all-gear catch limit. Given these considerations, a regionwide MSF is not likely to provide a net benefit. MSFs applied in specific locations and times where Alaska hatchery-produced stocks are more prevalent in the fishery may be a useful management tool to explore, although there are cost and benefits to consider for each location and scenario. Ample consideration should be given to the negative impacts of increased incidental mortality, increased complexity of regulation, and increased cost of compliance with international obligations to sample and report on MSF fisheries.

Areas of SEAK where harvest opportunity is currently limited by wild stock conservation concerns were also the areas identified by the mark fraction analysis as potentially having high enough rates of marked hatchery fish available under mass marking scenarios to be considered for MSFs. However, ADF&G already selectively manages king salmon fisheries in these areas to focus harvest on hatchery fish using time and area controls rather than marks. Providing sport harvest opportunity in select times and areas provides a similar benefit of focusing harvest on Alaska hatchery-produced stocks, but without the negative impacts of increased incidental mortality, increased complexity of regulation, and cost of compliance with international obligations. MSF implementation at any scale would increase the complexity of monitoring and assessment programs that would be required to collect additional information, possibly at finer geographic and temporal scales to meet reporting requirements to the PSC/SFEC. Current sport fishery assessment programs (MHS, SWHS, and Charter Logbook) would likely need modification or additional components added. Adding components to these programs would require budgetary support and staff capacity for data collection, analysis, and to fulfill reporting requirements. This data collection burden may be extended to anglers and charter operators who may be required to document and report additional information.

Table 7.–Potential negative outcomes of MSF implementation, categorized according to ecological, socioeconomic, and institutional impacts.

| Negative impacts | Type | | | Source |
|---|---|---|---|---|
| | Ecological | Socioeconomic | Institutional | |
| Increased release mortality of unmarked wild fish | X | | | LR, CE |
| Sublethal effects of catch and release on wild-origin fish (e.g., reduced spawning success) | X | | | CE |
| Impacts to the CWT program; Increased uncertainty in stock assessment and parameter estimation | X | | X | LR, PR |
| Requires additional data and Alaska-specific studies on release mortality | | | X | CE, PR |
| Increased complexity of regulations | | X | X | LR, CE, PR |
| Changes in charter fishing behavior affecting harvest experience for unguided residents | | X | | CE |
| Reduced efficiency, longer time, and/or higher cost to catch a harvestable fish | | X | | CE |
| Ethical concerns about catch and release fishing | | X | | CE |
| Inequitable distribution of benefits among segments of sport fishing anglers and fishery sectors | | X | | CE |
| Could be used as a tool to reduce opportunity over the longer-term | | X | | CE |
| Previous MSFs in SEAK have drawn little support | | X | X | CE |
| Complicates monitoring and assessment; May require increased reporting for anglers | | X | X | LR, PR |
| Could divert resources and attention from more significant salmon issues | | X | X | CE |

*Note:* The source is indicated for each impact (LR = literature review of MSFs outside Alaska; PR = program review; CE = community engagement). *It is important to note that these outcomes—including the magnitude and direction of impact (positive or negative)—will depend on the specific details of the MSF program design and implementation.*

Another increasingly relevant assessment issue is the impacts of mass-marking on the existing CWT sampling program. The significant increase in the number of marked but not tagged king salmon that is occurring due to mass marking in the region requires sampling programs to sort through larger numbers of marked fish to recover CWTs. This is problematic because CWT recovery and analysis is key to PST fishery assessment protocols and harvest estimation. The additional workload necessary for sampling programs to recover CWTs will stress ADF&G staff and budget capacity and will likely impact anglers and charter operators who will be subject to more and longer duration sampling of their catch. These issues are already occurring in areas of SEAK where mass-marked fish returned in 2024 and appear to be leading to less compliance by anglers and charter operators to sampling protocols.

This study found that there was very limited public support for MSFs by SEAK community members, Alaska Native organizations, hatcheries, or other fishery stakeholders. During the series of community meetings conducted through the course of this project and follow-up communication, the department received a number of negative comments generally expressing concern and a lack of support for MSF. The concerns included: disproportionate cost/benefits to segments of sport anglers and/or fishing sectors, a general dislike of increasing incidental mortality (perceived as waste), changes in harvest and effort patterns that may lead to crowding or increased tensions over king salmon allocation among gear groups, and finally increased complexity of regulations. Notably, without the cooperation and support of the private nonprofit hatchery organizations to mass mark and CWT an adequate proportion of king salmon releases, any MSF is unlikely to occur.

Additionally, the design and structure of this study provided an opportunity to develop a general template for evaluating the feasibility of MSF implementation for a specific fishery (Appendix G). This feasibility template mirrors the approach used in this study and is intended to be a first step taken by management agencies considering implementing an MSF. The template is similar to the SFEC MSF Proposal Template (Appendix A) in some ways but includes components that address feasibility rather than specific characteristics of a proposed MSF. A logical process for a management agency considering an MSF would be to start by completing this feasibility assessment and, if the outcome was a determination that an MSF was feasible, then the agency could get the necessary infrastructure changes and education campaign in place prior to implementation. While the template was derived from our feasibility study, modeling of anticipated MSF impacts did not occur in our study. This is because information gathered through other components of our study indicated significant challenges to MSF feasibility that rendered the modeling of impacts unnecessary. However, a modeling exercise would help inform assessment of impacts if other feasibility components suggested a MSF was feasible. Specifically, it would help the management agency determine if there was a threshold for acceptable mortality of wild stocks from an MSF.

This study has assessed the feasibility of MSF implementation in the SEAK king salmon sport fishery as it is currently managed and has explicated a variety of costs and concerns that do not support MSFs. However, the balance of these considerations could be shifted if external processes, such as PST renegotiations, litigation, or ESA designations, arose in a way that severely limited SEAK sport fishery king salmon harvest opportunity in the future. In the future if harvest opportunity was severely limited, MSFs may be a useful tool to maintain king salmon fishing and harvest opportunity, but assessment tools and programs would need to be in place to ensure benefits are realized without negatively impacting wild stocks or the sport fishery itself. These considerations and the specific fishery, assessment, and community-based issues identified in this feasibility study should be addressed before any MSF proposal is advanced in the SEAK king salmon sport fishery.

# ACKNOWLEDGEMENTS

This project was funded through a service contract between UW and ADF&G (contract no. IHP 23-035) using grant funds awarded to ADF&G by the Mark Selective Fishery Fund of the Pacific Salmon Commission. We are grateful to community members who participated in meetings and provided thoughtful and insightful feedback. Thanks to hatchery association staff Susan Doherty, Tessa Frost, Katie Harms, and Adam Olson for providing information on marking and tagging. We appreciate data, information, and meeting support provided by ADF&G staff in Craig, Juneau, Ketchikan, and Sitka offices. Additional thanks to Dani Evenson and Milo Adkinson for reviewing an earlier draft of this report. Thank you to faculty and staff at Juneau Public Library, University of Alaska Southeast, and Prince of Wales Vocational & Technical Education Center for providing meeting support. Thanks to UW graduate students Adriana Apintiloaiei, Erick Dowell, Katalin Plummer, and Lucas Weaver for notetaking and research assistance.

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# APPENDIX A: SELECTIVE FISHERY EVALUATION COMMITTEE MSF PROPOSAL TEMPLATE

Appendix A 1.–MSF proposal template form provided by the SFEC.

**Template for mark-selective fishery proposals**

Mark-Selective Fishery Proposal ID #_________________

Date Received ___________________________________

**MARK-SELECTIVE FISHERY PROPOSALS - TITLE**

## Contact information

| | |
|---|---|
| Proposing Agency: | |
| Contact Person: | |
| Mailing Address: | |
| Phone Number: | |
| Fax: | |
| Email: | |

Is the proposal:

new or not yet reviewed by PSC-SFEC ______
substantially changed ______

## Purpose/management objective

**Describe the management objective of the proposed mark-selective fishery.**

## Location and time of the proposed mark-selective fishery

Please **include any information when there are breaks or changes in regulations that might impact sampling stratification (see Question 7b below)**

1. **Location of the fishery:**

2. **Year and month(s) when the fishery is proposed to occur:**

-continued-

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## Other information about the fishery:

3. Target species/stocks (including nontarget PSC species/stocks of concern):

4. Gear to be used:

5. Other regulation details (e.g., size restrictions, bag limits, mixed bag information):

**6.** Expected mark rate:

## Projected impacts BY the fishery

7. Identify all (coast wide) CWT stocks likely to be encountered in this fishery (including individual tag codes if available), whether those stocks were Double Index Tagged (DIT). Appendices F and G provide tables of tagged indicator stocks for coho and Chinook for your convenience. Please note we are interested in tagged impacts alone, untagged hatchery production should not be included.

## In-season management

8. Describe your sampling program for sampling for: CWTs, marks and estimation of total catch. Attach your sampling plan if available. At a minimum, include descriptions for the following:
    a. CWT recoveries.
        i. Will there be *random* sampling of CWTs (i.e., fishers exiting fisheries contacted for biological sampling of harvest) or will you be using voluntary programs?
        ii. If *random* will there be ETD or visual identification of tagged fish?
        iii. If ETD in *random* samples, will all tagged fish (marked and unmarked) be processed?
        iv. If *random* what is the expected sample rate for CWTs?
        v. If voluntary programs are used, how is the awareness factor estimated?
    b. Monitoring for retained catch by sample strata for sample expansions. The sample strata and the strata of catch estimation must match the location/time/regulation strata (i.e., whenever there is a change in regulation such as from MSF to non-selective, or change in bag limits, the sampling strata should also change).
    c. Monitoring of mark rate in the MSF (this is the total mark rate, marked fraction in the harvest from the fishery).
    d. Other information, e.g., retained unmarked fish (mixed bag fisheries, or mark recognition error in MSF)

-continued-

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## Other information.

9. Please include any other information that will be useful for estimation of unmarked tagged mortalities in your MSF. For instance, sources of estimates of unmarked to marked ratios for DIT tagged groups (e.g., in a test fishery, nearby hatchery, non-selective fishery). Please provide any input you wish on methods to estimate the unmarked tagged mortalities for DIT groups, or for appropriate release mortality rates to be used.

# APPENDIX B: SFEC POST SEASON TABLES

Appendix B 1.–Postseason reporting table forms provided by SFEC related to MSF reporting.

Table B 1-1: CWT Sampling, both non-selective and mark selective fisheries

Note - *One entry per region and fishery sector as appropriate; to include information on general sampling programs and exceptions*

| Column | Description |
|---|---|
| Region | Fishery Reporting Region |
| Sector | Troll |
| | Sport |
| | Net |
| | First Nations |
| | Personal Use |
| CWT Sampling Method | Direct |
| | Voluntary |
| | None |
| CWT Detection Method | Visual |
| | Electronic |
| Heads Processed | All |
| | Only Marked Fish |
| | Other (describe) |

-continued-

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Table B 1-2: MSF information

| FISHERY INFORMATION | |
|---|---|
| **Column** | **Description** |
| Contact Information | Name, phone number, email address for additional information |
| Fishery Area | Area covered by MSF regulation |
| Sector | Troll |
| | Sport |
| | Gillnet |
| | Seine |
| | Personal Use |
| | Other |
| Start Date (MM/DD/YY) | Starting date for MSF regulation |
| End Date (MM/DD/YY) | Ending Date for MSF Regulation |
| Target Species for Fishery | Chinook |
| | Coho |
| | Other |

-continued-

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| MSF REGULATIONS | |
|---|---|
| **Column** | **Description** |
| MSF Species | Chinook |
| | Coho |
| | Other |
| Bag limits adult and juvenile by mark status | Describe retention limits (e.g., marked fish only, marked only adults, 1 marked adult, 2 jacks regardless of mark status) |
| Minimum Size Limit | Minimum size limit for retention. Specify unit of measurement (inches, centimeters) and type of measurement (e.g., total length, fork length) |
| Maximum Size Limit | Maximum size limit for retention if applicable). Specify unit of measurement (inches, centimeters) and type of measurement (e.g., total length, fork length) |
| Other regulations | Enter information on other applicable restrictions (e.g., barbless hooks, live boxes, tangle nets, mesh size) |

-continued-

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| CWT SAMPLING | |
|---|---|
| **Column** | **Description** |
| CWT Sampling Method | Direct |
| | Voluntary |
| | None |
| CWT Detection Method | Visual |
| | Electronic |
| Heads Processed | All |
| | Only Marked Fish |
| | Other (describe) |
| Mark Rate | Enter method to estimate mark rate (None, Observer, Angler interviews, Samplers) |
| Method For Catch Estimation | Enter method to estimate catches (None, Catch Slips/Tickets, Phone survey, Observer, Angler interviews, Creel Census, Catch Record Card, Log Books) |
| Method For Release Estimation | Enter method to estimate releases (None, Catch Slips/Tickets, Phone survey, Observer, Angler interviews, Creel Census, Catch Record Card, Log Books) |

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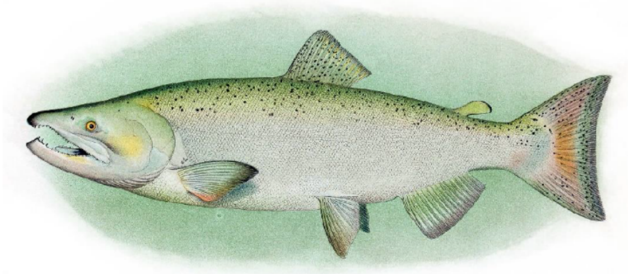
| (UN)MARKED FISH | |
|---|---|
| **Column** | **Description** |
| Retained | Number of fish retained (if unavailable, enter NA) |
| Legal Sized Fish Released | Number of legal-sized fish released (if unavailable, enter NA) |
| Sub-Legal Sized Fish Released | Number of Sub-Legal Sized fish released (if unavailable, enter NA) |
| Extra-Legal Sized Fish Released | Number of fish above the maximum size limit released (as applicable, (if unavailable, enter NA). |
| Extra-Legal Sized Fish Released | Number of fish above the maximum size limit released (as applicable, (if unavailable, enter NA). |
| **RELEASE MORTALITY RATES** | |
| **Column** | **Description** |
| Legal and Extra-Legal Sized Fish | Assumed total mortality rate for fish larger than the minimum size limit that are released (immediate and delayed) |
| Sub-Legal | Assumed total mortality rate for fish smaller than the minimum size limit that are released (immediate and delayed) |

# APPENDIX C: PUBLICLY DISTRIBUTED DOCUMENTS FROM COMMUNITY MEETINGS

Appendix C 1.–Project details provided to public meeting participants in Southeast Alaska.

**Understanding the costs and benefits of a mark-selective sport fishery for king salmon in Southeast Alaska: A feasibility study**



## Background

Along the west coast, some fisheries for king (Chinook) salmon are managed as mark-selective fisheries, where special regulations allow for harvest of adipose fin-clipped hatchery fish. This management tool was established to provide opportunity to harvest hatchery-produced fish when wild-origin salmon populations are at low abundance; however, implementing a selective fishery is not straightforward.

The Alaska delegation involved in the 2019 Pacific Salmon Treaty (PST) negotiations asked the Alaska Department of Fish and Game (ADF&G) to explore the possibility of using a mark-selective fishery for king salmon management in Southeast Alaska, specifically for the sport fishery. This request was made through Alaska's Commissioner to the Pacific Salmon Commission in response to reduced king salmon allocations for all Alaska gear groups under the 2009 and 2019 PST agreements.

ADF&G Division of Sport Fish received funding through a grant from the Pacific Salmon Commission to complete a feasibility study. Through a competitive process, ADF&G contracted a team of researchers from the University of Washington (UW) with experience in community engagement in Southeast Alaska to help do the work. The UW team's role is to gather and synthesize technical information, facilitate community meetings, incorporate community concerns and feedback, and write up the results in a final report that will be shared with ADF&G and the public.

## Study Objectives

1. Review mark-selective fishery programs outside of Alaska to understand how mark-selective fisheries have worked in British Columbia, Washington, and Oregon. What have the challenges and benefits been, and for whom?
2. Review the king salmon sport fish program in Southeast Alaska to understand what would need to change *if* a mark-selective fishery was implemented.
3. Engage Southeast Alaska fishing community members to gather local perspectives on mark-selective fisheries.
4. Evaluate potential costs and benefits of mark-selective fisheries in the Southeast Alaska king salmon sport fishery, incorporating community perspectives.

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## Community Engagement

In summer and fall of 2023, the project team held four meetings in Southeast Alaska communities and one online meeting. Information about the meetings was shared through email lists provided by ADF&G staff, public radio, posted flyers, and social media. During the meetings, the project team presented the goals of the feasibility study and results from the first phase of the project—a review of mark-selective fisheries (MSFs) in British Columbia, Washington, and Oregon, highlighting their benefits and challenges. Attendees provided feedback, questions, and concerns about MSFs. A goal of these conversations was to better understand community perspectives about potential costs and benefits of MSFs. Detailed questions and feedback from community members are being incorporated into the overall feasibility study.

| Meeting Locations | Participation* |
|---|---|
| **Juneau**<br>July 17, 2023 (5-6:30 pm)<br>Mendenhall Valley Public Library | 18 people attended, including university and agency researchers and management staff (~50%); sport (~40%), commercial (~5%), and personal use or subsistence (~20%) fishers; and other members of the public (~5%). 5 ADF&G and 3 UW project team members were also present. |
| **Ketchikan**<br>September 18, 2023 (7-8:30 pm)<br>ADF&G Office | 13 people attended, including charter operators (~85%) and local ADF&G staff (~15%). 1 ADF&G and 2 UW project team members were also present. |
| **Klawock / Craig**<br>September 19, 2023 (7-8:30 pm)<br>Prince of Wales Vocational & Technical Education Center | 48 people attended, including resident sport fishers (~50%), subsistence fishers (~33%), charter operators (~12%), commercial fishers (~10%), hatchery association employees (~2%), and local ADF&G staff (~2%). 2 ADF&G and 2 UW project team members were present. |
| **Sitka**<br>September 21, 2023 (7-8:30 pm)<br>University of Alaska Southeast | 18 people attended, including local ADF&G staff (~33%), commercial fishers (~22%), charter operators (~17%), subsistence fishers (~11%), hatchery association employees (~11%), and university researchers (~6%). 3 ADF&G and 2 UW project team members were also present. |
| **Online**<br>October 4, 2023 (7-9 pm)<br>Zoom link provided | 38 people attended, including subsistence or personal use fishers, resident sport fishers, charter operators, commercial fishers, hatchery association employees, and local ADF&G staff. 3 ADF&G and 5 UW project team members (incl. note takers) were also present. |

** Percentages do not always add up to 100% because people self-identified with multiple groups.*

## Meeting Highlights

Meeting attendees shared a wide range of comments, concerns, and questions about MSFs. Primary themes are highlighted below and were similar across meeting locations. Overall, more opposition than support was expressed for the potential use of MSFs as a management tool for the sport fishery. The strongest concerns were voiced by Prince of Wales community members, who noted a range of potential negative impacts to the local economy, customary and traditional fishing access, and fishing experience if MSFs are implemented.

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The meetings also provided an opportunity for information sharing between ADF&G staff and community members on relevant details of the current Southeast Alaska sport fish program and the potential effects of implementing MSFs. Technical information discussed included the percentage of marked fish caught by sport and commercial fisheries; mark rates and number of marked fish released coastwide; differences in feasibility of MSFs in inside waters versus outside waters of Southeast Alaska; and the current use of mass marking trailers by Southern Southeast Regional Aquaculture Association and Douglas Island Pink and Chum, Inc., including their efficiency and cost. These topics will be examined in detail during the next phase of the feasibility study (Obj. 2, above).

In addition, feedback was provided by participants to the project team about ways to improve outreach and engagement with a broader group of community members moving forward. In response to these recommendations, the team improved their outreach for the online meeting and has compiled an email distribution list of more than 400 individuals and organizations. Tlingit and Haida Central Council communications staff helped to distribute the online meeting announcement through social media and other online channels.

## Key Themes from Community Discussions

### Ideas about potential applications or benefits of MSFs

- MSFs could be a way to maintain or increase fishing opportunity in years with low returns of wild fish, during periods of non-retention of wild fish, or in specific areas near hatcheries
  - > May be most feasible on a small scale
- Improved data due to increased marking and tagging can help with accounting
  - > May result in Alaska fishers harvesting more hatchery fish originating in Alaska
- Alaska hatchery fish do not come out of PST allocation, so may provide a way to mitigate king salmon harvest reduction that resulted from the last treaty agreements

### Concerns about release mortality

- Concerns about MSF impacts on wild fish due to increased release mortality from catch and release of unmarked fish
- Questions raised about the accuracy of release mortality rates currently used in models
  - > Mortality varies by fish size, time of year, angler experience, fish handling, where fish are caught (freshwater or saltwater), hook type (e.g., barbed vs. barbless)
  - > No information on the impacts of repeated catch and release of the same individual
  - > May necessitate new Alaska-specific studies prior to MSF implementation
- Limited information on sublethal effects of MSFs on wild-origin fish, such as impact on spawning success

### Concerns about impacts of MSFs on fishing experience

- Potential for increased complexity of regulations, as in other places with MSFs (e.g., WA)
- Possible shifts in fishing locations and/or increased crowding in areas with MSFs
- Reduced efficiency, longer time, and/or higher cost to catch a harvestable fish (e.g., due to increased travel time to new fishing areas, more time until a marked fish is caught, etc.)
  - > Participants noted that most fish caught in their areas are currently unmarked
- Lower satisfaction due to above factors, as well as ethical concerns about catch and release fishing
  - > The number of unmarked fish that are caught and released can be high if mark rates are low

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- Several attendees shared personal experiences of operating charter businesses under MSF regulations in WA, and the many issues they experienced (described in the bullets above)

**Concerns about equitable access**

- Harvest of king salmon for customary and traditional use (subsistence) occurs under sport regulations, so any added challenges in accessing king salmon for subsistence is a concern
- Concerns that MSFs would negatively and disproportionately affect rural and Alaska Native residents
  - > For example, could further complicate regulations and shift charter effort into fishing areas currently used by local residents
- Fears that initial increased opportunity afforded by a MSF could lead to greater restrictions in the future, such as retention of *only* marked hatchery fish
  - > In WA, MSFs get shut down if rates of handling wild fish are too high
- Concerns that any potential benefits of MSFs would not be afforded to both sport and commercial fisheries

**Concerns related to implementation, feasibility, and applicability**

- Studies of MSFs have been done in other contexts, and these may not be applicable broadly to Southeast Alaska
- What has worked in WA, or other places, may not work in AK
  - > Some participants shared prior experiences with MSFs in Alaska (e.g., in commercial troll fisheries) and indicated there was little support for them overall
- MSFs for sport fisheries would impact subsistence and commercial fisheries, which needs to be taken into account when considering overall feasibility of a MSF program
  - > Concerns that new tagging trailers will lead to a "total MSF" in all sectors

**Broader concerns about king salmon fisheries and management**

- MSFs will do little to address larger scale king salmon issues, such as impacts of trawl bycatch
  - > The benefits to this tool are not clear with respect to reducing mortality for wild king salmon
- Subsistence priorities are not adequately recognized with respect to king salmon in Southeast Alaska
- Importance of direct engagement with tribes and tribal organizations by ADF&G to discuss potential impacts of MSFs, along with other broader concerns
  - > There is also a lack of Alaska tribal representation in the Pacific Salmon Treaty arena

## Emerging Questions

Meeting attendees asked a wide range of questions about the project origin and goals, mortality rates associated with MSFs, conservation impacts of MSFs, current creel sampling rates, nonlethal/sublethal effects of MSFs on wild-origin fish, details of current king salmon allocation, and more. Categories of frequently asked questions are listed below. The project team addressed some of these questions during the meetings, particularly those related to the study itself; however, they are working to address the remaining questions during the next phase of the project.

**Questions related to this study**

- What motivated the study and who is funding it?
- What are the goals of the funder (PSC) and ADF&G in pursuing this project?
- What are the project team member roles, including the role of UW?
- What impact will community feedback have on the end product of this study?

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- Why is this feasibility study directed only at sport and not commercial fisheries?
- How will this study address potential impacts on customary and traditional use of king salmon (subsistence)?

**Questions related to release mortality**

- What release mortality rate is used and how was it determined? What relevant parameters were considered (e.g., fish size, hook type, etc.)?
- How would release mortality differ for guided versus unguided fishing, particularly considering the high concentration of non-resident, guided anglers in some areas?
- How would a possible change in fishing behavior related to MSF implementation affect release mortality?

**Questions related to MSF implementation and feasibility**

- Would an MSF actually increase opportunity in reality and not just on paper? Does Alaska release enough hatchery-produced king salmon to see a benefit from MSFs?
- Mark rates are low and some wild stocks are marked in Southeast Alaska; is an MSF really feasible in this area?
  - > Would mark rates have to be near 100% in order for this to be effective?
- What would MSF sport regulations in Southeast Alaska actually look like (e.g., area, timing, bag limits)?
  - > What is the functional difference between MSFs and additional opportunities provided in terminal harvest areas?
- How would an MSF change fishing behavior? Could this be avoided? How would it be accounted for in management?
- Most hatcheries in the Southern U.S. are federally funded, which is part of what makes MSFs possible. How would a program like this work with private non-profit hatcheries in AK? How would funding of MSFs work? Who would be responsible?
- Will there be pushback from other parties in the Pacific Salmon Treaty arena if Alaska is to propose a new MSF?
- Would allowing MSFs in Southeast Alaska open the door for them to be used extensively?

## For more information, contact:

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**Judy Lum**, Regional Supervisor (Southeast)
Alaska Department of Fish and Game
Division of Sport Fish
judy.lum@alaska.gov | 907-465-4314

## How can you share your questions and ideas?

1. Attend future meetings—we will hold two online meetings in early 2024 to share a project update and seek additional feedback. Please contact Anne if you would like to be added to our email list.
2. Email or call Judy or Anne directly.
3. Provide anonymous feedback through this online form. Only project team members will see your responses, which will be anonymous and not linked to your name *unless* you choose to provide your contact information.

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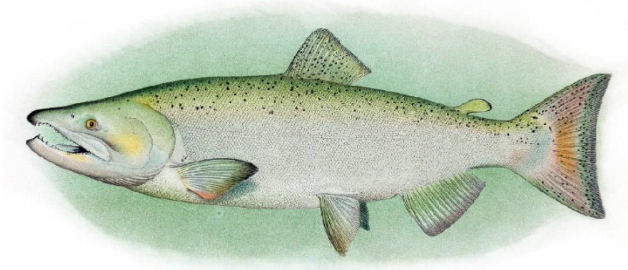
**March 2024**
**PROJECT UPDATE**

# Understanding the feasibility of a mark-selective sport fishery for king salmon in Southeast Alaska



## Background and Objectives

Mark-selective fisheries (MSFs) allow for the selective retention of hatchery-origin salmon that are marked with an adipose fin clip. Although MSFs have been implemented in other areas and fisheries within the geographic scope of the Pacific Salmon Treaty, the implications of an MSF occurring in the Southeast Alaska king salmon sport fishery are not well understood. Alaska Department of Fish and Game (ADF&G) Division of Sport Fish received funding through a grant from the Pacific Salmon Commission to study the feasibility of using MSFs to allow for additional opportunity to harvest hatchery-produced king salmon. ADF&G contracted a team at University of Washington (UW) to complete the project work.

The study objectives were to:

1. Review mark-selective fishery programs *outside* of Alaska to understand how mark-selective fisheries have worked in British Columbia, Washington, and Oregon;
2. Review the management, assessment, and enhancement programs associated with the king salmon sport fishery in Southeast Alaska to understand what would need to change *if* an MSF was implemented;
3. Engage Southeast Alaska fishing community members to gather local perspectives on mark-selective fisheries; and
4. Evaluate potential costs and benefits of mark-selective fisheries in the Southeast Alaska king salmon sport fishery, incorporating community perspectives.



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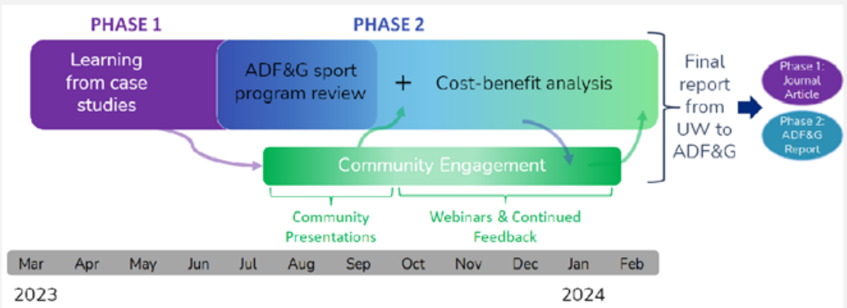
## Project Timeline

Phase 1 of the project began in March 2023 and was focused on learning from MSF case studies (Objective 1) to inform community engagement meetings and the development of the sport fish program review. Phase 2 included the sport fishery program review (Objective 2) and cost benefit analysis (Objective 4). Community engagement (Objective 3) occurred throughout both phases through a series of in person and online meetings. These meetings provided opportunities for feedback from the public and ADF&G staff, which was integrated into the feasibility study.

The contract period for the UW team extended from March 2023 through February 2024. UW submitted their final report to ADF&G in February 2024, and will continue collaborating with the ADF&G team to publish the results, which will be available to the public. The report will undergo technical review prior to publication, with intended final publication by the end of 2024. Two publications are in progress: one will focus on the case studies outside Alaska (Phase 1), and a second will include the review of Southeast Alaska king salmon management, assessment, and enhancement and the analysis of MSF costs and benefits (Phase 2).




**Project approach and timeline**. This timeline includes the contract period for the UW team (Mar 2023-Feb 2024). Publications will be prepared and finalized over the period from March to December 2024.

## Phase 1 Community Meetings

In summer and fall of 2023, the project team held four meetings in Juneau, Ketchikan, Prince of Wales, and Sitka, as well as one online meeting. During the meetings, the project team presented the goals of the feasibility study and results from the literature review of MSFs in British Columbia, Washington, and Oregon, highlighting their benefits and challenges. Attendees provided feedback, questions, and concerns about MSFs. A goal of these conversations was to better understand community perspectives about potential costs and benefits of MSFs and to elicit questions that would help to further guide the feasibility study.

**> You may view a recording of the presentation at this link. A written summary of the Phase 1 meetings is here.**

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## Phase 2 Online Meetings

We held two virtual meetings in February 2024 to share findings from the program review and cost-benefit assessment with ADF&G staff and the public. Information about the meetings was shared with an email distribution list of ~400 people compiled during Phase 1 of the project. The first meeting (2/7/24 12-1:30 pm) was attended by 5 members of the project team, 2 notetakers, and 20 members of the public, the second meeting (2/8/24 7-8:30 pm) was attended by 7 members of the project team, 2 notetakers, and 11 members of the public.

During these meetings the project team presented the goals of the feasibility study along with results from the Phase 2 of the project. Phase 2 results included a summary of the potential ecological, socioeconomic, and institutional costs and benefits of an MSF based on the literature review, program review, and community feedback to date. **The presentation may be viewed here.** Attendees provided feedback and asked questions about the project results, as well as broader questions about MSFs.

Similar to the first phase of meetings, these meetings provided an opportunity for information sharing between ADF&G staff and community members on relevant details of the current Southeast Alaska sport fish program and the potential effects of implementing MSFs. ADF&G staff answered questions relating to marked SEAK wild stocks, including the reasoning behind marking wild stocks, the specific stocks marked, and mark rates.

ADF&G staff reiterated during the discussion that the ADF&G Sport Fish Division is not championing the use of MSFs by doing this study. Rather, the purpose of this study is to better understand the potential impacts of MSFs – both positive and negative – on Southeast Alaska fisheries and their management. This feasibility study provides more comprehensive knowledge of MSFs that ADF&G can use to provide input and guidance if there is a need or a proposal for an MSF in the future.

## Summary of questions and comments from Phase 2 meetings

- Participants asked about the origin of king salmon caught in the sport fishery, which is highly variable depending on time and area. The table below shows the percentage of Alaska-origin hatchery Chinook salmon in Southeast Alaska sport fishery harvest, from 2005 to 2021. The information is summarized from the technical memorandum "*Harvest of Southeast Alaska Wild-Origin Chinook Salmon in the Southeast Alaska Troll and Sport Fisheries*."

| Fishery Area | Range (2005-2021) | Average (2005-2021) |
|---|---|---|
| SEAK Sport Fishery (region) | 16-42% | 24% |
| Ketchikan area | 14-62% | 45% |
| Northern inside area | 38-80% | 52% |
| Petersburg and Wrangell area | 18-86% | 51% |
| Outside area | 4-15% | 7% |

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- A number of the comments and questions focused on the potential effects of an MSF on hatcheries, and hatcheries' ability to influence MSFs. Some Southeast Alaska hatcheries are currently mass-marking 100% of their king salmon by clipping the adipose fin. Hatchery staff present at the meeting noted that the costs of maintaining fish tagging and marking trailers, as well as staff time, could be a future limitation to their mass-marking program. ADF&G staff noted that any MSF would require the cooperation of hatchery operators, and that hatchery decisions are primarily driven by their Board of Directors, meaning ADF&G cannot require a hatchery operation to mark all of their fish or increase production.

- Meeting participants also asked a variety of questions relating to the logistics of MSF implementation, and highlighted concerns about potential overlap with tagged and marked wild stocks (e.g., Chilkat, Taku, Stikine, and Unuk rivers). It was discussed that while the percentage of marked wild fish is low, it may not make sense to put an MSF in close proximity to these wild stock natal river systems.

- A question was asked about how MSFs would affect the incidental mortality magnitude (or exceed the cap for incidental mortality limits set by the Pacific Salmon Commission for the SEAK king salmon fishery); however, this is not possible to answer definitively without knowing the details of how an MSF would be designed, such as its location, timing, and specific regulations. The current king salmon sport fishery incidental mortality rate used for analysis is approximately 16% (Source: Chinook Technical Committee of the Pacific Salmon Commission; Report TCCHINOOK (22)-01).

- A question was also asked about how increased mark rates would result in better data. An ADF&G staff member replied that with an increase in mark rates, even without increasing the tag rate, additional information is gained from every fish that is sampled or harvested about whether it is of hatchery origin. Although there is some natural adipose fin loss in salmon, it is very minor; most fish without adipose fins are clipped from a hatchery.

## Project Contacts

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# APPENDIX D: SUMMARY OF POTENTIAL IMPACTS OF AN MSF ON THE ADF&G SPORT FISH PROGRAM IN SOUTHEAST ALASKA

Appendix D 1.–Programmatic impacts to the DSF as a result of MSF implementation in the sport fishery.

| Program area impacted | Requirement/ consideration | Details | Other information |
|---|---|---|---|
| Management | Proposal to SFEC by June 1 of the year prior to implementation of new or substantially changed mass-marking/MSF project proposals | Proposal is evaluated for the following:<br>1) Fishery regulation<br>2) CWT sampling method<br>3) CWT detection method<br>4) CWT composition estimation method<br>5) Alignment of time/area strata boundaries of regulations and catch estimation and CWT sampling programs<br>6) Catch estimation by size/mark/retention status<br>7) PSC Indicator stocks expected to be impacted by the fishery<br>8) DIT release groups expected to be impacted by the fishery | Plans for proposed fishery information provided to SFEC will require coordination with assessment and monitoring programs |
| Management | Proposal to BOF (from ADF&G or outside organization/group) with proposed fishery details | Proposal to include fishery regulation details; will occur after SFEC proposal is approved | No specific requirements for BOF proposal, may include time/area, bag limits, etc. |
| Management | Plan to fulfill post season reporting requirements for SFEC<br><br>Post season tables submitted to SFEC yearly on requested schedule | Table 1: information on CWT sampling method, CWT detection method, and number of heads processed by region and sector<br><br>Table 2: information on fishery area, sector, start date, end date, and target species, as well as specific MSF regulations, including species, bag limits by mark status and size (if applicable), minimum size limit, maximum size limit, and other regulations | Will require coordination with research (assessment and monitoring) program |

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| Program area impacted | Requirement/ consideration | Details | Other information |
| --- | --- | --- | --- |
| Management | Plan to fulfill post season reporting requirements for SFEC | Table 1: information on CWT sampling method, CWT detection method, and number of heads processed by region and sector | Will require coordination with research (assessment and monitoring) program |
| | Post season tables submitted to SFEC yearly on requested schedule | Table 2: information on fishery area, sector, start date, end date, and target species, as well as specific MSF regulations, including species, bag limits by mark status and size (if applicable), minimum size limit, maximum size limit, and other regulations | |
| | Public outreach and education; could start as early as BOF proposal, and potentially ongoing | If BOF proposal is from ADF&G, may consider outreach prior to meeting to gain public support<br>Education and outreach will communicate regulations and reporting requirements (if changed), as well as reason for management tool | MSFs often increase regulation complexity, making education and outreach important for this tool to be successful |
| Assessment & Monitoring | Navigating ERIS program in the context of an MSF | An MSF would alter the fraction of marked, as well as marked and tagged, fractions in such a way that would violate project assumptions for juvenile CWT projects on the Chilkat, Unuk, Taku, and Stikine rivers | Will be highly dependent on location of MSF, and of specific indicator stock |
| Assessment & Monitoring | Calculation and reporting of SFEC MSF proposal and reporting requirements | For proposal: harvest estimation method by size, mark, and retention status; DIT release groups expected to be impacted by the fishery; and CWT composition estimation results<br>For postseason reporting: method for catch estimation; method for release estimation | none |
| Assessment & Monitoring | Quantifying Southeast Alaska Hatchery Add-on | Alaska does not count a portion of its hatchery catch against its PST allocation; the calculation falls into the stock assessment category | Changes may be made based off of MSF |

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| Program area impacted | Requirement/ consideration | Details | Other information |
|---|---|---|---|
| Assessment & Monitoring | Quantifying Southeast Alaska Hatchery Add-on | Alaska does not count a portion of its hatchery catch against its PST allocation; the calculation falls into the stock assessment category | Changes may be made based off of MSF |
| Assessment & Monitoring | Statewide Harvest Survey changes | In current status, no anticipated changes | May reconsider based on any significant changes during SWHS modernization |
| Assessment & Monitoring | Saltwater (Charter) Logbook Program changes | Consider adding a logbook question to document mark status of released king salmon | none |
| Assessment & Monitoring | Southeast Alaska Marine Harvest Studies Project changes | Dependent on location of MSF, increase staffing or move existing staff in order to meet sampling goals; capture marked status for released fish | None Address potential issues of noncompliance due to increase marked fish in the harvest. Implement ETD? |
| Enhancement | Coordination and engagement with hatcheries | Feasible MSFs will rely on willing and engaged hatcheries (i.e., DIPAC has stated they will cease mass marking should an MSF occur, this may limit possible MSF locations) | none |

# APPENDIX E: MARK FRACTION AND CODED WIRE TAG CONTRIBUTION ESTIMATION METHODS AND ESTIMATED MARK FRACTIONS AND CONTRIBUTIONS

Appendix E 1.–Mark fraction and coded wire tag contribution estimation methods and estimated mark fractions and contributions.

## Methods for Estimating The Mark Fraction

The model used to estimate mark fractions in this study was calibrated using data collected from the SEAK king salmon sport fishery, as described in the *Mark Fraction Analysis* section.

## Mark Fraction Estimation Method

Mark fractions were derived by combining data from multiple strata. The estimated mark fraction, $\hat{P}$, was calculated as a weighted average of the mark fractions across all strata:

$$\hat{P} = \frac{\widehat{Mark}}{\widehat{Harvest}} \tag{E1}$$

where:

- $\widehat{Mark}$ is the sum of marked fish harvested, $\widehat{Mark} = \sum_h \widehat{Mark}_h$ ,
- $\widehat{Harvest}$ is the sum of fish harvested, $\widehat{Harvest} = \sum_h \widehat{Harvest}_h$ ,

and where the number of adipose-clipped fish harvested in stratum *h*, $\widehat{Mark}_h$, was estimated as:

$$\widehat{Mark}_h = \hat{P}_h \widehat{Harvest}_h \tag{E2}$$

where:

- $\hat{P}_h = \frac{a_h}{n_h}$ is the proportion of marked fish harvested in stratum *h*,
- $a_h$ is the number of marked fish sampled in stratum *h*,
- $n_h$ is the number of fish sampled for marks in stratum *h*,
- $\widehat{Harvest}_h$ is the number of fish harvested in stratum *h*.

The variance of the estimated proportion of marked fish in stratum *h*, $var(\hat{P}_h)$, was calculated as:

$$var(\hat{P}_h) = \frac{\hat{P}_h(1 - \hat{P}_h)}{n_h - 1}$$

The variance of the estimated number of marked fish harvested in stratum *h*, was calculated using the formula for the variance of a product of independent random variables (Goodman 1960):

$$var(\widehat{Mark}_h) = \widehat{Harvest}_h^{\,2} var(\hat{P}_h) + \hat{P}^2{}_h var(\widehat{Harvest}_h) - var(\hat{P}_h) var(\widehat{Harvest}_h)$$

and by the equation for the variance of a sum of independent random variables:

$$var(\widehat{Mark}) = \sum_h var(\widehat{Mark}_h) \tag{E3}$$

and similarly:

$$var(\widehat{Harvest}) = \sum_h var(\widehat{Harvest}_h) \tag{E4}$$

and by the delta method:

$$var(\hat{P}) \approx \widehat{Mark}^2/\widehat{Harvest}^2[var(\widehat{Mark})/\widehat{Mark}^2 + var(\widehat{Harvest})/\widehat{Harvest}^2] \tag{E5}$$

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if $\widehat{Mark} > 0$ and 0 otherwise. Bootstrap methods (Efron and Tibshirani 1993) were used to generate 95% confidence intervals for the estimated mark fraction, $\hat{P}$, and used to evaluate the uncertainty in the estimate. Mark fraction estimates with 95% confidence interval widths greater than 40% were removed from further analysis, which removed strata with low sample sizes or high uncertainty in the estimated harvest.

## Hatchery-Origin and Marked Hatchery-Origin Contribution Estimation Method

The contribution (harvest) of hatchery-origin fish from stock *S*, $\widehat{Harvest}_S$, as well as the harvest of marked hatchery-origin fish from stock *S*, $\widehat{Mark}_S$, and their associated variances were estimated using coded wire tag recovery data analysis methods outlined by Bernard and Clark (1996). The harvest of hatchery-origin fish from stock *S*, from stock *S*, $\widehat{H}_S$, was estimated as:

$$\widehat{Harvest}_S = \sum_j \sum_h \frac{x_{jh}}{\lambda_h \phi_h \theta_j} \tag{E6}$$

where:

- $x_{jh}$ is the number of decoded CWTs from cohort *j* recovered in stratum *h*,
- $\lambda_h = \frac{a'_h d'_h}{a_h d_h}$ is the decoding rate of CWTs recovered in stratum *h*,
- $a_h$ is the number of marked fish sampled from stratum *h*,
- $a'_h$ is the subset of $a_h$ that reach the ADF&G lab,
- $d_h$ is the number of heads from stratum *h* with CWTs detected at the ADF&G lab,
- $d'_h$ is the subset of $d_h$ that were successfully decoded,
- $\phi_h = \frac{n_h}{\widehat{Harvest}_h}$ is the fraction of fish sampled for CWTs in stratum *h*,
- $n_h$ is the number of fish sampled for CWT (marks) in stratum *h*,
- $\widehat{Harvest}_h$ is the number of fish harvested in stratum *h*,
- $\theta_j = t_j / T_j$ is the fraction of a fish released with a CWT and adipose-clip from cohort *j*,
- $t_j$ is the number of juvenile fish released with a CWT and adipose-clip from cohort *j*,
- $T_j$ is the number of juvenile fish released from cohort *j*.

with variances calculated using the large-sample approximation for hatchery-produced salmon in a recreational fishery as described in Bernard and Clark (1996).

Similarly, the harvest of marked hatchery-origin fish from stock *S*, $\widehat{Mark}_S$, was estimated as:

$$\widehat{Mark}_S = \sum_j \sum_h \frac{x_{jh}}{\lambda_h \phi_h} \tag{E7}$$

with variances calculated using the large-sample approximation for hatchery-produced salmon in a recreational fishery described in Bernard and Clark (1996), and by letting $\theta_j = 1$.

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Table E1-1. Estimated contribution of SEAK hatchery-origin king salmon ($\widehat{H}_S$), contribution of marked SEAK hatchery-origin king salmon ($\widehat{M}_S$), contribution of marked king salmon ($\widehat{M}$), and harvest ($\widehat{H}$) in the Craig-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}$ | $\widehat{H}$ | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}$ | $\widehat{H}$ | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}$ | $\widehat{H}$ |
| 2005 | 195.8 | 18.7 | 97.1 | 2,425.0 | 264.7 | 20.2 | 207.5 | 5,654.0 | 0.0 | 0.0 | 27.5 | 1,718.0 |
| 2006 | 229.4 | 24.6 | 59.0 | 2,192.0 | 186.0 | 30.5 | 117.0 | 5,905.0 | 0.0 | 0.0 | 39.5 | 1,750.0 |
| 2007 | 364.7 | 23.5 | 94.1 | 2,706.0 | 195.2 | 21.6 | 129.7 | 5,100.0 | 0.0 | 0.0 | 30.0 | 1,403.0 |
| 2008 | 484.4 | 48.6 | 97.2 | 1,320.0 | 0.0 | 0.0 | 124.6 | 1,698.0 | 0.0 | 0.0 | 0.0 | 29.0 |
| 2009 | 90.0 | 11.8 | 100.1 | 1,213.0 | 310.4 | 24.5 | 153.1 | 2,933.0 | 0.0 | 0.0 | 47.1 | 459.0 |
| 2010 | 121.8 | 12.8 | 51.2 | 1,481.0 | 228.4 | 26.4 | 286.0 | 3,265.0 | 0.0 | 0.0 | 153.6 | 879.0 |
| 2011 | 264.7 | 23.8 | 192.8 | 2,687.0 | 307.6 | 28.6 | 419.6 | 4,745.0 | 27.8 | 2.4 | 58.5 | 953.0 |
| 2012 | 150.7 | 9.1 | 102.9 | 1,065.0 | 429.1 | 23.7 | 759.7 | 4,317.0 | 0.0 | 0.0 | 127.8 | 625.0 |
| 2013 | 124.1 | 9.3 | 273.5 | 1,666.0 | 219.7 | 19.1 | 573.6 | 4,049.0 | 0.0 | 0.0 | 81.9 | 687.0 |
| 2014 | 131.6 | 20.8 | 484.9 | 3,824.0 | 124.3 | 11.3 | 1,265.5 | 6,275.0 | 0.0 | 0.0 | 115.2 | 647.0 |
| 2015 | 202.2 | 29.3 | 285.4 | 3,448.0 | 393.0 | 36.1 | 633.3 | 7,400.0 | 72.9 | 2.9 | 97.2 | 2,110.0 |
| 2016 | 539.6 | 43.5 | 488.5 | 5,330.0 | 40.2 | 5.4 | 910.2 | 7,345.0 | 0.0 | 0.0 | 55.4 | 871.0 |
| 2017 | 135.2 | 18.8 | 222.4 | 2,976.0 | 204.6 | 41.5 | 500.1 | 5,791.0 | 20.8 | 2.4 | 82.7 | 1,297.0 |
| 2018 | 133.9 | 33.7 | 107.8 | 1,523.0 | 395.0 | 41.6 | 214.9 | 2,475.0 | 3.2 | 3.2 | 73.1 | 728.0 |
| 2019 | 141.2 | 23.3 | 132.0 | 1,602.0 | 69.0 | 9.2 | 186.4 | 2,716.0 | 0.0 | 0.0 | 7.3 | 362.0 |
| 2020 | 172.3 | 19.4 | 191.0 | 1,371.0 | 297.0 | 40.0 | 627.5 | 6,110.0 | 0.0 | 0.0 | 47.8 | 510.0 |
| 2021 | 224.5 | 30.2 | 431.3 | 3,561.0 | 297.1 | 38.6 | 436.6 | 4,492.0 | 0.0 | 0.0 | 0.0 | 12.0 |
| 2022 | 238.6 | 34.8 | 258.7 | 1,918.0 | 331.8 | 46.2 | 339.0 | 2,175.0 | 0.0 | 0.0 | 44.3 | 367.0 |
| 2023 | 69.9 | 15.1 | 156.7 | 2,581.0 | 47.1 | 7.2 | 252.0 | 3,539.0 | 54.7 | 6.5 | 91.5 | 1,040.0 |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively.

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Table E1-2. Estimated (10%; status quo) and modeled (20%, 50%, and 100% SEAK marking scenarios) mark fractions in the Craig-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% |
| 2005 | 4.0% | 4.8% | 7.3% | 11.3% | 3.7% | 4.2% | 5.6% | 8.0% | 1.6% | 1.6% | 1.6% | 1.6% |
| 2006 | 2.7% | 3.7% | 6.8% | 12.0% | 2.0% | 2.3% | 3.2% | 4.6% | 2.3% | 2.3% | 2.3% | 2.3% |
| 2007 | 3.5% | 4.9% | 9.1% | 16.1% | 2.5% | 2.9% | 4.1% | 5.9% | 2.1% | 2.1% | 2.1% | 2.1% |
| 2008 | 7.4% | 11.0% | 22.0% | 40.4% | 7.3% | 7.3% | 7.3% | 7.3% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2009 | 8.3% | 9.0% | 11.1% | 14.7% | 5.2% | 6.3% | 9.6% | 15.0% | 10.3% | 10.3% | 10.3% | 10.3% |
| 2010 | 3.5% | 4.3% | 6.7% | 10.8% | 8.8% | 9.4% | 11.5% | 14.9% | 17.5% | 17.5% | 17.5% | 17.5% |
| 2011 | 7.2% | 8.2% | 11.2% | 16.1% | 8.8% | 9.5% | 11.5% | 14.7% | 6.1% | 6.4% | 7.3% | 8.8% |
| 2012 | 9.7% | 11.1% | 15.6% | 23.0% | 17.6% | 18.6% | 21.8% | 27.0% | 20.5% | 20.5% | 20.5% | 20.5% |
| 2013 | 16.4% | 17.2% | 19.5% | 23.3% | 14.2% | 14.7% | 16.4% | 19.1% | 11.9% | 11.9% | 11.9% | 11.9% |
| 2014 | 12.7% | 13.0% | 14.0% | 15.6% | 20.2% | 20.4% | 21.0% | 22.0% | 17.8% | 17.8% | 17.8% | 17.8% |
| 2015 | 8.3% | 8.8% | 10.5% | 13.3% | 8.6% | 9.1% | 10.7% | 13.4% | 4.6% | 5.0% | 6.1% | 7.9% |
| 2016 | 9.2% | 10.2% | 13.3% | 18.5% | 12.4% | 12.4% | 12.6% | 12.9% | 6.4% | 6.4% | 6.4% | 6.4% |
| 2017 | 7.5% | 7.9% | 9.2% | 11.4% | 8.6% | 8.9% | 9.9% | 11.5% | 6.4% | 6.5% | 7.0% | 7.8% |
| 2018 | 7.1% | 7.8% | 10.0% | 13.7% | 8.7% | 10.3% | 15.0% | 23.0% | 10.0% | 10.0% | 10.0% | 10.1% |
| 2019 | 8.2% | 9.1% | 11.5% | 15.6% | 6.9% | 7.1% | 7.8% | 9.1% | 2.0% | 2.0% | 2.0% | 2.0% |
| 2020 | 13.9% | 15.2% | 18.9% | 25.1% | 10.3% | 10.7% | 12.1% | 14.5% | 9.4% | 9.4% | 9.4% | 9.4% |
| 2021 | 12.1% | 12.7% | 14.5% | 17.6% | 9.7% | 10.4% | 12.3% | 15.5% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2022 | 13.5% | 14.7% | 18.2% | 24.1% | 15.6% | 17.0% | 21.4% | 28.7% | 12.1% | 12.1% | 12.1% | 12.1% |
| 2023 | 6.1% | 6.3% | 7.0% | 8.2% | 7.1% | 7.2% | 7.6% | 8.2% | 8.8% | 9.3% | 10.9% | 13.4% |
| Average | 8.5% | 9.5% | 12.4% | 17.4% | 9.4% | 9.9% | 11.6% | 14.5% | 7.9% | 7.9% | 8.2% | 8.5% |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively.

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Table E1-3. Estimated contribution of SEAK hatchery-origin king salmon ($\widehat{H}_S$), contribution of marked SEAK hatchery-origin king salmon ($\widehat{M}_S$), contribution of marked king salmon ($\widehat{M}_{\square}$), and harvest ($\widehat{H}$) in the Glacier Bay-area sport fishery by Sport Period, 2005–2023.

| (a) Sport Period 1 | | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}_{\square}$ | $\widehat{H}_{\square}$ | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}_{\square}$ | $\widehat{H}_{\square}$ | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}_{\square}$ | $\widehat{H}_{\square}$ |
| 2005 | 59.0 | 9.1 | 63.5 | 1,549.0 | 47.7 | 12.2 | 93.3 | 1,002.0 | 17.9 | 17.7 | 53.1 | 792.0 |
| 2006 | 184.2 | 34.5 | 88.1 | 1,571.0 | 139.1 | 11.5 | 49.8 | 1,384.0 | 3.8 | 3.8 | 18.9 | 533.0 |
| 2007 | 565.5 | 52.2 | 109.1 | 2,192.0 | 57.1 | 12.5 | 62.6 | 1,349.0 | 8.5 | 8.5 | 93.0 | 1,822.0 |
| 2008 | 518.2 | 93.1 | 138.9 | 978.0 | 246.0 | 22.0 | 71.5 | 693.0 | NA | NA | NA | NA |
| 2009 | 229.7 | 17.7 | 93.2 | 1,504.0 | 0.0 | 0.0 | 132.9 | 1,254.0 | 0.0 | 0.0 | 56.2 | 519.0 |
| 2010 | 68.3 | 5.2 | 36.1 | 474.0 | 23.4 | 4.7 | 184.9 | 1,193.0 | 0.0 | 0.0 | 27.9 | 405.0 |
| 2011 | 148.1 | 14.9 | 236.5 | 1,482.0 | 3.3 | 3.3 | 214.4 | 1,333.0 | 0.0 | 0.0 | 57.0 | 339.0 |
| 2012 | 91.0 | 10.5 | 131.1 | 708.0 | 0.0 | 0.0 | 180.6 | 967.0 | 0.0 | NA | NA | 103.0 |
| 2013 | 73.5 | NA | NA | 1,910.0 | 52.6 | NA | NA | 2,590.0 | 0.0 | NA | NA | 447.0 |
| 2014 | 38.5 | 8.1 | 447.1 | 2,449.0 | 51.4 | 4.2 | 543.9 | 2,544.0 | 0.0 | 0.0 | 61.1 | 271.0 |
| 2015 | 281.4 | 25.6 | 299.6 | 2,563.0 | 0.0 | 0.0 | 440.9 | 2,005.0 | 84.5 | NA | NA | 210.0 |
| 2016 | 0.0 | 0.0 | 173.9 | 979.0 | 0.0 | 0.0 | 127.6 | 860.0 | 0.0 | 0.0 | 14.3 | 162.0 |
| 2017 | 144.5 | 17.0 | 108.0 | 853.0 | 6.1 | 6.0 | 190.5 | 1,286.0 | 0.0 | 0.0 | 52.0 | 439.0 |
| 2018 | 0.0 | 0.0 | 26.1 | 365.0 | 284.5 | 25.9 | 285.4 | 1,453.0 | 45.0 | 7.4 | 22.1 | 177.0 |
| 2019 | 89.2 | 10.8 | 62.1 | 783.0 | 105.3 | 7.3 | 96.4 | 1,019.0 | 0.0 | NA | NA | 54.0 |
| 2020 | 0.0 | 0.0 | 0.0 | 26.0 | 0.0 | NA | NA | 1,219.0 | 0.0 | NA | NA | 254.0 |
| 2021 | 109.8 | NA | NA | 1,437.0 | 0.0 | 0.0 | 241.3 | 2,280.0 | NA | NA | NA | NA |
| 2022 | 137.8 | 18.5 | 368.9 | 1,932.0 | 0.0 | NA | NA | 1,049.0 | 0.0 | NA | NA | 204.0 |
| 2023 | 88.4 | 9.5 | 257.2 | 1,732.0 | 0.0 | 0.0 | 656.5 | 2,933.0 | 0.0 | NA | NA | 388.0 |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-4. Estimated (10%; status quo) and modeled (20%, 50%, and 100% SEAK marking scenarios) mark fractions in the Glacier Bay-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% |
| 2005 | 4.1% | 4.5% | 5.5% | 7.3% | 9.3% | 9.7% | 10.9% | 12.9% | 6.7% | 6.7% | 6.7% | 6.7% |
| 2006 | 5.6% | 6.7% | 9.8% | 15.1% | 3.6% | 4.6% | 7.7% | 12.8% | 3.5% | 3.5% | 3.5% | 3.5% |
| 2007 | 5.0% | 7.6% | 15.4% | 28.4% | 4.6% | 5.0% | 6.1% | 7.9% | 5.1% | 5.1% | 5.1% | 5.1% |
| 2008 | 14.2% | 19.0% | 33.5% | 57.7% | 10.3% | 13.9% | 24.7% | 42.6% | NA | NA | NA | NA |
| 2009 | 6.2% | 7.8% | 12.5% | 20.3% | 10.6% | 10.6% | 10.6% | 10.6% | 10.8% | 10.8% | 10.8% | 10.8% |
| 2010 | 7.6% | 9.1% | 13.5% | 20.9% | 15.5% | 15.7% | 16.2% | 17.1% | 6.9% | 6.9% | 6.9% | 6.9% |
| 2011 | 16.0% | 17.0% | 19.9% | 24.9% | 16.1% | 16.1% | 16.1% | 16.1% | 16.8% | 16.8% | 16.8% | 16.8% |
| 2012 | 18.5% | 19.8% | 23.6% | 29.9% | 18.7% | 18.7% | 18.7% | 18.7% | NA | NA | NA | NA |
| 2013 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2014 | 18.3% | 18.4% | 18.8% | 19.5% | 21.4% | 21.6% | 22.2% | 23.2% | 22.5% | 22.5% | 22.5% | 22.5% |
| 2015 | 11.7% | 12.8% | 16.1% | 21.7% | 22.0% | 22.0% | 22.0% | 22.0% | NA | NA | NA | NA |
| 2016 | 17.8% | 17.8% | 17.8% | 17.8% | 14.8% | 14.8% | 14.8% | 14.8% | 8.8% | 8.8% | 8.8% | 8.8% |
| 2017 | 12.7% | 14.3% | 19.3% | 27.6% | 14.8% | 14.8% | 14.8% | 14.8% | 11.8% | 11.8% | 11.8% | 11.8% |
| 2018 | 7.1% | 7.1% | 7.1% | 7.1% | 19.6% | 21.6% | 27.6% | 37.4% | 12.5% | 14.9% | 21.9% | 33.8% |
| 2019 | 7.9% | 9.0% | 12.4% | 17.9% | 9.5% | 10.5% | 13.7% | 19.1% | NA | NA | NA | NA |
| 2020 | 0.0% | 0.0% | 0.0% | 0.0% | NA | NA | NA | NA | NA | NA | NA | NA |
| 2021 | NA | NA | NA | NA | 10.6% | 10.6% | 10.6% | 10.6% | NA | NA | NA | NA |
| 2022 | 19.1% | 19.8% | 21.8% | 25.3% | NA | NA | NA | NA | NA | NA | NA | NA |
| 2023 | 14.8% | 15.4% | 16.9% | 19.4% | 22.4% | 22.4% | 22.4% | 22.4% | NA | NA | NA | NA |
| Average | 11.0% | 12.1% | 15.5% | 21.2% | 14.0% | 14.5% | 16.2% | 18.9% | 10.6% | 10.8% | 11.5% | 12.7% |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-5. Estimated contribution of SEAK hatchery-origin king salmon ($\hat{H}_S$), contribution of marked SEAK hatchery-origin king salmon ($\hat{M}_S$), contribution of marked king salmon ($\hat{M}_{\square}$), and harvest ($\hat{H}$) in the Haines and Skagway-area sport fishery by Sport Period, 2005–2023.

| (a) Sport Period 1 | | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | $\hat{H}_S$ | $\hat{M}_S$ | $\hat{M}_{\square}$ | $\hat{H}_{\square}$ | $\hat{H}_S$ | $\hat{M}_S$ | $\hat{M}_{\square}$ | $\hat{H}_{\square}$ | $\hat{H}_S$ | $\hat{M}_S$ | $\hat{M}_{\square}$ | $\hat{H}_{\square}$ |
| 2005 | 110.7 | 30.0 | 56.2 | 613.0 | 264.7 | NA | NA | 354.0 | 0.0 | 0.0 | 12.8 | 102.0 |
| 2006 | 67.2 | 27.3 | 54.6 | 455.0 | 191.6 | NA | NA | 356.0 | 20.2 | NA | NA | 127.0 |
| 2007 | 192.6 | 30.2 | 59.5 | 589.0 | 201.7 | 25.9 | 38.9 | 324.0 | 0.0 | 0.0 | 0.0 | 52.0 |
| 2008 | 71.2 | NA | NA | 151.0 | 47.4 | 14.6 | 14.6 | 277.0 | 0.0 | NA | NA | 7.0 |
| 2009 | 12.8 | NA | NA | 311.0 | 116.0 | 10.5 | 10.5 | 194.0 | 215.0 | NA | NA | 215.0 |
| 2010 | 44.2 | 8.8 | 26.4 | 269.0 | 401.0 | NA | NA | 401.0 | 39.4 | NA | NA | 72.0 |
| 2011 | 45.5 | NA | NA | 776.0 | 221.4 | NA | NA | 407.0 | 0.0 | 0.0 | 0.0 | 70.0 |
| 2012 | 22.3 | 3.2 | 12.6 | 171.0 | 133.8 | 15.7 | 15.7 | 253.0 | 0.0 | 0.0 | 0.0 | 136.0 |
| 2013 | 120.0 | NA | NA | 229.0 | 83.2 | NA | NA | 125.0 | 82.0 | 16.4 | 21.8 | 218.0 |
| 2014 | 75.6 | 9.4 | 16.1 | 233.0 | 45.9 | 6.7 | 20.0 | 180.0 | 0.0 | 0.0 | 0.0 | 33.0 |
| 2015 | 0.0 | 0.0 | 0.0 | 10.0 | 75.1 | NA | NA | 76.0 | 17.0 | NA | NA | 17.0 |
| 2016 | 29.0 | NA | NA | 29.0 | NA | NA | NA | NA | 0.0 | NA | NA | 6.0 |
| 2017 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2018 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2019 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2020 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2021 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2022 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2023 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-6. Estimated (10%; status quo) and modeled (20%, 50%, and 100% SEAK marking scenarios) mark fractions in the Haines and Skagway-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% |
| 2005 | 9.2% | 10.6% | 15.0% | 22.3% | NA | NA | NA | NA | 12.5% | 12.5% | 12.5% | 12.5% |
| 2006 | 12.0% | 13.0% | 15.9% | 20.8% | NA | NA | NA | NA | NA | NA | NA | NA |
| 2007 | 10.1% | 13.2% | 22.4% | 37.7% | 12.0% | 18.0% | 36.1% | 66.2% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2008 | NA | NA | NA | NA | 5.3% | 6.6% | 10.5% | 17.1% | NA | NA | NA | NA |
| 2009 | NA | NA | NA | NA | 5.4% | 11.4% | 29.6% | 59.8% | NA | NA | NA | NA |
| 2010 | 9.8% | 11.3% | 15.7% | 23.0% | NA | NA | NA | NA | NA | NA | NA | NA |
| 2011 | NA | NA | NA | NA | NA | NA | NA | NA | 0.0% | 0.0% | 0.0% | 0.0% |
| 2012 | 7.4% | 8.6% | 12.4% | 18.6% | 6.2% | 11.4% | 27.0% | 52.9% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2013 | NA | NA | NA | NA | NA | NA | NA | NA | 10.0% | 13.3% | 23.4% | 40.1% |
| 2014 | 6.9% | 10.1% | 19.6% | 35.4% | 11.1% | 13.5% | 20.8% | 32.9% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2015 | 0.0% | 0.0% | 0.0% | 0.0% | NA | NA | NA | NA | NA | NA | NA | NA |
| 2016 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2017 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2018 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2019 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2020 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2021 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2022 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2023 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Average | 7.9% | 9.5% | 14.4% | 22.5% | 8.0% | 12.2% | 24.8% | 45.8% | 3.8% | 4.3% | 6.0% | 8.8% |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-7. Estimated contribution of SEAK hatchery-origin king salmon ($\hat{H}_S$), contribution of marked SEAK hatchery-origin king salmon ($\hat{M}_S$), contribution of marked king salmon ($\hat{M}_{\square}$), and harvest ($\hat{H}$) in the Juneau-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | $\hat{H}_S$ | $\hat{M}_S$ | $\hat{M}_{\square}$ | $\hat{H}_{\square}$ | $\hat{H}_S$ | $\hat{M}_S$ | $\hat{M}_{\square}$ | $\hat{H}_{\square}$ | $\hat{H}_S$ | $\hat{M}_S$ | $\hat{M}_{\square}$ | $\hat{H}_{\square}$ |
| 2005 | 1,521.2 | 185.6 | 336.3 | 8,038.0 | 1,964.8 | 369.8 | 393.7 | 2,958.0 | 725.1 | 231.0 | 246.5 | 1,076.0 |
| 2006 | 603.8 | 133.3 | 244.5 | 5,828.0 | 1,482.2 | 263.0 | 288.4 | 1,871.0 | 557.7 | 252.7 | 275.9 | 1,605.0 |
| 2007 | 1,943.6 | 202.0 | 237.1 | 4,821.0 | 1,673.1 | 214.7 | 252.0 | 2,344.0 | 401.9 | 92.7 | 98.7 | 1,220.0 |
| 2008 | 2,001.4 | 225.2 | 290.8 | 4,699.0 | 919.0 | 98.8 | 111.1 | 2,272.0 | 329.0 | 42.5 | 75.5 | 591.0 |
| 2009 | 1,908.3 | 236.4 | 326.4 | 5,954.0 | 1,881.7 | 187.5 | 227.7 | 2,581.0 | 372.9 | 53.0 | 86.0 | 806.0 |
| 2010 | 797.0 | 107.8 | 140.2 | 3,591.0 | 1,209.2 | 143.6 | 159.5 | 2,499.0 | 375.4 | 46.3 | 49.3 | 819.0 |
| 2011 | 175.3 | 45.6 | 98.7 | 2,666.0 | 356.0 | 43.9 | 65.8 | 892.0 | 570.8 | 68.8 | 73.8 | 1,157.0 |
| 2012 | 291.4 | 25.6 | 56.3 | 1,602.0 | 826.2 | 100.1 | 136.5 | 1,292.0 | 824.7 | 101.9 | 156.3 | 1,416.0 |
| 2013 | 1,948.8 | 245.7 | 279.5 | 3,626.0 | 1,217.0 | 139.5 | 179.3 | 1,783.0 | 402.0 | 67.0 | 90.2 | 742.0 |
| 2014 | 661.3 | 70.8 | 120.4 | 3,252.0 | 1,114.4 | 111.2 | 166.7 | 1,621.0 | 355.3 | 44.7 | 57.1 | 644.0 |
| 2015 | 1,843.2 | 165.8 | 226.9 | 4,382.0 | 1,578.0 | 158.0 | 218.7 | 3,475.0 | 271.8 | 40.6 | 88.9 | 664.0 |
| 2016 | 427.2 | 50.8 | 108.9 | 1,858.0 | 443.3 | 47.1 | 70.7 | 895.0 | 250.7 | 43.6 | 47.6 | 358.0 |
| 2017 | 501.5 | NA | NA | 574.0 | 1,449.5 | 153.7 | 198.9 | 2,006.0 | 197.5 | NA | NA | 231.0 |
| 2018 | 231.0 | 24.0 | 24.0 | 432.0 | 1,217.2 | 142.2 | 164.1 | 1,905.0 | 275.9 | 41.0 | 41.0 | 359.0 |
| 2019 | 520.9 | 55.8 | 62.8 | 1,121.0 | 1,226.1 | 122.6 | 141.4 | 1,875.0 | 14.0 | 2.0 | 3.0 | 418.0 |
| 2020 | 809.8 | 84.8 | 145.2 | 989.0 | 1,057.8 | 105.1 | 120.7 | 1,609.0 | 161.1 | 16.9 | 28.4 | 627.0 |
| 2021 | 327.1 | 32.2 | 72.2 | 1,391.0 | 1,538.8 | 164.7 | 281.6 | 1,788.0 | 169.5 | 44.6 | 64.4 | 588.0 |
| 2022 | 1,087.4 | 187.3 | 247.3 | 1,638.0 | 1,333.5 | 226.3 | 284.4 | 2,421.0 | 33.3 | 5.0 | 20.6 | 637.0 |
| 2023 | 155.6 | 39.4 | 47.3 | 345.0 | 378.6 | 79.3 | 107.1 | 1,105.0 | 120.3 | 36.0 | 55.9 | 534.0 |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-8. Estimated (10%; status quo) and modeled (20%, 50%, and 100% SEAK marking scenarios) mark fractions in the Juneau-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% |
| 2005 | 4.2% | 6.0% | 11.6% | 20.8% | 13.3% | 19.3% | 37.3% | 67.2% | 22.9% | 28.0% | 43.3% | 68.8% |
| 2006 | 4.2% | 5.1% | 7.8% | 12.3% | 15.4% | 22.7% | 44.4% | 80.6% | 17.2% | 19.3% | 25.6% | 36.2% |
| 2007 | 4.9% | 8.9% | 21.0% | 41.0% | 10.8% | 17.7% | 38.4% | 73.0% | 8.1% | 10.9% | 19.4% | 33.4% |
| 2008 | 6.2% | 10.4% | 23.0% | 44.0% | 4.9% | 8.9% | 20.9% | 41.0% | 12.8% | 18.2% | 34.3% | 61.2% |
| 2009 | 5.5% | 8.6% | 18.0% | 33.6% | 8.8% | 16.1% | 38.0% | 74.5% | 10.7% | 15.1% | 28.3% | 50.4% |
| 2010 | 3.9% | 6.0% | 12.4% | 23.1% | 6.4% | 11.1% | 25.3% | 49.0% | 6.0% | 10.5% | 23.9% | 46.2% |
| 2011 | 3.7% | 4.2% | 5.9% | 8.6% | 7.4% | 11.3% | 22.9% | 42.4% | 6.4% | 11.2% | 25.7% | 49.8% |
| 2012 | 3.5% | 5.4% | 10.9% | 20.1% | 10.6% | 16.8% | 35.5% | 66.8% | 11.0% | 16.7% | 33.7% | 62.1% |
| 2013 | 7.7% | 12.9% | 28.6% | 54.7% | 10.1% | 16.8% | 36.9% | 70.5% | 12.2% | 17.2% | 32.2% | 57.3% |
| 2014 | 3.7% | 5.7% | 11.8% | 21.9% | 10.3% | 17.2% | 37.8% | 72.2% | 8.9% | 14.2% | 30.3% | 57.1% |
| 2015 | 5.2% | 9.4% | 22.2% | 43.5% | 6.3% | 10.8% | 24.5% | 47.2% | 13.4% | 17.3% | 28.9% | 48.2% |
| 2016 | 5.9% | 8.1% | 14.9% | 26.1% | 7.9% | 12.8% | 27.6% | 52.2% | 13.3% | 19.7% | 39.0% | 71.2% |
| 2017 | NA | NA | NA | NA | 9.9% | 17.1% | 38.6% | 74.5% | NA | NA | NA | NA |
| 2018 | 5.6% | 10.9% | 26.9% | 53.5% | 8.6% | 14.9% | 33.7% | 65.0% | 11.4% | 18.7% | 40.5% | 76.8% |
| 2019 | 5.6% | 10.2% | 24.0% | 47.1% | 7.5% | 14.1% | 33.7% | 66.4% | 0.7% | 1.0% | 2.0% | 3.6% |
| 2020 | 14.7% | 22.8% | 47.3% | 88.0% | 7.5% | 14.1% | 33.8% | 66.7% | 4.5% | 7.1% | 14.7% | 27.5% |
| 2021 | 5.2% | 7.5% | 14.6% | 26.4% | 15.8% | 24.3% | 49.9% | 92.6% | 11.0% | 13.3% | 20.4% | 32.2% |
| 2022 | 15.1% | 21.2% | 39.5% | 70.0% | 11.7% | 16.8% | 32.1% | 57.5% | 3.2% | 3.7% | 5.2% | 7.7% |
| 2023 | 13.7% | 17.4% | 28.7% | 47.4% | 9.7% | 12.7% | 21.7% | 36.8% | 10.5% | 12.2% | 17.5% | 26.3% |
| Average | 6.6% | 10.1% | 20.5% | 37.9% | 9.6% | 15.5% | 33.3% | 62.9% | 10.2% | 14.1% | 25.8% | 45.3% |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-9. Estimated contribution of SEAK hatchery-origin king salmon ($\hat{H}_S$), contribution of marked SEAK hatchery-origin king salmon ($\hat{M}_S$), contribution of marked king salmon ($\hat{M}_{\square}$), and harvest ($\hat{H}$) in the Ketchikan-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | $\hat{H}_S$ | $\hat{M}_S$ | $\hat{M}_{\square}$ | $\hat{H}_{\square}$ | $\hat{H}_S$ | $\hat{M}_S$ | $\hat{M}_{\square}$ | $\hat{H}_{\square}$ | $\hat{H}_S$ | $\hat{M}_S$ | $\hat{M}_{\square}$ | $\hat{H}_{\square}$ |
| 2005 | 5,094.3 | 452.9 | 554.2 | 6,549.0 | 5,085.8 | 499.1 | 641.6 | 9,538.0 | 129.6 | 16.3 | 65.2 | 1,157.0 |
| 2006 | 2,596.4 | 267.7 | 357.2 | 4,297.0 | 2,017.7 | 226.8 | 317.5 | 5,345.0 | 197.3 | 25.3 | 141.5 | 2,006.0 |
| 2007 | 2,262.3 | 191.5 | 235.4 | 3,301.0 | 2,336.7 | 225.7 | 372.5 | 7,745.0 | 0.0 | 0.0 | 18.3 | 713.0 |
| 2008 | 2,701.2 | 298.2 | 303.5 | 3,711.0 | 1,757.1 | 167.1 | 222.8 | 3,208.0 | 0.0 | 0.0 | 0.0 | 209.0 |
| 2009 | 3,534.3 | 375.0 | 611.3 | 6,113.0 | 4,440.4 | 516.2 | 712.8 | 9,014.0 | 377.4 | NA | NA | 918.0 |
| 2010 | 3,034.7 | 285.6 | 373.3 | 3,928.0 | 2,266.8 | 235.2 | 285.6 | 5,045.0 | 113.3 | 6.6 | 19.7 | 289.0 |
| 2011 | 1,234.4 | 126.2 | 191.8 | 3,824.0 | 2,508.8 | 270.9 | 483.8 | 7,740.0 | 93.0 | 8.1 | 73.3 | 798.0 |
| 2012 | 571.0 | 63.2 | 99.9 | 1,540.0 | 1,358.5 | 119.8 | 204.4 | 2,909.0 | 182.2 | 17.7 | 70.7 | 607.0 |
| 2013 | 1,961.8 | 172.9 | 329.8 | 4,011.0 | 1,907.6 | 150.4 | 543.9 | 5,115.0 | 69.4 | NA | NA | 328.0 |
| 2014 | 1,594.0 | 126.8 | 155.4 | 3,279.0 | 2,085.3 | 184.8 | 670.0 | 7,765.0 | 177.8 | 10.7 | 85.4 | 1,323.0 |
| 2015 | 2,081.6 | 183.6 | 313.5 | 5,016.0 | 2,657.5 | 224.2 | 766.2 | 7,239.0 | 0.0 | NA | NA | 1,200.0 |
| 2016 | 1,465.2 | 107.4 | 225.2 | 3,914.0 | 370.7 | 27.0 | 351.6 | 2,882.0 | 86.8 | 5.8 | 23.2 | 255.0 |
| 2017 | 1,137.0 | 140.8 | 277.0 | 3,166.0 | 944.8 | 111.0 | 245.4 | 3,476.0 | 133.3 | 13.0 | 77.8 | 493.0 |
| 2018 | 308.3 | 34.2 | 76.9 | 1,187.0 | 524.1 | 66.2 | 253.8 | 4,028.0 | 229.4 | 19.5 | 77.9 | 672.0 |
| 2019 | 380.2 | 52.2 | 103.7 | 1,636.0 | 769.1 | 61.7 | 198.8 | 1,934.0 | 0.0 | NA | NA | 211.0 |
| 2020 | 332.2 | 54.7 | 92.2 | 697.0 | 456.4 | 36.8 | 183.3 | 1,883.0 | 90.4 | 10.3 | 29.4 | 642.0 |
| 2021 | 186.9 | 43.1 | 111.9 | 1,305.0 | 371.2 | 53.9 | 345.9 | 3,226.0 | 0.0 | 0.0 | 0.0 | 109.0 |
| 2022 | 538.6 | 82.4 | 114.4 | 1,384.0 | 853.3 | 121.3 | 432.1 | 3,247.0 | 21.4 | 2.9 | 33.8 | 282.0 |
| 2023 | 680.8 | 102.1 | 160.4 | 2,240.0 | 680.4 | 85.5 | 401.0 | 6,225.0 | 0.0 | 0.0 | 112.6 | 747.0 |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-10. Estimated (10%; status quo) and modeled (20%, 50%, and 100% SEAK marking scenarios) mark fractions in the Ketchikan-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% |
| 2005 | 8.5% | 16.3% | 40.0% | 79.3% | 6.7% | 12.1% | 28.1% | 54.8% | 5.6% | 6.7% | 10.0% | 15.4% |
| 2006 | 8.3% | 14.3% | 32.4% | 62.5% | 5.9% | 9.7% | 20.8% | 39.4% | 7.1% | 8.0% | 10.9% | 15.6% |
| 2007 | 7.1% | 14.1% | 35.0% | 69.9% | 4.8% | 7.8% | 16.9% | 32.1% | 2.6% | 2.6% | 2.6% | 2.6% |
| 2008 | 8.2% | 15.4% | 37.0% | 72.9% | 6.9% | 12.5% | 29.0% | 56.5% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2009 | 10.0% | 15.7% | 33.0% | 61.7% | 7.9% | 12.7% | 27.3% | 51.4% | NA | NA | NA | NA |
| 2010 | 9.5% | 17.3% | 40.6% | 79.5% | 5.7% | 10.1% | 23.6% | 45.9% | 6.8% | 10.9% | 23.2% | 43.7% |
| 2011 | 5.0% | 8.2% | 17.9% | 34.0% | 6.2% | 9.5% | 19.1% | 35.2% | 9.2% | 10.4% | 13.9% | 19.8% |
| 2012 | 6.5% | 10.2% | 21.1% | 39.5% | 7.0% | 11.8% | 26.0% | 49.6% | 11.7% | 14.7% | 23.7% | 38.8% |
| 2013 | 8.2% | 13.2% | 28.0% | 52.8% | 10.6% | 14.5% | 25.9% | 45.0% | NA | NA | NA | NA |
| 2014 | 4.7% | 9.7% | 24.6% | 49.5% | 8.6% | 11.3% | 19.5% | 33.1% | 6.5% | 7.9% | 12.1% | 19.1% |
| 2015 | 6.2% | 10.5% | 23.1% | 44.1% | 10.6% | 14.3% | 25.5% | 44.2% | NA | NA | NA | NA |
| 2016 | 5.8% | 9.6% | 21.2% | 40.4% | 12.2% | 13.5% | 17.5% | 24.1% | 9.1% | 12.6% | 23.2% | 40.8% |
| 2017 | 8.7% | 12.2% | 22.7% | 40.2% | 7.1% | 9.7% | 17.7% | 31.0% | 15.8% | 18.5% | 26.6% | 40.2% |
| 2018 | 6.5% | 9.0% | 16.7% | 29.6% | 6.3% | 7.6% | 11.4% | 17.7% | 11.6% | 15.1% | 25.5% | 42.8% |
| 2019 | 6.3% | 8.6% | 15.2% | 26.4% | 10.3% | 14.3% | 26.5% | 46.9% | NA | NA | NA | NA |
| 2020 | 13.2% | 17.7% | 30.9% | 53.0% | 9.7% | 12.2% | 19.6% | 32.0% | 4.6% | 6.0% | 10.1% | 17.1% |
| 2021 | 8.6% | 9.8% | 13.5% | 19.6% | 10.7% | 11.8% | 15.1% | 20.6% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2022 | 8.3% | 11.9% | 22.9% | 41.2% | 13.3% | 15.8% | 23.3% | 35.9% | 12.0% | 12.7% | 14.9% | 18.5% |
| 2023 | 7.2% | 10.0% | 18.6% | 33.0% | 6.4% | 7.5% | 10.7% | 16.0% | 15.1% | 15.1% | 15.1% | 15.1% |
| Average | 7.7% | 12.3% | 26.0% | 48.9% | 8.3% | 11.5% | 21.2% | 37.4% | 7.8% | 9.4% | 14.1% | 22.0% |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-11. Estimated contribution of SEAK hatchery-origin king salmon ($\widehat{H}_S$), contribution of marked SEAK hatchery-origin king salmon ($\widehat{M}_S$), contribution of marked king salmon ($\widehat{M}_{\square}$), and harvest ($\widehat{H}$) in the Petersburg and Wrangell-area sport fishery by Sport Period, 2005–2023.

| (a) Sport Period 1 | | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}_{\square}$ | $\widehat{H}_{\square}$ | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}_{\square}$ | $\widehat{H}_{\square}$ | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}_{\square}$ | $\widehat{H}_{\square}$ |
| 2005 | 355.6 | 84.4 | 136.5 | 6,192.0 | 15.1 | 15.0 | 15.0 | 302.0 | NA | NA | NA | NA |
| 2006 | 927.4 | 117.2 | 198.2 | 5,839.0 | 200.4 | 71.3 | 107.0 | 902.0 | 5.2 | 5.1 | 5.1 | 169.0 |
| 2007 | 567.2 | 78.0 | 112.6 | 4,580.0 | 466.1 | 54.8 | 72.9 | 702.0 | 41.0 | NA | NA | 41.0 |
| 2008 | 286.9 | 43.9 | 95.9 | 3,330.0 | 57.6 | NA | NA | 64.0 | 0.0 | NA | NA | 10.0 |
| 2009 | 286.3 | 34.9 | 50.2 | 3,042.0 | 211.8 | 19.6 | 19.6 | 407.0 | 0.0 | NA | NA | 58.0 |
| 2010 | 262.8 | 26.5 | 49.3 | 2,568.0 | 0.0 | 0.0 | 0.0 | 377.0 | 0.0 | 0.0 | 0.0 | 50.0 |
| 2011 | 367.0 | 34.7 | 95.1 | 2,758.0 | 344.0 | 30.4 | 33.2 | 344.0 | 0.0 | 0.0 | 1.4 | 57.0 |
| 2012 | 68.8 | 7.0 | 47.5 | 2,194.0 | 279.4 | 26.9 | 51.1 | 463.0 | 0.0 | 0.0 | 0.0 | 57.0 |
| 2013 | 189.2 | 19.7 | 88.3 | 2,727.0 | 0.0 | 0.0 | 12.0 | 410.0 | 0.0 | 0.0 | 0.0 | 90.0 |
| 2014 | 810.5 | 69.5 | 112.8 | 2,889.0 | 131.6 | 27.4 | 27.4 | 349.0 | 0.0 | NA | NA | 91.0 |
| 2015 | 963.3 | 74.0 | 170.5 | 3,393.0 | 362.8 | 24.9 | 24.9 | 407.0 | 0.0 | NA | NA | 20.0 |
| 2016 | 523.2 | 71.4 | 140.4 | 3,489.0 | 155.6 | 33.9 | 67.7 | 757.0 | 0.0 | NA | NA | 25.0 |
| 2017 | 790.3 | 76.2 | 103.6 | 1,360.0 | 345.0 | NA | NA | 345.0 | 0.0 | NA | NA | 10.0 |
| 2018 | 0.0 | 0.0 | 0.0 | 64.0 | 204.2 | 53.2 | 53.2 | 778.0 | 384.5 | 45.1 | 71.9 | 652.0 |
| 2019 | 54.9 | 23.2 | 52.6 | 420.0 | 126.4 | 13.2 | 32.3 | 297.0 | 0.0 | 0.0 | 0.0 | 178.0 |
| 2020 | 0.0 | 0.0 | 11.6 | 498.0 | 196.8 | 26.4 | 26.4 | 838.0 | 0.0 | NA | NA | 105.0 |
| 2021 | 94.9 | 18.7 | 29.8 | 429.0 | 54.7 | 8.6 | 18.9 | 590.0 | NA | NA | NA | NA |
| 2022 | 60.3 | 10.9 | 32.5 | 465.0 | 89.8 | 27.6 | 27.6 | 695.0 | 0.0 | NA | NA | 146.0 |
| 2023 | 43.6 | 9.2 | 18.4 | 368.0 | 107.5 | 22.8 | 44.6 | 904.0 | 1.0 | NA | NA | 201.0 |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-12. Estimated (10%; status quo) and modeled (20%, 50%, and 100% SEAK marking scenarios) mark fractions in the Petersburg and Wrangell-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% |
| 2005 | 2.2% | 2.7% | 4.2% | 6.6% | 5.0% | 5.0% | 5.0% | 5.0% | NA | NA | NA | NA |
| 2006 | 3.4% | 4.9% | 9.6% | 17.3% | 11.9% | 13.5% | 18.2% | 26.2% | 3.0% | 3.0% | 3.0% | 3.1% |
| 2007 | 2.5% | 3.6% | 7.2% | 13.1% | 10.4% | 16.9% | 36.4% | 69.0% | NA | NA | NA | NA |
| 2008 | 2.9% | 3.7% | 6.1% | 10.2% | NA | NA | NA | NA | NA | NA | NA | NA |
| 2009 | 1.7% | 2.6% | 5.3% | 9.9% | 4.8% | 10.1% | 25.8% | 52.0% | NA | NA | NA | NA |
| 2010 | 1.9% | 2.9% | 6.0% | 11.1% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2011 | 3.4% | 4.8% | 8.8% | 15.5% | 9.7% | 19.8% | 50.2% | 100.8% | 2.5% | 2.5% | 2.5% | 2.5% |
| 2012 | 2.2% | 2.5% | 3.4% | 5.0% | 11.0% | 17.1% | 35.3% | 65.6% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2013 | 3.2% | 3.9% | 6.0% | 9.5% | 2.9% | 2.9% | 2.9% | 2.9% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2014 | 3.9% | 6.8% | 15.3% | 29.6% | 7.8% | 11.2% | 21.1% | 37.7% | NA | NA | NA | NA |
| 2015 | 5.0% | 7.9% | 16.7% | 31.2% | 6.1% | 15.3% | 43.0% | 89.1% | NA | NA | NA | NA |
| 2016 | 4.0% | 5.5% | 9.8% | 17.0% | 8.9% | 10.7% | 16.1% | 25.0% | NA | NA | NA | NA |
| 2017 | 7.6% | 13.5% | 31.0% | 60.1% | NA | NA | NA | NA | NA | NA | NA | NA |
| 2018 | 0.0% | 0.0% | 0.0% | 0.0% | 6.8% | 9.0% | 15.5% | 26.3% | 11.0% | 16.8% | 34.2% | 63.1% |
| 2019 | 12.5% | 13.4% | 15.9% | 20.1% | 10.9% | 15.1% | 27.8% | 49.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2020 | 2.3% | 2.3% | 2.3% | 2.3% | 3.1% | 5.4% | 12.2% | 23.5% | NA | NA | NA | NA |
| 2021 | 7.0% | 8.9% | 14.9% | 24.7% | 3.2% | 4.1% | 6.7% | 11.0% | NA | NA | NA | NA |
| 2022 | 7.0% | 8.2% | 11.7% | 17.6% | 4.0% | 5.0% | 7.9% | 12.9% | NA | NA | NA | NA |
| 2023 | 5.0% | 6.0% | 9.2% | 14.3% | 4.9% | 6.0% | 9.1% | 14.3% | NA | NA | NA | NA |
| Average | 4.1% | 5.5% | 9.6% | 16.6% | 6.6% | 9.8% | 19.6% | 35.9% | 2.4% | 3.2% | 5.7% | 9.8% |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-13. Estimated contribution of SEAK hatchery-origin king salmon ($\widehat{H}_S$), contribution of marked SEAK hatchery-origin king salmon ($\widehat{M}_S$), contribution of marked king salmon ($\widehat{M}_{\square}$), and harvest ($\widehat{H}$) in the Wrangell Narrows-area sport fishery by Sport Period, 2005–2023.

(a) Sport Periods 1-2

| Year | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}_{\square}$ | $\widehat{H}_{\square}$ |
|---|---|---|---|---|
| 2005 | 1,657.2 | 165.5 | 182.1 | 1,887.0 |
| 2006 | 2,124.2 | 251.1 | 251.1 | 3,013.0 |
| 2007 | 2,939.1 | 317.4 | 317.4 | 4,388.0 |
| 2008 | 1,850.0 | 205.6 | 205.6 | 1,850.0 |
| 2009 | 1,266.6 | 131.6 | 150.4 | 1,654.0 |
| 2010 | 184.0 | NA | NA | 813.0 |
| 2011 | 0.0 | NA | NA | 633.0 |
| 2012 | 0.0 | NA | NA | 735.0 |
| 2013 | 0.0 | NA | NA | 430.0 |
| 2014 | 0.0 | NA | NA | 1,789.0 |
| 2015 | 1,206.0 | 193.0 | 193.0 | 1,206.0 |
| 2016 | 2,359.0 | 393.2 | 393.2 | 2,359.0 |
| 2017 | 1,695.0 | 206.7 | 206.7 | 1,695.0 |
| 2018 | 491.8 | NA | NA | 1,426.0 |
| 2019 | 540.1 | NA | NA | 1,254.0 |
| 2020 | NA | NA | NA | NA |
| 2021 | 1,372.0 | 182.9 | 205.8 | 1,372.0 |
| 2022 | 1,403.1 | 264.7 | 291.1 | 1,480.0 |
| 2023 | 1,294.0 | 253.2 | 253.2 | 1,294.0 |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-14. Estimated (10%; status quo) and modeled (20%, 50%, and 100% SEAK marking scenarios) mark fractions in the Wrangell Narrows-area sport fishery by Sport Period, 2005–2023.

(a) Sport Periods 1-2

| Year | Status quo | 20% | 50% | 100% |
|---|---|---|---|---|
| 2005 | 9.6% | 18.4% | 44.8% | 88.7% |
| 2006 | 8.3% | 15.2% | 36.0% | 70.5% |
| 2007 | 7.2% | 13.9% | 33.8% | 67.0% |
| 2008 | 11.1% | 21.0% | 50.6% | 100.0% |
| 2009 | 9.1% | 16.7% | 39.6% | 77.7% |
| 2010 | NA | NA | NA | NA |
| 2011 | NA | NA | NA | NA |
| 2012 | NA | NA | NA | NA |
| 2013 | NA | NA | NA | NA |
| 2014 | NA | NA | NA | NA |
| 2015 | 16.0% | 25.3% | 53.3% | 100.0% |
| 2016 | 16.7% | 25.9% | 53.7% | 100.0% |
| 2017 | 12.2% | 22.0% | 51.2% | 100.0% |
| 2018 | NA | NA | NA | NA |
| 2019 | NA | NA | NA | NA |
| 2020 | NA | NA | NA | NA |
| 2021 | 15.0% | 24.6% | 53.5% | 101.7% |
| 2022 | 19.7% | 28.2% | 53.9% | 96.6% |
| 2023 | 19.6% | 28.5% | 55.3% | 100.0% |
| Average | 13.1% | 21.8% | 47.8% | 91.1% |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-15. Estimated contribution of SEAK hatchery-origin king salmon ($\widehat{H}_S$), contribution of marked SEAK hatchery-origin king salmon ($\widehat{M}_S$), contribution of marked king salmon ($\widehat{M}_{\square}$), and harvest ($\widehat{H}$) in the Sitka-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}_{\square}$ | $\widehat{H}_{\square}$ | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}_{\square}$ | $\widehat{H}_{\square}$ | $\widehat{H}_S$ | $\widehat{M}_S$ | $\widehat{M}_{\square}$ | $\widehat{H}_{\square}$ |
| 2005 | 1,583.9 | 169.6 | 589.8 | 13,062.0 | 563.6 | 55.5 | 451.7 | 9,842.0 | 188.4 | 22.1 | 159.4 | 3,707.0 |
| 2006 | 667.0 | 101.5 | 432.9 | 13,350.0 | 688.3 | 91.0 | 521.2 | 13,917.0 | 59.9 | 10.2 | 232.0 | 7,484.0 |
| 2007 | 2,156.1 | 213.5 | 502.1 | 13,895.0 | 795.1 | 83.4 | 385.7 | 10,929.0 | 13.9 | 13.7 | 181.3 | 6,055.0 |
| 2008 | 1,125.8 | 154.8 | 429.8 | 9,934.0 | 433.7 | 39.2 | 242.8 | 5,115.0 | 0.0 | 0.0 | 9.5 | 210.0 |
| 2009 | 952.8 | 102.3 | 607.5 | 7,828.0 | 181.7 | 14.3 | 510.5 | 7,347.0 | 97.1 | 12.1 | 233.6 | 3,161.0 |
| 2010 | 1,568.5 | 168.4 | 882.8 | 10,400.0 | 249.3 | 22.5 | 961.8 | 8,446.0 | 93.9 | 10.7 | 540.6 | 4,653.0 |
| 2011 | 1,680.4 | 153.0 | 1,190.6 | 10,146.0 | 660.3 | 55.5 | 1,678.6 | 11,767.0 | 153.8 | 19.1 | 794.4 | 5,964.0 |
| 2012 | 1,087.6 | 78.6 | 1,191.8 | 9,607.0 | 624.6 | 34.6 | 1,622.4 | 8,812.0 | 180.5 | 40.0 | 730.6 | 3,386.0 |
| 2013 | 1,974.3 | 154.8 | 1,407.6 | 9,239.0 | 359.1 | 24.2 | 1,487.9 | 8,151.0 | 53.9 | 4.4 | 482.7 | 2,468.0 |
| 2014 | 1,053.6 | 88.0 | 3,272.6 | 18,238.0 | 404.9 | 33.1 | 3,700.9 | 18,747.0 | 0.0 | 0.0 | 689.5 | 3,733.0 |
| 2015 | 1,881.8 | 127.0 | 2,385.4 | 17,397.0 | 410.3 | 26.9 | 1,394.9 | 9,532.0 | 371.3 | 40.7 | 522.3 | 4,910.0 |
| 2016 | 1,713.4 | 131.1 | 3,135.0 | 19,102.0 | 359.2 | 29.8 | 1,872.7 | 11,305.0 | 0.0 | 0.0 | 657.4 | 2,968.0 |
| 2017 | 975.6 | 144.8 | 1,535.7 | 10,426.0 | 367.9 | 53.8 | 1,527.3 | 11,334.0 | 0.0 | 0.0 | 215.4 | 1,802.0 |
| 2018 | 1,045.9 | 100.4 | 402.5 | 3,357.0 | 287.8 | 19.9 | 418.6 | 3,132.0 | 0.0 | 0.0 | 295.6 | 2,411.0 |
| 2019 | 580.2 | 52.4 | 430.2 | 5,288.0 | 110.7 | 11.1 | 351.2 | 3,811.0 | 0.0 | 0.0 | 201.5 | 1,828.0 |
| 2020 | 379.4 | 48.1 | 326.7 | 2,741.0 | 247.0 | 42.8 | 1,026.0 | 6,193.0 | 126.0 | 19.3 | 783.1 | 3,982.0 |
| 2021 | 1,211.7 | 181.7 | 1,783.3 | 10,253.0 | 312.4 | 28.6 | 1,388.2 | 7,288.0 | 0.0 | NA | NA | 521.0 |
| 2022 | 1,316.6 | 148.2 | 1,651.2 | 8,696.0 | 961.7 | 114.1 | 1,790.6 | 7,854.0 | 0.0 | 0.0 | 414.1 | 2,313.0 |
| 2023 | 434.6 | 61.0 | 1,658.6 | 14,295.0 | 252.8 | 31.7 | 1,268.2 | 12,740.0 | 0.0 | 0.0 | 636.9 | 4,246.0 |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Table E1-16. Estimated (10%; status quo) and modeled (20%, 50%, and 100% SEAK marking scenarios) mark fractions in the Sitka-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% |
| 2005 | 4.5% | 5.7% | 9.3% | 15.3% | 4.6% | 5.2% | 6.9% | 9.8% | 4.3% | 4.8% | 6.3% | 8.8% |
| 2006 | 3.2% | 3.7% | 5.1% | 7.5% | 3.7% | 4.2% | 5.7% | 8.0% | 3.1% | 3.2% | 3.4% | 3.8% |
| 2007 | 3.6% | 5.2% | 9.8% | 17.6% | 3.5% | 4.3% | 6.4% | 10.0% | 3.0% | 3.0% | 3.0% | 3.0% |
| 2008 | 4.3% | 5.4% | 8.7% | 14.1% | 4.7% | 5.6% | 8.2% | 12.5% | 4.5% | 4.5% | 4.5% | 4.5% |
| 2009 | 7.8% | 9.0% | 12.6% | 18.6% | 6.9% | 7.2% | 8.0% | 9.2% | 7.4% | 7.7% | 8.6% | 10.1% |
| 2010 | 8.5% | 10.0% | 14.5% | 22.0% | 11.4% | 11.7% | 12.6% | 14.1% | 11.6% | 11.8% | 12.4% | 13.4% |
| 2011 | 11.7% | 13.4% | 18.4% | 26.8% | 14.3% | 14.8% | 16.5% | 19.4% | 13.3% | 13.6% | 14.3% | 15.6% |
| 2012 | 12.4% | 13.6% | 17.1% | 22.9% | 18.4% | 19.2% | 21.4% | 25.1% | 21.6% | 22.0% | 23.4% | 25.7% |
| 2013 | 15.2% | 17.4% | 24.0% | 34.9% | 18.3% | 18.7% | 20.1% | 22.4% | 19.6% | 19.8% | 20.4% | 21.6% |
| 2014 | 17.9% | 18.5% | 20.3% | 23.2% | 19.7% | 20.0% | 20.6% | 21.7% | 18.5% | 18.5% | 18.5% | 18.5% |
| 2015 | 13.7% | 14.8% | 18.2% | 23.8% | 14.6% | 15.1% | 16.4% | 18.7% | 10.6% | 11.4% | 13.6% | 17.4% |
| 2016 | 16.4% | 17.3% | 20.1% | 24.7% | 16.6% | 16.9% | 17.9% | 19.5% | 22.1% | 22.1% | 22.1% | 22.1% |
| 2017 | 14.7% | 15.6% | 18.3% | 22.7% | 13.5% | 13.8% | 14.7% | 16.2% | 12.0% | 12.0% | 12.0% | 12.0% |
| 2018 | 12.0% | 15.1% | 24.5% | 40.2% | 13.4% | 14.3% | 17.2% | 21.9% | 12.3% | 12.3% | 12.3% | 12.3% |
| 2019 | 8.1% | 9.2% | 12.6% | 18.1% | 9.2% | 9.5% | 10.4% | 11.8% | 11.0% | 11.0% | 11.0% | 11.0% |
| 2020 | 11.9% | 13.3% | 17.3% | 24.0% | 16.6% | 16.9% | 18.0% | 19.9% | 19.7% | 20.0% | 20.9% | 22.3% |
| 2021 | 17.4% | 18.5% | 21.9% | 27.4% | 19.0% | 19.5% | 20.8% | 22.9% | NA | NA | NA | NA |
| 2022 | 19.0% | 20.5% | 25.0% | 32.4% | 22.8% | 24.0% | 27.6% | 33.6% | 17.9% | 17.9% | 17.9% | 17.9% |
| 2023 | 11.6% | 11.9% | 12.8% | 14.2% | 10.0% | 10.1% | 10.7% | 11.7% | 15.0% | 15.0% | 15.0% | 15.0% |
| Average | 11.3% | 12.5% | 16.3% | 22.7% | 12.7% | 13.2% | 14.7% | 17.3% | 12.6% | 12.8% | 13.3% | 14.2% |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Appendix E1.–Page 19 of 20.

Table E1-17. Estimated contribution of SEAK hatchery-origin king salmon ($\hat{H}_S$), contribution of marked SEAK hatchery-origin king salmon ($\hat{M}_S$), contribution of marked king salmon ($\hat{M}_{\square}$), and harvest ($\hat{H}$) in the Yakutat-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | $\hat{H}_S$ | $\hat{M}_S$ | $\hat{M}_{\square}$ | $\hat{H}_{\square}$ | $\hat{H}_S$ | $\hat{M}_S$ | $\hat{M}_{\square}$ | $\hat{H}_{\square}$ | $\hat{H}_S$ | $\hat{M}_S$ | $\hat{M}_{\square}$ | $\hat{H}_{\square}$ |
| 2005 | 0.0 | 0.0 | 19.1 | 379.0 | 0.0 | 0.0 | 1.9 | 159.0 | 0.0 | 0.0 | 0.0 | 8.0 |
| 2006 | 0.0 | 0.0 | 6.9 | 329.0 | 0.0 | 0.0 | 14.0 | 145.0 | 57.0 | NA | NA | 57.0 |
| 2007 | 7.0 | 4.8 | 9.6 | 446.0 | 0.0 | 0.0 | 10.7 | 147.0 | 0.0 | 0.0 | 0.0 | 18.0 |
| 2008 | 2.9 | 2.8 | 19.1 | 458.0 | 0.0 | 0.0 | 7.0 | 152.0 | 0.0 | NA | NA | 2.0 |
| 2009 | 9.1 | 3.8 | 64.6 | 555.0 | 0.0 | 0.0 | 61.3 | 301.0 | 0.0 | NA | NA | 24.0 |
| 2010 | 145.6 | 13.7 | 34.2 | 424.0 | 0.0 | NA | NA | 135.0 | 0.0 | 0.0 | 0.0 | 31.0 |
| 2011 | 0.0 | 0.0 | 27.7 | 277.0 | 0.0 | 0.0 | 8.5 | 83.0 | 0.0 | NA | NA | 14.0 |
| 2012 | 0.0 | 0.0 | 29.0 | 218.0 | 0.0 | NA | NA | 70.0 | 0.0 | 0.0 | 0.0 | 4.0 |
| 2013 | 0.0 | 0.0 | 68.5 | 411.0 | 0.0 | 0.0 | 9.5 | 98.0 | 0.0 | 0.0 | 0.0 | 8.0 |
| 2014 | 29.1 | 9.7 | 43.6 | 644.0 | 0.0 | 0.0 | 70.4 | 365.0 | 0.0 | 0.0 | 0.0 | 16.0 |
| 2015 | 0.0 | 0.0 | 53.0 | 615.0 | 0.0 | 0.0 | 4.7 | 217.0 | 0.0 | 0.0 | 8.3 | 87.0 |
| 2016 | 0.0 | 0.0 | 106.2 | 818.0 | 0.0 | 0.0 | 0.0 | 81.0 | 0.0 | 0.0 | 0.0 | 41.0 |
| 2017 | 74.5 | 11.8 | 48.7 | 472.0 | 0.0 | 0.0 | 8.1 | 122.0 | 0.0 | NA | NA | 38.0 |
| 2018 | 0.0 | 0.0 | 19.7 | 200.0 | 0.0 | NA | NA | 203.0 | 0.0 | 0.0 | 3.4 | 47.0 |
| 2019 | 0.0 | 0.0 | 63.8 | 720.0 | 0.0 | 0.0 | 11.0 | 185.0 | 0.0 | 0.0 | 0.0 | 31.0 |
| 2020 | 50.0 | NA | NA | 204.0 | 0.0 | NA | NA | 543.0 | 0.0 | NA | NA | 84.0 |
| 2021 | 0.0 | NA | NA | 542.0 | 0.0 | NA | NA | 131.0 | 0.0 | NA | NA | 5.0 |
| 2022 | 27.0 | NA | NA | 1,054.0 | 0.0 | NA | NA | 518.0 | 0.0 | NA | NA | 175.0 |
| 2023 | 0.0 | 0.0 | 30.7 | 579.0 | 0.0 | 0.0 | 25.1 | 254.0 | 0.0 | 0.0 | 10.6 | 107.0 |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

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Appendix E1.–Page 20 of 20.

Table E1-18. Estimated (10%; status quo) and modeled (20%, 50%, and 100% SEAK marking scenarios) mark fractions in the Yakutat-area sport fishery by Sport Period, 2005–2023.

| | (a) Sport Period 1 | | | | (b) Sport Period 2 | | | | (c) Sport Period 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% | Status quo | 20% | 50% | 100% |
| 2005 | 5.1% | 5.1% | 5.1% | 5.1% | 1.2% | 1.2% | 1.2% | 1.2% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2006 | 2.1% | 2.1% | 2.1% | 2.1% | 9.7% | 9.7% | 9.7% | 9.7% | NA | NA | NA | NA |
| 2007 | 2.2% | 2.2% | 2.4% | 2.7% | 7.3% | 7.3% | 7.3% | 7.3% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2008 | 4.2% | 4.2% | 4.2% | 4.2% | 4.6% | 4.6% | 4.6% | 4.6% | NA | NA | NA | NA |
| 2009 | 11.6% | 11.7% | 12.1% | 12.6% | 20.4% | 20.4% | 20.4% | 20.4% | NA | NA | NA | NA |
| 2010 | 8.1% | 11.5% | 21.9% | 39.2% | NA | NA | NA | NA | 0.0% | 0.0% | 0.0% | 0.0% |
| 2011 | 10.0% | 10.0% | 10.0% | 10.0% | 10.3% | 10.3% | 10.3% | 10.3% | NA | NA | NA | NA |
| 2012 | 13.3% | 13.3% | 13.3% | 13.3% | NA | NA | NA | NA | 0.0% | 0.0% | 0.0% | 0.0% |
| 2013 | 16.7% | 16.7% | 16.7% | 16.7% | 9.7% | 9.7% | 9.7% | 9.7% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2014 | 6.8% | 7.1% | 8.1% | 9.8% | 19.3% | 19.3% | 19.3% | 19.3% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2015 | 8.6% | 8.6% | 8.6% | 8.6% | 2.2% | 2.2% | 2.2% | 2.2% | 9.5% | 9.5% | 9.5% | 9.5% |
| 2016 | 13.0% | 13.0% | 13.0% | 13.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2017 | 10.3% | 11.8% | 16.2% | 23.6% | 6.7% | 6.7% | 6.7% | 6.7% | NA | NA | NA | NA |
| 2018 | 9.8% | 9.8% | 9.8% | 9.8% | NA | NA | NA | NA | 7.1% | 7.1% | 7.1% | 7.1% |
| 2019 | 8.9% | 8.9% | 8.9% | 8.9% | 6.0% | 6.0% | 6.0% | 6.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 2020 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2021 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2022 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2023 | 5.3% | 5.3% | 5.3% | 5.3% | 9.9% | 9.9% | 9.9% | 9.9% | 9.9% | 9.9% | 9.9% | 9.9% |
| Average | 8.5% | 8.8% | 9.8% | 11.5% | 8.2% | 8.2% | 8.2% | 8.2% | 2.4% | 2.4% | 2.4% | 2.4% |

*Note:* Dates associated with Sport Period change from year-to-year; however, periods 1-3 correspond roughly to January-May, June-July, and August-December, respectively. NA used for all parameters and cells is defined consistently to mean estimation was not possible.

# APPENDIX F: SEAK KING HATCHERY SALMON RELEASE, MARKING, AND TAGGING INFORMATION

Appendix F 1.–Total king salmon released by hatchery organizations in SEAK.

| Operator | AKI | DIPAC | | | | | | | | NMFS |
|---|---|---|---|---|---|---|---|---|---|---|
| Hatchery | PORT ARMSTRONG | MACAULAY | | | | | | | | LITTLE PORT WALTER |
| Release Year | Port Armstrong | Auke Bay | Fish Creek | Gastineau Channel | Juneau Area | Lena Cove | Pullen Creek | Thane Net Pens | DIPAC TOTAL | L PORT WALTER |
| 2014 | 161,355 | 70,000 | 209,700 | 257,300 | | 90,000 | | | 627,000 | 211,164 |
| 2015 | 252,749 | 88,800 | 269,500 | 218,900 | | 179,900 | 228,700 | | 985,800 | 149,503 |
| 2016 | 231,839 | 88,400 | 279,400 | 220,500 | | 179,100 | | 124,100 | 891,500 | 30,358 |
| 2017 | | 87,000 | 279,300 | 219,500 | | 148,900 | | 150,100 | 884,800 | 115,628 |
| 2018 | | 89,300 | 233,900 | 249,400 | | | | | 572,600 | 160,691 |
| 2019 | | 89,600 | 278,700 | 248,800 | | 187,500 | | 182,800 | 987,400 | 192,767 |
| 2020 | | | 272,200 | 1,441,400 | | | | | 1,713,600 | |
| 2021 | | | | | | | | | 0 | 201,926 |
| 2022 | | | 364,403 | 443,468 | | 206,536 | | | 1,014,407 | 62,680 |
| 2023 | | | 249,587 | 324,540 | | 199,848 | | | 773,975 | |
| Total | 645,943 | 513,100 | 2,436,690 | 3,623,808 | 944,532 | 1,191,784 | 228,700 | 457,000 | 9,395,614 | 1,124,717 |

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Appendix F 1.–Page 2 of 3.

| Operator | NSRAA | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hatchery | HIDDEN FALLS | | | | | MEDVEJIE | | | | | SAWMILL CREEK | SHELDON JACKSON | |
| Release Year | Gunnuk Creek & Kasnyku Bay | Gunnuk Creek | Kasnyku Bay | Little Port Walter | Southeast Cove | Bear Cove | Crawfish Inlet | Crawfish Inlet & Halibut Point | Crescent Bay | Halibut Point | Crawfish Inlet | Deep Inlet | NSRAA Total |
| 2014 | | | 558,227 | | | 1,780,952 | | | | 377,549 | | | 2,716,728 |
| 2015 | | | 674,433 | | | 1,385,629 | | | | 431,295 | | | 2,491,357 |
| 2016 | | | 588,842 | | | 2,320,019 | 129,250 | | | 392,677 | | | 3,430,788 |
| 2017 | | | 556,005 | | | 1,935,237 | 155,854 | 419,513 | | | | | 3,066,609 |
| 2018 | 232,377 | | 370,292 | | | 1,542,778 | 198,924 | 208,678 | | 190,639 | | | 2,743,688 |
| 2019 | | 108,625 | 433,213 | | | 1,842,409 | 573,250 | | 395,447 | | | | 3,352,944 |
| 2020 | | 179,754 | 315,266 | | | 1,719,553 | 635,764 | | 388,556 | | | | 3,238,893 |
| 2021 | | 194,231 | 442,196 | | | 1,792,777 | 795,152 | | 399,607 | | 243,159 | | 3,867,122 |
| 2022 | | 186,704 | | | 312,054 | 2,054,932 | 517,632 | | 354,164 | | 311,123 | 39,074 | 3,775,683 |
| 2023 | | 154,649 | | 40,313 | 347,658 | 2,397,410 | 160,633 | | 298,223 | | | | 3,398,886 |
| Total | 232,377 | 823,963 | 3,938,474 | 40,313 | 659,712 | 18,771,696 | 3,166,459 | 628,191 | 1,835,997 | 1,392,160 | 554,282 | 39,074 | 32,082,698 |

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Appendix F 1.–Page 3 of 3.

| Operator | POWHA | | MIC | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Hatchery | PORT SAINT NICHOLAS | | TAMGAS CREEK | | | | | | |
| Release Year | COFFMAN COVE | PORT ST NICHOLAS CR | HANGER PONDS | PORT CHESTER | QUARRY LK | SKATERS LK | TAMGAS CR | TAMGAS HARBOR | MIC Total |
| 2014 | 67,808 | 246,358 | | | | | 9 | | 9 |
| 2015 | 48,796 | 175,459 | | | | | | | |
| 2016 | 37,695 | 100,318 | | | | | 355,328 | | 355,328 |
| 2017 | | | | | | | 351,898 | | 351,898 |
| 2018 | | | | | | | 85,789 | | 85,789 |
| 2019 | | | | | | | 198,175 | | 198,175 |
| 2020 | | | | 134,456 | | | 136,485 | | 270,941 |
| 2021 | | | | 284,442 | | | | 288,846 | 573,288 |
| 2022 | | | | 267,267 | | | | | 267,267 |
| 2023 | | | | | | | | 153,061 | 153,061 |
| Total | 154,299 | 522,135 | 46,426 | 1,741,519 | 50,067 | 50,036 | 1,127,684 | 1,380,308 | 4,396,040 |

Appendix F 2.–Total marked king salmon released by hatchery organizations in SEAK.

| Operator | AKI | DIPAC | | | | | | | | NMFS |
|---|---|---|---|---|---|---|---|---|---|---|
| Hatchery | PORT ARMSTRONG | MACAULAY | | | | | | | | LITTLE PORT WALTER |
| Release Year | Port Armstrong | Auke Bay | Fish Creek | Gastineau Channel | Juneau Area | Lena Cove | Pullen Creek | Thane Net Pens | DIPAC TOTAL | Little PORT WALTER |
| 2014 | 33,673 | 10,949 | 20,534 | 31,988 | | 11,058 | | | 74,529 | 208,418 |
| 2015 | 74,626 | 10,090 | 27,828 | 29,381 | | 19,266 | 40,248 | | 126,813 | 145,536 |
| 2016 | 29,703 | 9,663 | 26,886 | 21,875 | | 29,353 | | 13,433 | 101,210 | 29,817 |
| 2017 | | 7,557 | 25,930 | 19,342 | | 13,554 | | 14,176 | 80,559 | 113,875 |
| 2018 | | 9,750 | 22,298 | 22,529 | | | | | 54,577 | 159,076 |
| 2019 | | 16,079 | 43,474 | 42,827 | | 29,051 | | 27,883 | 159,314 | 138,150 |
| 2020 | | | 58,443 | 286,370 | | | | | 344,813 | |
| 2021 | | | | | | | | | | 160,879 |
| 2022 | | | 79,238 | 90,745 | | 45,884 | | | 215,867 | 62,234 |
| 2023 | | | 249,587 | 322,575 | | 195,033 | | | 767,195 | |
| Total | 138,002 | 64,088 | 554,218 | 867,632 | 944,131 | 343,199 | 40,248 | 55,492 | 2,869,008 | 1,017,985 |

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Appendix F 2.–Page 2 of 4.

| Operator | NSRAA | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hatchery | HIDDEN FALLS | | | | | | MEDVEJIE | | | | SAWMILL CREEK | SHELDON JACKSON | |
| Release Year | Gunnuk Creek & Kasnyku Bay | Gunnuk Creek | Kasnyku Bay | Little Port Walter | Southeast Cove | Bear Cove | Crawfish Inlet | Crawfish Inlet & Halibut Point | Crescent Bay | Halibut Point | Crawfish Inlet | Deep Inlet | NSRAA Total |
| 2014 | | | 53,713 | | | 97,467 | | | | 22,496 | | | 173,676 |
| 2015 | | | 57,532 | | | 77,104 | | | | 27,608 | | | 162,244 |
| 2016 | | | 35,958 | | | 159,425 | 24,393 | | | 26,735 | | | 246,511 |
| 2017 | | | 46,885 | | | 185,679 | 17,244 | 52,956 | | 0 | | | 302,764 |
| 2018 | 29,689 | | 56,261 | | | 199,894 | 33,216 | 28,122 | | 25,913 | | | 373,095 |
| 2019 | | 34,283 | 32,277 | | | 131,048 | 77,078 | | 35,279 | | | | 309,965 |
| 2020 | | 34,662 | 29,139 | | | 112,885 | 65,416 | | 40,229 | | | | 282,331 |
| 2021 | | 34,994 | 34,904 | | | 123,192 | 67,150 | | 34,190 | | 1,136 | | 295,566 |
| 2022 | | 34,300 | | | 34,574 | 184,689 | 60,244 | | 68,456 | | 16,526 | 3,066 | 401,855 |
| 2023 | | 35,568 | | 40,313 | 35,434 | 183,379 | 34,813 | | 35,028 | | | | 364,535 |
| Total | 29,689 | 138,239 | 346,669 | 40,313 | 70,008 | 1,454,762 | 379,554 | 81,078 | 213,182 | 102,752 | 17,662 | 3,066 | 2,876,974 |

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Appendix F 2.–Page 3 of 4.

| Operator | SSRAA | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hatchery | CRYSTAL LAKE | | | | DEER MOUNTAIN | PORT SAINT NICHOLAS | WHITMAN LAKE | | | | | |
| Release Year | ANITA BAY | CITY CR | CRYSTAL CR | NEETS BAY | KETCHIKAN CR | PORT ST NICHOLAS | CARROLL INLET | HERRING COVE | KETCHIKAN CR | NEETS BAY | PORT ST NICHOLAS | SSRAA Total |
| 2014 | 49,956 | 23,794 | 55,372 | 43,249 | | | | 55,322 | | 32,979 | | 260,672 |
| 2015 | 31,097 | 0 | 66,150 | 31,968 | | | | 65,108 | 22,560 | 10,956 | | 227,839 |
| 2016 | 41,002 | 19,137 | 63,594 | 37,620 | | | 42,319 | 75,932 | 19,544 | 22,049 | | 321,197 |
| 2017 | 43,851 | 22,034 | 64,419 | 43,365 | 20,048 | 54,884 | 41,694 | 54,003 | | 21,288 | | 365,586 |
| 2018 | 42,901 | 21,822 | 62,046 | 19,792 | | 40,869 | 64,798 | 64,343 | 17,599 | | | 334,170 |
| 2019 | 75,012 | 16,434 | 122,442 | 62,788 | | 66,466 | 133,066 | 113,512 | 20,005 | | | 609,725 |
| 2020 | 46,716 | 19,777 | 63,845 | 32,482 | 10,941 | 40,125 | 78,413 | 69,949 | 21,510 | | | 383,758 |
| 2021 | 49,097 | | 62,731 | | 21,423 | 78,390 | 63,341 | 59,283 | 20,728 | | | 354,993 |
| 2022 | 464,251 | 93,240 | 624,925 | | 20,475 | 491,140 | 569,933 | 706,264 | 89,570 | | | 3,059,798 |
| 2023 | 402,297 | | 651,151 | | 9,777 | 87,483 | 625,418 | 698,458 | 82,763 | | 99,264 | 2,656,611 |
| Total | 1,246,180 | 216,238 | 1,836,675 | 271,264 | 82,664 | 859,357 | 1,618,982 | 1,962,174 | 294,279 | 87,272 | 99,264 | 8,574,349 |

Appendix F 2.–Page 4 of 4.

| Operator | POWHA | | MIC | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Hatchery | PORT SAINT NICHOLAS | | TAMGAS CREEK | | | | | | |
| Release Year | COFFMAN COVE | PORT ST NICHOLAS CR | HANGER PONDS | PORT CHESTER | QUARRY LK | SKATERS LK | TAMGAS CR | TAMGAS HARBOR | MIC Total |
| 2014 | 30,956 | 30,743 | | | | | 9 | | 9 |
| 2015 | 31,450 | 32,681 | | | | | | | |
| 2016 | 30,150 | 31,355 | | | | | 5,161 | | 5,161 |
| 2017 | | | | | | | 6,864 | | 6,864 |
| 2018 | | | | | | | 3,898 | | 3,898 |
| 2019 | | | | | | | 15,919 | | 15,919 |
| 2020 | | | | 22,749 | | | 25,434 | | 48,183 |
| 2021 | | | | 66,009 | | | | 58,105 | 124,114 |
| 2022 | | | | 23,683 | | | | | 23,683 |
| 2023 | | | | | | | | 38,757 | 38,757 |
| Total | 92,556 | 94,779 | 2,331 | 247,503 | 2,545 | 2,550 | 57,285 | 181,020 | 493,234 |

Appendix F 3.–Total tagged king salmon released by hatchery organizations in SEAK.

| Operator | AKI | DIPAC | | | | | | | | NMFS |
|---|---|---|---|---|---|---|---|---|---|---|
| Hatchery | PORT ARMSTRONG | MACAULAY | | | | | | | | LITTLE PORT WALTER |
| Release Year | Port Armstrong | Auke Bay | Fish Creek | Gastineau Channel | Juneau Area | Lena Cove | Pullen Creek | Thane Net Pens | DIPAC TOTAL | L PORT WALTER |
| 2014 | 33,673 | 10,949 | 20,534 | 31,988 | | 11,058 | | | 74,529 | 208,418 |
| 2015 | 74,626 | 10,090 | 27,828 | 29,381 | | 19,266 | 40,248 | | 126,813 | 145,535 |
| 2016 | 29,703 | 9,663 | 26,886 | 21,875 | | 29,353 | | 13,433 | 101,210 | 27,979 |
| 2017 | | 7,557 | 25,930 | 19,342 | | 13,554 | | 14,176 | 80,559 | 110,756 |
| 2018 | | 9,750 | 22,298 | 22,529 | | | | | 54,577 | 159,076 |
| 2019 | | 16,079 | 43,474 | 42,827 | | 29,051 | | 27,883 | 159,314 | 83,379 |
| 2020 | | | 58,443 | 286,370 | | | | | 344,813 | |
| 2021 | | | | | | | | | 0 | 159,767 |
| 2022 | | | 79,238 | 90,745 | | 45,884 | | | 215,867 | 62,214 |
| 2023 | | | 53,826 | 65,799 | | 38,179 | | | 157,804 | |
| Total | 138,002 | 64,088 | 358,457 | 610,856 | 199,940 | 186,345 | 40,248 | 55,492 | 1,515,426 | 957,124 |

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Appendix F 3.–Page 2 of 4.

| Operator | NSRAA | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hatchery | HIDDEN FALLS | | | | | | MEDVEJIE | | | | SAWMILL CREEK | SHELDON JACKSON | |
| Release Year | Gunnuk Creek & Kasnyku Bay | Gunnuk Creek | Kasnyku Bay | Little Port Walter | Southeast Cove | Bear Cove | Crawfish Inlet | Crawfish Inlet & Halibut Point | Crescent Bay | Halibut Point | Crawfish Inlet | Deep Inlet | NSRAA Total |
| 2014 | | | 53,713 | | | 97,467 | | | | 22,496 | | | 173,676 |
| 2015 | | | 57,532 | | | 77,104 | | | | 27,608 | | | 162,244 |
| 2016 | | | 35,958 | | | 159,425 | 24,393 | | | 26,735 | | | 246,511 |
| 2017 | | | 46,885 | | | 185,679 | 17,244 | 52,956 | | 0 | | | 302,764 |
| 2018 | 29,689 | | 56,261 | | | 199,894 | 33,216 | 28,122 | | 25,913 | | | 373,095 |
| 2019 | | 34,283 | 32,277 | | | 131,048 | 77,078 | | 35,279 | | | | 309,965 |
| 2020 | | 34,662 | 29,139 | | | 112,885 | 65,416 | | 40,229 | | | | 282,331 |
| 2021 | | 34,994 | 34,904 | | | 123,192 | 67,150 | | 34,190 | | 1,136 | | 295,566 |
| 2022 | | 34,300 | | | 34,574 | 184,689 | 60,244 | | 68,456 | | 16,526 | 3,066 | 401,855 |
| 2023 | | 35,568 | | 40,313 | 35,434 | 183,379 | 34,813 | | 35,028 | | | | 364,535 |
| Total | 29,689 | 138,239 | 346,669 | 40,313 | 70,008 | 1,454,762 | 379,554 | 81,078 | 213,182 | 102,752 | 17,662 | 3,066 | 2,912,296 |

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Appendix F 3.–Page 3 of 4.

| Operator | SSRAA | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hatchery | CRYSTAL LAKE | | | | DEER MOUNTAIN | PORT SAINT NICHOLAS | WHITMAN LAKE | | | | | |
| Release Year | ANITA BAY | CITY CR | CRYSTAL CR | NEETS BAY | KETCHIKAN CR | PORT ST NICHOLAS | CARROLL INLET | HERRING COVE | KETCHIKAN CR | NEETS BAY | PORT ST NICHOLAS | SSRAA Total |
| 2014 | 49,956 | 23,794 | 55,372 | 43,249 | | | | 55,322 | | 32,979 | | 260,672 |
| 2015 | 31,097 | | 66,150 | 31,968 | | | | 65,108 | 22,560 | 10,956 | | 227,839 |
| 2016 | 41,002 | 19,137 | 63,594 | 37,620 | | | 42,319 | 75,932 | 19,544 | 22,049 | | 321,197 |
| 2017 | 43,851 | 22,034 | 64,419 | 43,365 | 20,048 | 54,884 | 41,694 | 54,003 | | 21,288 | | 365,586 |
| 2018 | 42,901 | 21,822 | 62,046 | 19,792 | | 40,869 | 64,798 | 64,343 | 17,599 | | | 334,170 |
| 2019 | 75,012 | 16,434 | 122,442 | 62,788 | | 66,466 | 133,066 | 113,512 | 20,005 | | | 609,725 |
| 2020 | 46,716 | 19,777 | 63,845 | 32,482 | 10,941 | 40,125 | 78,413 | 69,949 | 21,510 | | | 383,758 |
| 2021 | 49,097 | | 62,731 | | 21,423 | 78,390 | 63,341 | 59,283 | 20,728 | | | 354,993 |
| 2022 | 98,748 | 12,629 | 130,073 | | 20,475 | 112,547 | 126,870 | 166,211 | 19,898 | | | 687,451 |
| 2023 | 125,870 | | 126,229 | | 9,777 | 87,483 | 130,221 | 145,919 | 19,503 | | 19,368 | 664,370 |
| Total | 604,250 | 135,627 | 816,901 | 271,264 | 82,664 | 480,764 | 680,722 | 869,582 | 161,347 | 87,272 | 19,368 | 4,209,761 |

Appendix F 3.–Page 4 of 4.

| Operator | POWHA | | MIC | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Hatchery | PORT SAINT NICHOLAS | | TAMGAS CREEK | | | | | | |
| Release Year | COFFMAN COVE | PORT ST NICHOLAS CR | HANGER PONDS | PORT CHESTER | QUARRY LK | SKATERS LK | TAMGAS CR | TAMGAS HARBOR | MIC Total |
| 2014 | 30,956 | 30,743 | | | | | 9 | | 9 |
| 2015 | 31,450 | 32,681 | | | | | | | |
| 2016 | 30,150 | 31,355 | | | | | 5,161 | | 5,161 |
| 2017 | | | | | | | 6,864 | | 6,864 |
| 2018 | | | | | | | 3,898 | | 3,898 |
| 2019 | | | | | | | 15,919 | | 15,919 |
| 2020 | | | | 22,749 | | | 25,434 | | 48,183 |
| 2021 | | | | 66,009 | | | | 58,105 | 124,114 |
| 2022 | | | | 23,683 | | | | | 23,683 |
| 2023 | | | | | | | | 38,757 | 38,757 |
| Total | 92,556 | 94,779 | 2,331 | 247,503 | 2,545 | 2,550 | 57,285 | 181,020 | 493,234 |

# APPENDIX G: ADF&G MSF FEASIBILITY STUDY TEMPLATE

Appendix G 1. A mark-selective-fishery feasibility template developed by the ADF&G, DSF for use in MSF planning.

1- Define the scope of the fishery that will be evaluated.

  a. Location; Dates; Species

  b. Identify goal(s) of the MSF scenarios being evaluated, for example:

    i. Maintain/increase fishing opportunity

    ii. Maintain/increase harvest opportunity

    iii. Protect wild stocks

2- Evaluate relevant fishery management, assessment, and hatchery enhancement programs

  a. Relevant management processes to implement new fishery

    i. Domestic, national, and international

  b. Available assessment tools

    i. Are technical fishery monitoring tools in place at appropriate temporal and geographic resolution to evaluate whether an MSF is meeting its goals and meet PSC reporting requirements?

    ii. Release mortality study- focused on the specific fishery

  c. Relevant enhancement program characteristics

    i. Characterize relevant enhancement activities and coordinate with hatchery associations

      1. Release amounts, locations, ancestral stock utilized

      2. Marking and tagging rates

3- Engage with community members and fishery stakeholders to understand perspectives on MSFs

  a. Opportunity for information sharing, and outreach to educate anglers about MSFs and to solicit questions, comments, and recommendations on MSF scenarios from a broad group of fishery users.

  b. Plan for post-season engagement to evaluate fishery outcomes from community perspective

-continued-

Appendix G1. Page 2 of 2.

4- Evaluate relevant fishery data to inform MSF scenarios

a. Planning exercise: Were you able to quantitatively or qualitatively demonstrate an MSF would meet your stated goals

i. Mark-Fraction analysis- demonstration of plausibility

ii. Model anticipated MSF impacts (fishery and stock outcomes) to assess whether goals will be met

5- Synthesize results of steps 2-4 to:

a. Evaluate potential for MSF to achieve its goals

b. Identify information or capacity gaps to MSF implementation and assessment

c. Describe impacts: costs/risks, benefits, - contrast with non-MSF scenario

d. Assess who will benefit from the MSF scenario and who will be harmed

**Project Title:**
Best Practices for Improving CWT Sampling and Recovery Data
MSF-23-06

**Performance Period:**
November 1st, 2023, to October 31st, 2024

**Name of Organization**
Pacific State Marine Fisheries Commission

**Principal Investigator / Project Lead:**
Nancy Leonard, Pacific States Marine Fisheries Commission, 205 SE Spokane Street, Suite 100 Portland, OR 97202, (503) 595-3100, nleonard@psmfc.org

**Abstract.**
This project focused on improving the quality of coded wire tag (CWT) data collected and submitted to the Regional Mark Processing Center (RMPC) Regional Mark Information System (RMIS). RMIS is the public-facing CWT data system that provides access to the CWT data used by Pacific Salmon Commission (PSC) technical committees to inform management of mark selective fisheries. This work was accomplished by compiling existing guidance on CWT lab procedures (e.g., extraction and reading), reviewing and revising this guidance with experts, and finalizing lab guidance in a document and lab poster. This project also included capturing information about calculation of estimate exploitation rates on Chinook salmon indicator stocks encountered in mark selective fisheries, which aligns with the Mark Selective Fishery (MSF) theme *(3) Maintain and improve the ability to estimate exploitation rates on Chinook salmon indicator stocks that are encountered in MSFs.* Final products were disseminated to CWT labs and staff participating in the project and to RCMT members, which include PSC parties, and were made available on the RMPC website.

**Introduction.**
The Regional Committee on Marking and Tagging (RCMT) (https://www.rmpc.org/committees/rcmt/) is a collaborative committee under the Regional Mark Processing Center (RMPC). The RCMT includes representatives, either directly or indirectly, from all coded wire tagging and/or recovery agencies and tribes on the Pacific Coast. Several of these representatives also serve on Pacific Salmon Commission (PSC) technical committees. During the RCMT April 2023 meeting, the RCMT members identified an urgent need to provide document lab practices for coded wire tag extraction, reading, and expansion processes. This need was identified by the RCMT members based on their observation of increased use of small CWT labs, changes in CWT lab personnel and loss of expertise with staff turnover, and the need to provide guidance in an accessible manner to ensure consistency and quality of the CWT data. Similarly, the RCMT members identified a need to document guidance related to recent use of subsampling and subsequent CWT expansion methods, to ensure data consistency between agencies, as required for accurate exploitation rate estimates. To this end, the RCMT agreed to collaboratively develop guidance material to be used by the CWT labs and staff based on existing guidance used by the members' agencies and input from experts. The RCMT members, who also serve on PSC committees, identified that this work of compilation, dissemination, and implementation of lab practices will directly respond to the Mark Selective Fishery (MSF) request for proposals by improving the ability to estimate exploitation rates on Chinook salmon indicator stocks encountered in mark selective fisheries, which aligns with the MSF theme *(3) Maintain and improve the ability to estimate exploitation rates on Chinook salmon indicator stocks that are encountered in MSFs.*

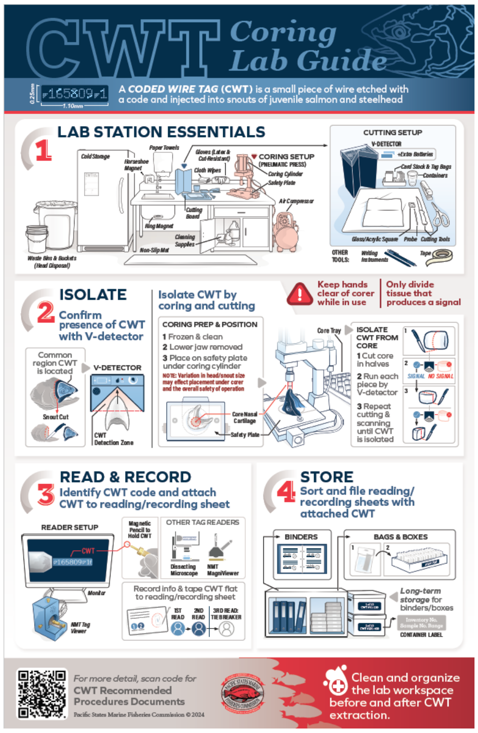
**Project Objectives.**
The primary objectives of this project consisted of using a collaborative approach to succinctly develop a document on: (1) CWT lab guide procedures, including extraction and reading, (2) best methods for calculating expansion factors in the presence of MSF and complex regulations, and (3) best practices for subsampling and associated expansion calculations. A secondary objective was to develop visual posters that would effectively convey the main steps from the CWT lab guide.

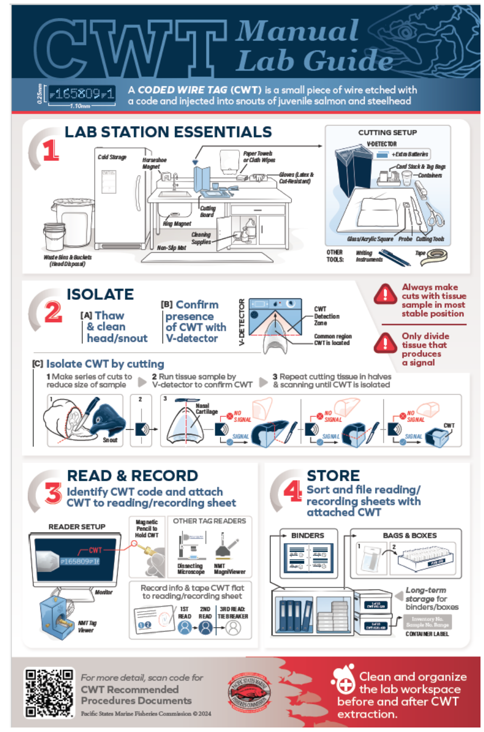
**Methodology and Project Design. Methods, sample design, and techniques for conducting the project.**
PSMFC worked closely with the RCMT members, who also serve on PSC committees, to locate existing documents, identify experts, and disseminate the guidance documents to the appropriate CWT practitioners. As the deliverables include guidance on expansion factor calculations and related subsampling — important information used by analytical technical committees — engagement of relevant PSC committee members during the review of these documents was important. The RCMT members who serve on several of these committees assisted in identifying workshop participants from these committees and shared the draft and final products with committee members.

PSMFC used the existing lab documents from multiple agencies to draft a lab guide document and lab poster. Five workshops were scheduled, including one hybrid. The working group consisted of 40 experts representing 13 agencies and tribes. The lab guide document was broken into three major sections: Collection & Transportation of Heads, Prep & Head Dissection, and Reading & Recoding of CWT, with each virtual workshop focusing on a section, with the last section extending into a secondary workshop. During the workshops, experts reviewed the context to ensure that various lab protocols were captured as well as a proper supply lists and lab safety tips. During the hybrid meeting, the final draft of the document was reviewed, ensuring the document reflected the best available knowledge from agency and tribal experts. An accompanying draft lab poster was also reviewed and discussed, with essential content identified by the working group participants for inclusion on the final lab poster.

The pre-final version of the products was sent to the working group for a last review by email. Additional CWT lab managers identified by the working group were included in this email to obtain their input before concluding the document revision process. Two versions of the poster were created to reflect the coring method and the manual extraction of CWTs. Upon receiving the remaining edits, the finalized PDF document and lab poster were produced and disseminated to the working group via email. Additionally, these resources were made publicly accessible on the RMPC website at https://www.rmpc.org/resources/cwt-info/.

**Results and Project Deliverables**
The project was successful in producing the proposed CWT Lab Guide and Lab Posters. These final products reflected the expertise and input of RCMT members and CWT lab experts. The RCMT is dedicated to several key objectives, including maintaining the integrity of data used for stock assessment, harvest management, and enhancement evaluation. The finalized CWT Best Practices document (including guidance on expansion rates) and the accompanying lab poster embody these objectives by ensuring the accurate extraction and recording of CWT data. This focus on consistency and data quality ultimately enhances the reliability of exploitation rate estimates.




*The CWT extraction lab posters serve as a quick guide for staff to reference in the lab. Left: Coring lab guide poster, Right: Manual extraction lab guide poster.*

**Project Schedule.**

The project timeline was adjusted to align with participants' availability and ability to provide draft material to inform the first version of the Lab Guide. Originally, we anticipated holding multiple hybrid meetings, but participants were more successful in scheduling and participating in virtual workshop meetings. Additional virtual meetings were added to allow the working group to engage in group discussions to inform the content for each major section: Collection & Transportation of Heads, Prep & Head Dissection, and Reading & Recoding of CWT, with each virtual workshop focusing on a section,

| Status / Comment | Date | Task |
|---|---|---|
| Completed during the expected timeframe. | November 2023 to January 2024 | PSMFC executed subcontract with QW Consulting.<br><br>PSMFC staff lead the tasks of contacting RCMT members and other experts to access existing documentation on procedures for CWT lab extraction/reading and expansion calculations and related subsampling. This required emailing and one-on-one meetings to locate and access information. The Columbia Basin Fish & Wildlife Library (CBF&W) Librarian, located within the Columbia River Inter-Tribal Fish Commission and connected to other libraries, will also be contacted to assist with locating published (gray/peer review) documents. Documents located by the Librarian and QW consultant will be verified with the relevant management entities to ensure these reflect current practices and are appropriate for informing the guidance documents. |

| | | |
|---|---|---|
| Completed.<br><br>Time period was extended from February to April 2024. | January – April 2024 | The first draft of the CWT Best Practices document (now called CWT Lab Guide) was created using the existing lab documents and input from the RCMT subgroup. This draft document highlighted areas requiring expert input and decisions needed to inform a collaborative recommendation and served as the focus of the work group meetings<br><br>RCMT assisted in identifying experts from RCMT member agencies/Tribes, PSC committees, and others invited to review and discuss the draft during the virtual workshop meetings and one hybrid workshop meeting. |
| Completed.<br><br>Workshop 1 was moved from March to April due to the extended period used to draft CWT Lab Guide from available material.<br><br>Workshop was held virtually and not hybrid as originally planned for ease of participation | April 22, 2024 | Workshop 1. PSMFC staff scheduled a half-day virtual workshop with RCMT subgroup and identified experts. The group identified the workshop approach, and future dates for virtual meetings. Section 1: Collection & Transportation of Heads, was revised to align with their input, discuss outstanding issues, and identify collaborative solutions to these issues.<br><br>Comments and edits were captured to inform revised documents per workshop input. |
| Completed.<br>The timeline was adjusted by 1 month due to adjustments to previous tasks. | April 22 -May 16, 2024 | Revisions to the document were made as directed by PSMFC staff per workshop input.<br><br>PSMFC staff set up and facilitated one-on-one follow up meetings/email exchange to guide revisions to understand suggested modifications. |
| Completed.<br><br>Virtual Workshops 2 held per original timeline | May 16, 2024 | Workshop 2. PSMFC staff convened a virtual workshop meeting to revise Section 2: Prep & Head Dissection of the document to align with their input, discuss outstanding issues, and identify collaborative solutions to these issues.<br><br>Comments and edits were captured to inform revised documents per workshop input. |
| Completed, per original timeline. | May 2024 (RCMT meeting) | PSMFC staff and RCMT subgroup presented the revised documents during the 2024 RCMT hybrid meeting (hosted by ADFG in Juneau, Ak). Accompanying draft lab cheat-sheet, infographic poster option(s) were reviewed and discussed by RCMT members. |
| Completed, per original timeline. | May – June 2024 | Revisions to the document were made as directed by PSMFC staff per workshop 2 input. |

| | | |
|---|---|---|
| | | PSMFC staff set up and facilitated one-on-one follow up meetings/email exchange to guide revisions to understand suggested modifications. |
| Completed.<br><br>An additional virtual meeting to focus on section 3 | July 1, 2024 | Workshop 3. PSMFC staff convened a virtual workshop meeting to revise Section 3: Reading & Recording of CWT, of the document to align with their input, discuss outstanding issues, and identify collaborative solutions to these issues.<br><br>PSMFC staff set-up and facilitated one-on-one follow up meetings/email exchange to guide revisions. QW Consulting participated in these meetings to understand the suggested modifications. |
| Completed.<br><br>An additional virtual meeting to continue work on section 3 | July 15, 2024 | Workshop 4. PSMFC staff convened a virtual workshop meeting to continue revising Section 3: Reading & Recording of CWT, of the document to align with their input, discuss outstanding issues, and identify collaborative solutions to these issues.<br><br>PSMFC staff set up and facilitated one-on-one follow up meetings/email exchange to guide revisions to understand suggested modifications. |
| Completed.<br><br>The final workshop held per original timeline but moved to hybrid format. | August 19, 2024 | PSMFC staff scheduled and convened a hybrid meeting with workshop participants to review the final draft document and address any outstanding issues. A draft lab poster was reviewed and essential content identified by the working group. Drafts of the CWT lab poster were sent out over email for comments and edits.<br><br>PSMFC staff revised the documents and infographic poster as directed by PSMFC staff per input received and finalized the CWT Best Practices document. |
| Completed per original timeline | October 15, 2024 | Final edits, comments and input for the CWT lab posters received by the working group. |
| Completed per original timeline | October 31, 2024 | Final products are produced and provided in an electronic format to RCMT members, emailed to all known CWT practitioners. interested parties, CBF&W Library, and posted on the RMPC website.<br><br>We will defer to PSC on whether to distribute to PSC members/committees. |
| Completed | November 30, 2024 | PSMFC staff submits final written report. |

**Benefits**

The production of the CWT Lab Guide and Lab Posters will aid in ensuring the quality of CWT data being provided by CWT labs and support the appropriate use of expansion calculations and related subsampling.

**Project Title:**
Populating a Coastwide Chinook and Coho Fishing Regulations Database

MSF-23-0B

**Performance Period:**
November 1st, 2023, to October 31st, 2024

**Name of Organization**
Pacific State Marine Fisheries Commission

**Principal Investigator / Project Lead:**
Nancy Leonard, Pacific States Marine Fisheries Commission, 205 SE Spokane Street, Suite 100
Portland, OR 97202, (503) 595-3100, nleonard@psmfc.org

**Abstract**

The Coastwide Chinook and Coho Fishing Regulations Database project seeks to aid The Pacific Salmon Commission (PSC) in accounting for the impact of mark-selective fishery regulations (MSF) on salmon species exploitation rates and other analysis efforts through the development of a database that links coastwide salmon regulations to the existing catch sample data in information systems like the Regional Mark Information System (RMIS). The project objective, to develop a PSMFC hosted database of compiled fishing regulations linked to RMIS catch sample data, was accomplished through development of the Coastwide Chinook and Coho Fishing Regulations Database via data compilation informed database schema restructuring, web application development for data query, assessment of practical GIS based RMIS data integration, stakeholder lead resource discovery for fishery regulations, and data consumer insights on project development. The database was migrated to a PSMFC MSSQL platform and the data query web application was launched to stakeholders. Future prioritization of RMIS data integration and expanded staffing capacity for data compilation are recommended to ensure the success and continued progress of this endeavor.

**Introduction**

The Pacific Salmon Commission requires accurate and comprehensive data to assess mark-selective fishery impacts and fulfill the objectives outlined in the Chinook Chapter of the Pacific Salmon Treaty. This project aimed to address critical gaps in the ability to link fishery regulations to catch and release estimates by developing and populating a coastwide fishing regulations database for Chinook and Coho salmon. This effort builds on a 2022 feasibility study and prototype database, focusing on transitioning to a permanent location, refining the database structure, and integrating it into broader PSC data systems.

While other regulation database projects are active in the Pacific Northwest and California, the team deliberately avoided non-PSC distractions, maintaining focus on the specific tasks needed to support PSC objectives. By adhering to this focus, the project sought to create a tool capable of addressing PSC's technical needs while remaining scalable for future enhancements.

**Methods**

To meet the objectives of developing and populating the fishing regulations database, the project employed several methodologies:

Database Development

The team transitioned the database to a permanent MSSQL platform at the Pacific States Marine Fisheries Commission (PSMFC). Early pilot data compilations informed a significant shift from an initially flattened data table approach (via Google Forms data entry) to a relational database schema, completed by August 2024. This schema was designed to:

- Enhance data entry efficiency using lookup tables.
- Support hierarchical regulation structures by time, area, and species.
- Align with diverse state and regional management practices.

This restructuring supported Objectives #1 (migration and schema refinement) and #4 (data population for 2006–2023 regulations).

Web Application Prototyping

To maintain project momentum despite delays in data compilation, the team prioritized prototyping a web interface for regulations queries earlier in the year. This approach leveraged feedback from biologists and incorporated high-level requirements, ensuring that the web application would meet user needs. The prototype evolved into a functioning application by fall of 2024.

Regulations Literature Collection

Recognizing the importance of building a robust dataset, the team began collecting regulations literature early in 2024. This effort included regulations from Washington, Oregon, and Alaska, as well as post-season reports and tribal records. The collected assets were permanently stored at the Columbia Basin Fish & Wildlife Library, a PSMFC partner, ensuring centralized access for all stakeholders.

Stakeholder Collaboration

The project team held consistent meetings with the Chinook Technical Committee (CTC) biologists, approximately every two weeks to a month. These meetings provided valuable feedback and helped maintain focus on PSC objectives. The biologists contributed insights on prioritizing regulation sources (e.g., annual agency regulation pamphlets versus post-season reports) and designing user-friendly interfaces.

**Results**

Database Migration and Restructuring

The database was successfully migrated to a permanent MSSQL platform at the Pacific States Marine Fisheries Commission (PSMFC). After completing an initial pilot data compilation for several key regulation areas, the team identified the need for a major schema restructuring to better accommodate the hierarchical nature of fishing regulations and diverse management practices. This restructuring, completed in August 2024, ensured the database could accurately capture complex regulation data.

Web Application Development

An early focus on prototyping the web query application helped maintain project momentum. The application, informed by input from Chinook Technical Committee (CTC) biologists, progressed from a prototype in September to a functional version launched by the end of fall 2024. This approach minimized delays and positioned the project for continued testing and refinement.

Regulations Literature Collection

Regulations for both Chinook and Coho mark-selective areas, as well as non-selective regulations for all salmon species, were compiled from Washington, Oregon, Alaska, post-season reports, and tribal areas. These resources are being permanently stored at the Columbia Basin Fish & Wildlife Library, ensuring long-term access to this critical data. The early collection of literature also facilitated smooth onboarding and rapid progress by the newly hired Data Management Specialist in July 2024.

Stakeholder Engagement

Regular meetings with CTC biologists provided essential guidance throughout the project. Their input shaped key project deliverables, including:

- Identifying critical sources for regulation data.
- Providing insights into user interface design for the web application.
- Ensuring the project remained aligned with PSC priorities.

GIS and RMIS Integration Progress

While connecting RMIS data with fishing regulation areas proved more challenging than anticipated, the team developed a plan for integrating GIS solutions to correlate RMIS reporting domains with regulation areas. Active collaboration with RMIS personnel and the PSMFC GIS department has laid the groundwork for resolving these challenges in the 2025 project cycle.

**Discussion**

The project achieved significant progress toward its objectives, despite challenges that affected timelines. The late hiring of the Data Management Specialist delayed data compilation efforts, but early adjustments—such as prioritizing the web application and initiating literature collection—helped mitigate these impacts. Once onboard, the new hire contributed to rapid advancements in data compilation and schema refinement, demonstrating the importance of staffing expertise.

The relational database schema, informed by pilot data and feedback from stakeholders, has positioned the database for scalable, efficient data entry and retrieval. This directly supports PSC's goals of assessing mark-selective fishery impacts and enhancing the accuracy of exploitation rate analysis.

However, challenges remain, particularly in integrating RMIS data with fishing regulation areas. The geographic discrepancies between RMIS reporting domains and regulation areas require innovative GIS solutions, which the team has begun exploring with PSMFC support. This task will continue into the 2025 cycle, underscoring the complexity of aligning datasets across diverse systems.

The project's success in launching a functional web application and compiling key regulation datasets demonstrates its value to PSC and stakeholders. With continued refinement and collaboration, the project is well-positioned to address remaining challenges and deliver a comprehensive fishing regulations database.

**Conclusion and Recommendations**

This project represents a significant step forward in the development of a comprehensive fishing regulations database to support the Pacific Salmon Commission (PSC) and its Chinook Technical Committee (CTC). Despite challenges, such as delays in hiring and the complexity of aligning RMIS data with fishing regulation areas, the project achieved several key milestones, including:

- Migration of the database to a permanent MSSQL platform at PSMFC.
- Completion of a relational schema restructuring to support hierarchical regulation structures.
- Development and launch of a functional web query application.
- Compilation and permanent storage of regulations literature from multiple states, tribal areas, and post-season reports.

These accomplishments underscore the project's alignment with PSC objectives, particularly in improving the accuracy of mark-selective fishery assessments and exploitation rate analysis.

**Recommendations**

To ensure continued success and address remaining challenges, we recommend the following:

1. **Focus on RMIS Integration:**
   Allocate resources in the 2025 cycle to finalize GIS solutions for correlating RMIS reporting domains with fishing regulation areas. This step is critical for linking catch and recovery data to regulations.
2. **Ongoing Data Compilation and Maintenance:**
   Maintain the momentum of data compilation efforts, prioritizing regulations for 2006–2023 while ensuring long-term sustainability through partnerships like the Columbia Basin Fish & Wildlife Library.

3. **Enhanced Stakeholder Collaboration:**
   Continue regular engagement with CTC biologists and other stakeholders to refine the database and web application, ensuring the tool remains practical and user-friendly.
4. **Expand Staff Capacity:**
   Evaluate the need for additional Data Management Specialists to support ongoing data entry and validation tasks, particularly as the database expands to include more complex datasets.

With these steps, the project is poised to achieve its long-term goals, delivering a robust, scalable, and user-centric database to meet PSC's needs.

**Project Deliverables - Were the Stated Objectives Met?**

- **Addressed in Results and Discussion Sections:**
  - Objective #1: **Database migration** to PSMFC and schema refinement was completed, ensuring appropriate fields and structure for capturing regulations.
  - Objective #4: **Data compilation** began for regulations from 2006 to 2023, focusing on Chinook and Coho mark-selective and non-selective areas. While progress was delayed due to the late hire of the Data Management Specialist, significant datasets were compiled, and assets were permanently stored at the Columbia Basin Fish & Wildlife Library.
  - The **web query application** was developed, tested, and launched, providing a functional tool for accessing the database.
  - Progress was made on linking RMIS data to regulations, although this remains a complex task planned for the 2025 cycle.

**Project Schedule - Did the Project Run According to Schedule?**

- **Explicitly Discussed in Challenges and Discussion Sections:**
  - The schedule was impacted by the delayed hiring of the Data Management Specialist, which pushed back data compilation and schema restructuring.
  - Adjustments were made to prioritize other tasks, such as prototyping the web application and collecting regulations literature, to mitigate the impact of the delay.
  - Despite the initial delay, key deliverables like the web application launch and schema restructuring were achieved within the project year.

**Benefits - What Tangible Benefits Have Resulted from the Project?**

- **Highlighted in Results and Conclusion Sections:**
  - The **relational database schema** significantly improved data entry efficiency, reduced potential for human error, and provided a scalable structure for future expansions.

- The **web application** enables stakeholders to access and query regulations data efficiently, creating a foundation for future integrations with RMIS and GIS solutions.
- The **permanent storage of regulation literature** at the Columbia Basin Fish & Wildlife Library ensures accessibility and preservation of critical resources.
- Regular collaboration with CTC biologists ensured alignment with PSC priorities and supported the development of a user-friendly interface and practical database structure.

November 27, 2024

# Mark Selective Fishery Fund
# Project Progress Report #2

| | |
|---|---|
| Project Title: | Mass marking of Hatchery Seapen-Produced San Juan Chinook Salmon |
| Period covered: | March 1, 2023 to January 31, 2026 |
| Name of Organization / Affiliation: | Lead: Pacheedaht First Nation<br>Support: Fisheries and Oceans Canada (DFO) |
| Principal Investigator / Project Lead: | Lead: Helen Jones<br>Support: Katie Davidson, Pieter Van Will, Erin Rechisky |

## 1. Summary/status of project

Pacheedaht First Nation (PFN), in partnership with Fisheries and Oceans Canada (DFO) and the 4 Mile Enhancement Society, are pursing the use of marking to support a sustainable terminal community fishery and to assist with managing the impacts of hatchery production on wild San Juan Chinook salmon genetics. While 4 Mile Hatchery currently applies otolith thermal marks, coded wire tags (CWTs), and genetic parental-based tagging, the term “mass mark” (hereafter “mark”) refers to adipose fin clipping, while “tagging” refers to coded-wire tags (CWT), unless specified otherwise. This project provides three years of funding, with Year 1 beginning in brood year 2022, to mark hatchery-produced San Juan Chinook at the 4 Mile Hatchery, with the plan to mark all Chinook released from seapens and to increase the mark rate on the freshwater released Chinook (as hatchery infrastructure and staff capacity allow). We are reporting on Year 2 (brood year 2023/release year 2024). See below table for a summary of project results to date.

*Table 1. Mark and tag rate updates for Years 1 and 2 of the San Juan Chinook marking program, MSF-03-22.*

| PSC MSFF Project Year | Fiscal year | Brood year (Release year) | Release group | Ad-clip by release group (rate) | CWT by release group (rate*) | Total BY release (ad-clip rate) |
|---|---|---|---|---|---|---|
| Year 1 | 2023-2024 | 2022 (2023) | Seapen | 44,081 (100%) | 41,823 (94.8%) | 17.4% (478,584) |
| | | | Lake/lower river | 43,284 (9.9%) | 41,604 (9.5%) | |
| Year 2 | 2024-2025 | 2023 (2024) | Seapen | 39,573 (100%) | 38,051 (96%) | 21.8% (562,433) |
| | | | Upper river | 42,560 (100%) | 0 (0%) | |
| | | | Lake/lower river | 40,433 (9.2%) | 37,639 (8.6%) | |
| Year 3 (tentative) | 2025-2026 | 2024 (2025) | | - | - | Goal: minimum 50% (TBD) |

** CWT rates take into account tag retention checks and tagging mortalities.*

The project has met all objectives for Year 2; marks were applied to a total of 122,566 San Juan Chinook smolts (75,690 of those fish also received a CWT). The project is currently on track for Year 3; the 2024 broodstock has been collected and spawned successfully, with the intention to continue marking/tagging Chinook as per the first two years, and hopefully increasing the mark rate further for Year 3.

A new release strategy was piloted in Year 2 in the upper San Juan River. In recent years, PFN have observed Chinook spawning lower in the San Juan River which is thought to be due to the majority of hatchery releases occurring in the lower San Juan (at Fairy Lake). Continuing to encourage spawning in the lower river is particularly concerning as a recent University of British Columbia study noted 0% egg survival in the lower river likely due to fine sediment deposition and/or gravel scouring. We are planning to adopt this new upper river location for more of the 2025 freshwater release group, with the goal of encouraging more hatchery fish to spawn in the upper river where spawning habitat. All fish released at the upper river site will be marked so as not to interfere with data collection on natural-origin Chinook at the downstream rotary screw trap.

## 2. Milestones and Timeline

This is the second interim report for the 3-year project (see Table 2). Marking occurred at the expected time in 2023; the upper river release group was marked April 22-23, while the remaining releases were marked early May (May 5-14). Project crew size varied daily between 7-13 people and included Pacheedaht, DFO, and 4 Mile Hatchery staff. Rockfish Services (CWT consultant) staff were involved for capacity development training on day 1, after which time 4 Mile, DFO and Pacheedaht staff were fully independent. The upper river group was released April 29, the lower river/lake group released May 26, and the seapen released June 7.  All releases were smolt 0+ stage. Broodstock collection and sampling for 2024 (release year [RY] 2025) occurred throughout September and early October.

*Table 2. Timeline and milestone details for MSF-03-22.*

| Date | Milestone |
|---|---|
| March and April 2023, 2024, 2025 | Marking and tagging of San Juan chinook releases |
| September and October 2023, 2024, 2025 | Broodstock collection and sampling |
| 1 December 2023, 2024, 2025 | Progress reports on annual marking and broodstock sampling |
| January 2026 | Final report |

## 3. Key area of work

San Juan Chinook have been enhanced by the 4 Mile Hatchery in Port Renfrew, BC, since 1979. In recent years, the 4 Mile Hatchery has utilized two main rearing and release strategies: ~40,000 Chinook smolts reared in and released from a sea pen in Mill Bay, Port San Juan, (PFMA 20-2), and ~400,000 reared in a lake pen in Fairy Lake, and then released into either the lake or the river depending on water level and temperature. The primary goal of this project was to mass mark (adipose-clip) all seapen releases and begin building capacity to increase mark rates on freshwater releases as hatchery capacity allows. The adipose-clip rate has averaged 8.5% over the history of San Juan Chinook enhancement prior to this grant. However, since its peak at 99% in 1979, San Juan hatchery Chinook mark rates have frequently been 0%, including as recently as 2018–2020. Accordingly, the 2023 broodstock (363 fish) had a 0% adipose-clip rate, while 2024 broodstock (369 fish) had a 0.8% mark rate.

The objectives of the present MSF-funded project, in line with Theme 1 of the MSF Fund, are:

1. Increase the mark rate of San Juan Chinook in the Strait of Juan de Fuca and SWVI by mass marking all sea pen reared San Juan Chinook and a portion of lake-pen reared San Juan Chinook, and apply unique CWT codes to both release groups.
2. Increase the Proportion of Natural Influence (PNI) for San Juan Chinook from the recent levels of 0.1-0.4 to over 0.5 through selective harvest of marked Chinook in terminal fisheries (e.g.,

Pacheedaht terminal community fishery and Port San Juan sport fishery in PFMA 20-2, East Point).

3. Establish viable and sustainable terminal MSF opportunities on San Juan Chinook in the future, as implemented by DFO.
4. Enable the use of predominantly natural-origin broodstock for hatchery production while ensuring adequate levels of natural-origin spawners (through monitoring of PNI).

Prior to the MSF-03-22 grant being awarded, Pacheedaht First Nation solely funded the marking and CWT-tagging of 43,234 seapen releases (a 100% mark rate on seapen releases, and an 8.6% mark rate on overall hatchery Chinook production) for brood year 2021 (release year 2022). The MSF fund marking program for hatchery-produced San Juan chinook salmon began in March 2023. For BY 2022 (RY 2023—i.e., Year 1 of MSF-03-22), we achieved an overall mark rate of 17% for hatchery-produced San Juan Chinook, which increased to 22% for BY 2023 (RY 2024). While biological sampling results on parental origin are not fully available yet for the 2023 broodstock, the 2022 broodstock were estimated to be approximately 63% hatchery-origin (based on otolith thermal mark results). We do not expect marked returns from this project until 2025 at the earliest, and more likely 2027-28 (San Juan Chinook are predominantly age $4_1$ or 0.3 at return).

## 4. Challenges and resolutions

There are currently no risks to the project being completed. However, hatchery infrastructure and capacity are ongoing challenges. The 4 Mile Hatchery's primarily water source is surface water which dries up during severe drought (such as 2022 and 2023), and the generator for the backup well system is costly to operate continuously. During drought conditions access to the San Juan River to release juveniles can also be challenging. In early spring 2024, DFO and PFN were able to find emergency funding to establish access to the upper San Juan release site, thus ensuring accessible long-term river access for future hatchery releases. DFO is also currently in the process of identifying and allocating significant funding for hatchery infrastructure upgrades, which we expect to mitigate many of these challenges in the near future.

The availability of CWT machines remains a challenge. As a contingency plan in Year 2, DFO was able to submit a special mass-marking request to DFO Science which was approved; this allows us to mark fish in the absence of CWTs. We plan to submit this request again for Year 3 releases to ensure all marking targets are met.

## 5. Next Steps

The project is on schedule, with no delays expected. Thanks to a slight budget increase for Years 2 and 3, the project is also anticipated to stay within budget. The scope has not changed, other than plans to increase the total mark rate of hatchery-produced San Juan Chinook at the request of the Mark Selective Fisheries Fund review committee. We have completed Years 1 and 2 of 3, leaving less than one-third of the project to be completed. Work and discussions are underway to increase the overall mark rate of hatchery-produced San Juan Chinook in the final year of this grant; the specific mark rate to be achieved will be developed through pre-season discussions with DFO, Pacheedaht and 4 Mile Hatchery.

# Mark Selective Fishery Fund
# Project Progress Report

| | |
|---|---|
| Project Title: | FRIS - Mark Selective Fisheries (MSF) Export |
| Period covered: | *April 1, 2024 to Dec 19, 2024* |
| Name of Organization / Affiliation: | DFO |
| Principal Investigator / Project Lead: | Greg Hornby, Regional Manager Recreational Fisheries |

1. **Summary/status of project**
    - The objective of the project is the development of queries and export tools on recreational management measures/regulations entered in DFO's Fishery Regulations Information System (FRIS). FRIS is the database where all BC tidal waters recreational fishing regulations are stored. Technical enhancements to FRIS are required to enable easier extraction of mark-selective fishery regulations The development of new technical tools to export the data will aid in the estimation of recreational catch by stock in Mark Selective Fisheries (MSF).
    - The results of the Project, the development of queries to export recreational regulations in FRIS, will support MSF and the sustainable management of the recreational fishery. Additionally, this work will increase efficiency, reduce error and improve recreational catch estimates, including estimates used to meet Canada's international treaty requirements.
    - Progress to date:
        i. Coat-sharing agreement near completion
        ii. Consultants are lined up and ready to complete the work

2. **Milestones and Timeline**
    - The project is behind schedule as financial documentation has not yet been complete. Documentation is drafted and going through approval processes.
    - FRIS contractors have been briefed on the project and are ready to complete the work in Jan to March 2025.
    - Target completion date: March 31, 2025

3. **Key area of work**
    - The objective of the project is the development of queries and export tools on recreational management measures/regulations entered in DFO's Fishery Regulations Information System (FRIS). FRIS is the database where all BC tidal waters recreational fishing regulations are stored. Technical enhancements to FRIS are required to enable easier extraction of mark-selective fishery regulations The development of new

technical tools to export the data will aid in the estimation of recreational catch by stock in Mark Selective Fisheries (MSF).

- The results of the Project, the development of queries to export recreational regulations in FRIS, will support MSF and the sustainable management of the recreational fishery. Additionally, this work will increase efficiency, reduce error and improve recreational catch estimates, including estimates used to meet Canada's international treaty requirements
- The scope of the work has been assessed and technical enhancements to the FRIS system will be completed in the Winter of 2025 to streamline the exportation of MSF fishery regulations.

## 4. Challenges and resolutions

- There has been challenges determining the required administrative and financial documentation required to facilitate this work.
- The cost-sharing agreement has been completed in Dec 2024, and will require final approval signatures.
- The technical work should not be overly complicated and will be conducted from January to March 2025.

## 5. Next Steps

- Technical enhancements to FRIS conducted from January to March 2025
- Target completion date: March 31, 2025

# Mark Selective Fishery Fund
# Project Progress Report

| | |
|---|---|
| Project Title: | **MSF-23-03 - Implementing a Canadian "Node" in the DIT Network Recommended in the CYER WG: Double Index Tagging and Escapement Recovery of Big Qualicum Chinook as an Audit of the CYER Analytical Methods being Implemented by the CTC** |
| Period covered: | **Year 1: March-May 2024** |
| Name of Organization / Affiliation: | Department of Fisheries and Oceans Canada |
| Principal Investigator / Project Lead: | Laura Tessier, Rob Houtman, and Norah Brown |

## 1. Summary/status of project

Project Overview

The Pacific Salmon Treaty (PST) uses indicator stocks to monitor naturally-spawning Chinook salmon escapement to meet management objectives and ISBM fishery limits according to Annex IV, Chapter 3, Attachment I of the 2019 Pacific Salmon Treaty. With the addition of mass marking and mark-selective fishing (MSF), the underlying assumption that a CWT indicator stock of hatchery-origin fish accurately represents the fishery impacts on the escapement indicator stocks is no longer valid. To address this, the CYER WG recommended that estimation of Calendar Year Exploitation Rates (CYERs) employ a single index tag (SIT) method in their analysis (Recommendation 2.1, PSC Tech. Rep. No. 50, 2023).

While the SIT method was recommended by the CYER WG after a thorough investigation, it is important that any method being applied in fisheries is validated utilizing real-world data. To ensure an accurate estimation of MSF impacts, implementing a DIT Indicator Network will allow for an ongoing assessment of the performance of the SIT method. The DIT Indicator Network will provide a direct observation of tag recoveries which can be used to calculate total (rather than fishery specific) ERs to assess the accuracy of the estimates provided by the SIT method. Should the assessment demonstrate biases within the estimates, this will allow us to determine where they are occurring and make the necessary corrections to provide the best possible estimates.

Therefore, this project will implement the first Canadian Chinook DIT indicator stock which will allow for an assessment of the accuracy of the CYER estimates developed using the adopted SIT methods for southern BC Chinook stocks impacted by MSFs. The stock selected to represent the DIT Indicator Network is Big Qualicum River, which meets several of the criteria specified in Recommendation 3.2 of PSC Tech. Rep. No. 50, 2023. This also provides an opportunity for enhanced monitoring of salmon stocks as the data collected from this program will be used to improve and validate the assumption that a CWT Indicator stock represents a naturally-spawning Chinook salmon stock. Enhanced monitoring is essential to achieve accurate assessments of productivity and status of Chinook salmon stocks, particularly for vulnerable populations. Additionally, enhanced monitoring of MSFs is currently an initiative being pursued domestically to ensure salmon stocks are not negatively impacted by the implementation of MSFs.

Progress to date

The hatchery tagged and released an unmarked group of fish (200k) in the spring of 2024, which is the same number of releases as the regular marked CTW release group. The hatchery implemented new practices to avoid confounding variables during release, and to ensure that both the unmarked and marked CWT release groups were as identical as possible with the exception of mark status. A tag loss study was conducted to determine the retention rate of the tags that were applied to both the marked and unmarked CWTd fish.

We are currently in the process of ordering the additional materials required to tag the next cohort of fish which will be released in the spring of 2025. Additionally, we will be ordering the remaining equipment that will be required to begin escapement sampling in the fall of 2026.

Goals achieved

- Tagging and release of the first cohort of Chinook for the DIT stock
- Funding approved and received at CDFO: equipment can now be ordered
- Additional funding to continue releasing and sampling this stock has been secured until 2029

## 2. Milestones and Timeline

*Table 1: Timeline and status of the project "Implementing a Canadian "Node" in the DIT Network Recommended in the CYER WG: Double Index Tagging and Escapement Recovery of Big Qualicum Chinook as an Audit of the CYER Analytical Methods being Implemented by the CTC". Green shaded cells indicate a milestone has been achieved, yellow shaded cells indicate a milestone is pending completion, and red shaded cells indicate a delay or issue with achievement of the milestone.*

| Date | Milestone | Status |
|---|---|---|
| Spring 2024 | Hatchery releases an unmarked, CWT group of 200k Chinook (same size and age as regular marked CWT release group). | Complete |
| Dec 2024 | Submit Progress Summary Report on 2024 project activities. | Pending |
| Spring 2025 | Hatchery releases an unmarked, coded wire tagged group of 200k Chinook (same size and age as regular marked CWT release group). | |
| Dec 2025 | Submit Progress Summary Report on 2025 project activities. | |
| Spring 2026 | Hatchery releases an unmarked, coded wire tagged group of 200k Chinook (same size and age as regular marked CWT release group). | |
| Fall 2026 | PBS staff sample returns of unmarked CWT fish. | |
| Dec 2026 | Submit Progress Summary Report on 2026 project activities. | |
| 2026/27 | Preliminary analyses to audit SIT method, based only on one year of 3-year-old returns. | |
| Feb 2027 | Submit Final Project Report and Full Accounting of Financial Expenditures for 2024 – 2026 MSF Fund Project | |
| Spring 2027 | Tagging of the fourth cohort of fish and escapement recovery of previous cohorts. | |
| Dec 2027 | Progress report and interim financial statement to the PSC on 2027 activities. | |
| Spring 2028 | Tagging of the next cohort of fish and escapement recovery of previous cohorts. | |
| Dec 2028 | Progress report and interim financial statement to the PSC on 2028 activities. | |
| Spring 2029 | Tagging of the next cohort of fish and escapement recovery of previous cohorts. | |
| Dec 2029 | Progress report to the PSC on all 2029 activities | |
| Feb 2030 | Final report and financial statement to the PSC on the Project including preliminary analysis of two complete recovery cycles on the accuracy of the SIT method for evaluating MSF impacts. | |
| Feb 2030 | Final Payment/Holdback | |

### 3. Key area of work

The first objective to tag and release 200k unmarked Chinook (the same number of marked Chinook) has been completed in the spring of 2024. This cohort has been released to represent the DIT pair of regularly marked and CWTd ER release group. The fish were tagged using an automatic tagging trailer, and data was collected for potential tag loss.

Additional tags for the upcoming year are currently being ordered, as well as the equipment required for escapement sampling (R9500, gate and counter, T-wand etc.). Escapement sampling is anticipated to begin with age-3 returns which will be fall of 2026. Therefore, at this point there are no interim results to report.

### 4. Challenges and resolutions

The project initially encountered an issue with the ability for CDFO to receive funds from PSC for the purchase of CWTs for the first cohort of fish. However, we were able to work within the Department to cover the invoice for 2024, and the account has now been generated. We do not anticipate further delays or issues with the purchasing of equipment or receiving funds.

There were limitations with the availability of containers at the BQR hatchery which affected the number of fish that were retained after tagging to measure rates of tag loss. While the goal was to retain 2000 fish total, due to tank renovations all fish had to be retained together for the 30 day holding period to measure tag loss. In the production AdCWT/Late Release fish group, 606/606 retained their tags, leading to a 100% tag retention rate. For the production CWT only group, one fish out of 515 lost their rag, resulting in a 99.8% tag retention rate. It is anticipated that similar tub restrictions will occur in 2025, which will lead to less than 2000 fish retained. However, due to automatic tagging trailers and other upgraded equipment, it is not anticipated that tag loss will be a major issue and the smaller sample size for tag retention should not impact the results of this project.

At this point there are no other risks identified that would prevent the project from being completed.

### 5. Next Steps

The project is on schedule and on budget with no delays expected. The scope of the project remains unchanged from the initial proposal, with the majority of work still to be completed as this project is in early stages. Preliminary analysis will not occur until escapement sampling is initiated in the fall of 2026.

# Mark Selective Fishery Fund
# Project Progress Report

| | |
|---|---|
| Project Title: | Sarita River Chinook Mark Selective Fishery Pilot, 2024 - 2025 |
| Period covered: | *August 1, 2024 to November 30th 2024* |
| Name of Organization / Affiliation: | Huu-ay-aht First Nations |
| Principal Investigator / Project Lead: | Amelia Vos (HFN) / Robert Bocking (LGL) |

This report covers the 2024 Sarita River Chinook brood stock and Numukamis Bay Terminal Fishery biological sample collection.

## 1. Summary/status of project

2024 Brood Year

Returns to Sarita River were expected from BY2018 (Age 6) through to BY2023 (Jimmies) (see Table 1). BY2017 had 39.1% of the fish released clipped and CWT with remainder being unmarked. BY2018 and BY2020 was 100% marked with 66% of those fish being CWT'd. Unfortunately, due to COVID restraints, only the Larges were tagged and clipped for BY2019. For BY2021 and BY2022, 100% of the fish were fin clipped with 48.8% and 47.3% respectively being CWT'd. CWT codes expected for these returns are noted below in Table 2.

**Table 1.** Summary of releases and mark rate for Sarita Chinook anticipated to return in 2024.

| Brood Year | Total Released | AD/CWT | AD Only | Unmarked | % AD/CWT | % AD | % Unmarked | Age @ RY24 |
|---|---|---|---|---|---|---|---|---|
| 2018 | 304,165 | 199,916 | 104,249 | 0 | 65.7% | 100.0% | 0.0% | 6 |
| 2019 | 489,499 | 98,713 | 95,435 | 295,351 | 20.2% | 39.7% | 60.3% | 5 |
| 2020 | 292,674 | 195,717 | 96,957 | 0 | 66.9% | 100.0% | 0.0% | 4 |
| 2021 | 409,991 | 200,096 | 209,955 | 0 | 48.8% | 100.0% | 0.0% | 3 |
| 2022 | 440,831 | 208,667 | 232,164 | 0 | 47.3% | 100.0% | 0.0% | Jack |
| 2023 | 581,598 | 192,874 | 388,724 | 0 | 33.2% | 100.0% | 0.0% | Jimmies |

## 1. Summary of Biological Sampling in the 2024 Broodstock and MS Fishery Sampling

Both staff from NRH and HFN conducted beach together seines at Sarita River in 2024. HFN was primarily focused on collecting surplus fish (primarily marked male) for harvest while NRH was focused on collecting fish for broodstock (primarily unmarked males and females). Additionally, any unmarked or marked fish not selected for broodstock or harvest purposes were released after being counted, sex and operculum punched. Due to September drought conditions, collection sites were limited to the lower reaches of Hunter Creek, Cable Car Pool, and Corder Pool for both broodstock and harvest collection efforts.

HFN MS Fishery occurred on Sarita River in conjunction with brood stock collection between September 2nd and September 19th, 2024Sampling details for the HFN MS fishery, broodstock and releases are noted below in the sampling summary section. HFN also conducted dead pitch sampling of 67 adult Chinook.

River swims along with the data from the removals provided a preliminary estimated escapement of **3,502 adult salmon.**

**Sampling Overview**

Fish with an AD clip, were scanned with a T wand. Any fish identified as having a CWT (pin detected) was measured for length and had the head removed and sent to the ageing lab. Fish with adipose present ( naturals) were samples every 5th fish for length, scales, otoliths and PBT. Any fish with an AD clip but not identified as having a CWT (pin not detected) was identified as No Pin. Fish were also checked for the presence of an operculum punch. Any fish that were operculum punch were removed from the release data to avoid duplicate counting.

As noted above, HFN conducted the MS Fishery on marked males. Every fish was sampled for sex, length, presence or absence of fin clip and presence or absence of CWT for fin clipped fish and PBT. Additionally, every 5th fish (both with CWT and no CWT) was sampled for scales and otoliths.

Fish released back to Sarita were counted, sexed, and identified for presence/absence of fin clip. Fish were not scanned for the presence or absence of CWT pin. All fish released were given an operculum hole punch to identify as already counted if caught a second time. Operculum punches were collected in bulk (not identified to particular sex or clip) for DNA analysis. If a fish with an operculum punch was caught a second time, they were counted as recaptures by sex and clip. No additional operculum punch was given to avoid duplication of DNA analysis.

Fish collected in the dead pitch were counted by sex and clip and sampled for otoliths, scales (where possible), heads (for those with CWT) and a fin clip or heart tissue for DNA testing.

## 2. Brief project overview

Funding support for ongoing mass marking of hatchery produced Sarita River Chinook salmon This work is part of a joint pilot effort by HFN and DFO to increase returns of Chinook salmon to the Sarita River by improving survivability under optimum rearing strategies at the Nitinat Hatchery (New and Brouwer, 2015), enhancing habitat for natural spawners, increasing the proportionate natural influence (PNI) over time to maintain a viable natural spawning population, and to facilitate mark selective fisheries in terminal areas in the future. This project will make a significant contribution to our understanding of how mark-selective fisheries might be implemented and enhanced through collaborative efforts by DFO and a BC First Nation. The results of this research will have applicability to other salmon populations in the Pacific Northwest.

## 3. Progress and Goals Achieved

- 1. Research completed to evaluate different rearing strategies that will improve survival, size and age at return to fisheries and escapement.
- 2. Predominantly natural-origin broodstock used for hatchery production;
- 3. Successful strategies utilized to increase natural influence (PNI) for Chinook returning to the Sarita River. Examples: natural origin brood stock, marked males removed for harvest, sampling protocols support PNI research goals
- 4. Collaboration between hatchery production and habitat restoration in HFN Watershed Renewal Program.
- 5. 3 years of successful sustainable mark selective fishery on Sarita Chinook salmon, indigenous led fishery benefiting HFN citizens.

## 4. Milestones and Timeline

The project schedule continues to be met and the target of successfully marking the releases from the 2022-2024 brood years has been met.

## 5. Key area of work

- Please see above

## 6. Challenges and resolutions

- The project has not encountered any issues or roadblocks and there are no risks to the project being completed other than a complete collapse of returning adult Chinook. However, the 2024 return was very good and broodstock was once again successful setting the stage for the final 100% marking under this funding arrangement of the 2025 brood.

## 7. Next Steps

- Yes, the project on schedule and budget.
- No delays are expected.
- There has been no change in the scope of the project.
- The project is 75% complete with one season of marking still to be completed.
- Scope changed with addition of marking 2024 Sarita Chinook

# Mark Selective Fishery Fund
# Project Interim Report

| | |
|---|---|
| Project Title: | Mass marking of hatchery produced Conuma River and Gold River Chinook salmon and development of a complementary reference fishery in PFMA 25 (Nootka Sound and Esperanza Inlet) MSF-23-05 |
| Period covered: | Jan 1, 2024, to Dec 5, 2024 |
| Name of Organization / Affiliation: | Fisheries and Oceans Canada |
| Principal Investigator / Project Lead: | Pieter Van Will/Erin Rechisky |

## 1. Summary/status of project

### a. Mass Marking of Conuma and Gold Brood Year 2023

The focus of this section is to provide an update on the mass marking component of this project through the spring of 2024. The initial proposal was to 100% mass mark, via adipose clip, the entire production of Chinook from the Conuma (up to 3 million) and Burman (up to 300 thousand) Rivers. Upon a closer review, after the proposal was submitted, an evaluation of the contribution of strays in the escapement into the Burman River increased our concern regarding the trajectory and rate of loss of native Burman ancestry. It was determined and agreed to by both the PI and the MSF Fund Committee that a shift from mass marking the Burman stock to the Gold River Stock (near the Burman) was a prudent modification to the program. This pivot in the approach to the Burman stock will help to prevent complete loss of native population genetics. The revised plan was to attempt to mark 100% of the Conuma (~540 thousand), Gold and Robertson Creek Chinook which are the populations that comprise 98% of Burman stray-ins (2012-2022). In the future, this will allow for the near 100% exclusion of strays in our brood collection for Burman stock in future years while supporting a higher contribution of mass marked Chinook returns to Area 25. This plan to aggressively reverse introgression by maximally reducing the stray abundance and maximally increasing high ancestry Burman Chinook on the spawning grounds will require continued mass marking of Conuma, Gold and Robertson Chinook. Mass marking Robertson Creek Chinook was not included in this proposal.

### b. Chinook Reference Fishery 2024

Mark-selective fisheries (MSFs) have been developed as a management strategy to shift exploitation towards hatchery-origin Chinook while reducing impacts on natural-origin stocks. A MSF has been proposed for Pacific Fishery Management Area 25 (Nootka Sound and Esperanza Inlet; Figure 1) and this PSC-funded Chinook reference fishery project will be used in DFO's consultations with First Nations and stakeholders to help inform decision making.

In 2024, all 3- and 4-year-old Chinook from Conuma and Burman hatcheries were 100% hatchery-marked. These hatchery-origin stocks were expected to make up a considerable proportion of the stock composition of Chinook intercepted by the recreational fishery in Nootka Sound and Esperanza Inlet (Area 25) during July and August. To evaluate the potential of a MSF in Area 25, sampling occurred during 42 boat days conducted during those months. The reference fishery methods emulated typical recreational fishing trips targeting Chinook salmon. Professional fishing guides were contracted to maximize catch per unit effort, as the objective was to assess the composition of the fish vulnerable to the fishery rather than to evaluate effort. All fish caught during the reference fishery were released, with only Chinook brought on board for biological sampling. For each Chinook captured, data recorded included catch location, time to landing, fork length, adipose fin clip status, and a tissue sample for genetic stock identification.


*Figure 1. Pacific Fishery Management Area (PFMA) 25 includes Esperanza Inlet and Nootka Sound. Conuma River (thick blue line) and the Burman River (thick orange line). Conuma Hatchery is located on the Conuma River. Gold River is not shown but is near the Burman River just north of PFMA sub-area 25-1.*

## 2. Milestones and Timeline

### a. Mass Marking of Conuma and Gold Brood Year 2023

The main objective for this component of the project was to 100% mass mark the Conuma and Gold River Chinook production to support the development of mark selective fisheries and selective removals in Area 25 which was completed in spring 2024.

### b. Chinook Reference Fishery 2024

Year 1 of 3 of the project is on schedule. From the 2024 sampling season, mark rates are reported, and genetic stock identification (GSI) results are still pending. The 2025 and 2026 reference fisheries are planned to proceed at the same capacity as in 2024. Further analysis, including comparisons between DFO catch monitoring (creel) data and reference fishery data, is either ongoing or pending GSI results.

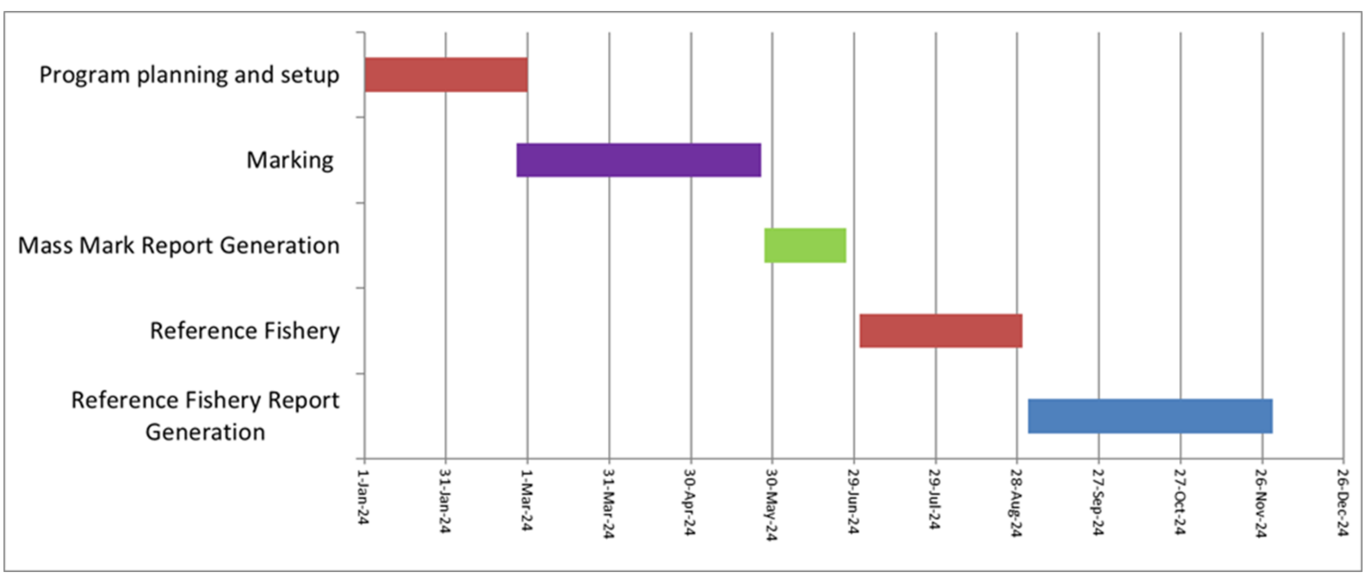



*Figure 2. Project timeline for 2024.*

**3. Key area of work**

**a) Mass Marking of Conuma and Gold BY2024**

The objective associated with 100% marking of brood year 2023 Conuma and Gold River Chinook was achieved (

*Table 1*). A total of 3,243,821 Chinook were manually mass marked during this period.

*Table 1. Brood year releases and marking (clipped, i.e., removal of the adipose fin) of hatchery produced Conuma and Gold Chinook stocks (2018-2023).*

| Release site | Brood Year | Brood year release Information | | | |
|---|---|---|---|---|---|
| | | Not marked | # Clipped | Total Released | % Marked |
| Burman | 2018 | 0 | 78,396 | 78,396 | 100% |
| | 2019 | 0 | 65,003 | 65,003 | 100% |
| | 2020 | 0 | 167,404 | 167,404 | 100% |
| | 2021 | 0 | 285,481 | 285,481 | 100% |
| | 2022 | 0 | 269,934 | 269,934 | 100% |
| | 2023 | 279,229 | 0 | | 0% |
| **Gold** | **2023** | **0** | **538,933** | **538,933** | **100%** |
| **Conuma** | 2018 | 3,103,617 | 0 | 3,103,617 | 0% |
| | 2019 | 2,487,604 | 763,203 | 3,250,807 | 23% |
| | 2020 | 0 | 2,866,468 | 2,866,468 | 100% |
| | 2021 | 0 | 2,775,426 | 2,775,426 | 100% |
| | 2022 | 0 | 2,994,415 | 2,994,415 | 100% |
| | **2023** | **0** | **2,704,888** | **2,704,888** | **100%** |

**b) Reference Fishery 2024**

The objective of the Chinook reference fishery was to independently verify Chinook salmon catch estimates focusing on the proportion of Chinook caught by size class, mark rate (proportion of hatchery-marked Chinook) and stock composition.

A total of 323 Chinook were sampled: 215 legal-sized Chinook (≥ 45 cm), 108 sub-legal Chinook (< 45 cm). The mark rate for legal Chinook for all areas was 36% (40% in July, 31% in August). The mark rate for legal Chinook in Nootka Sound was 39% overall (42% in July, 23% in August) and in Esperanza Inlet mark rate was 36% overall (39% in July, 33% in August). Mark rates were much lower than anticipated.

Genetic Stock Identification (GSI) results are anticipated in spring 2025. Ongoing work includes comparing mark rates and size class ratios between DFO catch monitoring (creel) data and reference fishery data, expected in 2025.

**4. Challenges and resolutions**

**a. Mass Marking of Conuma and Gold BY2024**

The only issues encountered during this project was the shift from mass marking the Burman Chinook stock to the Gold River Chinook. Strong rationale for that shift was provided and the fund committee supported the change in the project. This portion of the project is complete.

**b. Chinook Reference Fishery 2024**

One of the challenges in 2024 involved contracting charter vessels and guides. Due to last-minute changes by an external organization, there was some uncertainty in securing the necessary resources; however, the full schedule of sampling was ultimately completed as intended. To mitigate this issue in 2025, the contracting process will begin roughly six months earlier than in 2024 to ensure timely arrangements and avoid similar disruptions. No significant risks have been identified at this stage, as the adjustments in contracting timelines should help ensure smoother operations moving forward.

## 5. Next Steps

**a. Mass Marking of Conuma and Gold BY2024**

Project was on schedule and on budget, this portion of the project is complete.

**b. Reference Fishery 2025**

The project is on schedule and within budget as it moves into the 2025 sampling season. The only anticipated delay relates to the availability of GSI results from the DFO genetics lab, but this was expected. This delay will not impact the operation of the program, but it will affect the timing of reporting and analysis. Two-thirds of the project remains to be completed, as two of the three field seasons are still to occur (July and August of 2025 and 2026). Consequently, the majority of results reporting, and analysis are yet to be completed.

# Standing Committee for Scientific Cooperation

Meeting of the Bilateral Commission
February 13, 2025

# Overview of proposed 2025-26 CSC workplan

1. Current assignments and progress to date
2. Proposed 2025/26 CSC activities

# Current assignments

1. Environmental change and the PST
2. Standards for genetic analysis of sockeye intercepted in Alaska District 104 Purse Seine Fisheries
3. PSC Pacific Salmon run-size Shiny application

# Current assignments and progress to date:

1. Environmental change and the PST
   - CSC’s principle, multi-year assignment
   - Phase one (2021-2023): document responsiveness of current PST assessment and management framework to environmental change
   - Phase two (2024-2026): dedicated forum for facilitated discussions and technical training on opportunities to strengthen robustness of PST frameworks to environmental change
   - This year (2024/25):
     - Climate Resilient Fisheries Management and the PST (November 2024 - virtual workshop)
     - Accounting for Changes in Salmon Dynamics when Providing Management Advice (January - in-person seminar and panel discussion)
     - Introduction to Scenario Planning (May - virtual workshop)

# Current assignments and progress to date:

1. Environmental change and the PST
2. Standards for genetic analysis of sockeye intercepted in Alaska District 104 Purse Seine Fisheries
   - Tasked with participating in the ad-hoc GSI working group (PIPWOG) meetings in fall 2024 to observe discussions and stay briefed on developments, received correspondence from the working group as it plans next steps/workshops, updated the CSC Liaison Group and commissioner at January 2025 post season meeting

# Current assignments and progress to date:

1. Environmental change and the PST
2. Standards for genetic analysis of sockeye intercepted in Alaska District 104 Purse Seine Fisheries
3. PSC Pacific Salmon run-size Shiny application
    - Supported PSC secretariat in presenting plan to Commissioners (fall 2024) for addressing application development and general data management and sharing issues
    - Provided project oversight and supported chapter-specific review and approval of the data and documentation by relevant Technical Committees (underway).
    - Internal beta version of the application: Pacific Salmon Run Size App

# Proposed 2025/26 CSC activities

1. **Environmental change and the PST**: Continued support of joint CSC-ESSA Technologies project on *Improving Robustness of PSC Frameworks to Environmental Change and Variability** :
    - Year two project recap and lessons learned to date (Summer 2025 - written briefing for commissioners)
    - Accounting for demographic change in assessment and management (Fall 2025 - virtual workshop)
    - Technical tools to confront time varying dynamics in assessments and management advice (Winter 2025 - in-person technical training workshop)
    - Scenario Planning to confront climate change under the PST (Spring 2026 - virtual workshop)
    - Begin development of final project "synthesis and insights" report to be delivered in 2026-27

* contingent on continued SEF support and CSC involvement in project dependent on commissioner support after delivery of year 2 written briefing in Summer 2025

# Proposed 2025/26 CSC activities

2. **Standards for genetic analysis of salmon intercepted in PST fisheries**:
   - track PIPWOG activities,
   - provide input on workshops as they are developed and delivered (e.g., objectives, outputs, recommendations, etc.),
   - seek opportunities to strengthen scientific cooperation among parties with respect to the use of GSI, and
   - report back to the CSC Liaison Group and commissioners as requested (e.g., at fall 2025 Commissioner meeting after workshop 1 seeking support for workshop 2)

| | |
|---|---|
| **Workshop 1**: Standards for using GSI to estimate Fraser sockeye catch in D104 | **Workshop 2**: Guidance and standards for the use of GSI data to support PST assessment and management |

# Proposed 2025/26 CSC activities

3. **PSC Pacific Salmon run-size Shiny application**
    - continue providing oversight, publishing of app, and working with secretariat to ensure sign-off from the different panels/committees.
    - expected to publish the Shiny app on the PSC website in June 2025, covering those PST chapters that have received sign-off by the relevant panels/committees, while chapters that are still undergoing review at that time, will be added later after sign-off has been obtained.

# Update on recent CSC-PIPWoG engagement and District 104 GSI workshop planning

**CSC and PIPWoG met virtually February 4th**

- workshop planning is underway, CSC has provided some initial input and is also working to finalize ToR
- PIPWOG is seeking external facilitation for workshop (late April)
- PIPWOG clarified desired role of CSC role (largely consistent with CSC workplan):
  - providing input into workshops (e.g., scope, format, attendees, etc.)
  - participating in workshop
  - reviewing report and recommendations that come from workshop
  - support disseminating outcomes/recommendations from workshop and a potential cross-chapter survey to determine needs/value in a second workshop
  - joining CSC when reporting back to commissioners on results and recommendation from workshop

# The CSC is seeking:

1. Feedback on proposed 2025/26 CSC activities
2. Commissioner approval of the 2025/26 CSC workplan

# extra

# **About:** Standing Committee on Scientific Cooperation

- Helps Commission advance scientific agenda by identifying emerging issues for new / additional research and presenting scientific information to the Commission
- Monitors Commission's progress in assisting the Parties to enhance cooperation and consultation on science pertinent to the Treaty
- Provides support to PSC technical committees upon the request of the Commission or the committees

- made up of 2 Canadian and 2 U.S. representatives:
    - Canada: Brendan Connors, Cam Freshwater
    - USA: John Carlile, Brian Beckman
    - PSC Executive Secretary and Science Director are ex officio members
- Guided by CSC liaison group:
    - Canada: Andy Thomson and Sue Farlinger
    - USA: Bill Auger and Rick Klumph

**PACIFIC SALMON COMMISSION WORK PLAN 2025-2026**

**Panel / Committee:** Standing Committee on Scientific Cooperation (CSC)

**Date:** February 10, 2025

**Update on CSC Work Plan For This Cycle:**

**Background**

In February 2020, the Commission approved a revision to the way the CSC develops its annual workplan which resulted in drafting it in consultation with a bilateral Liaison Group consisting of four commissioners (two from each of the parties) and participation by senior Secretariat staff. The workplan is to be completed each year by the close of the Pacific Salmon Commission (PSC) February annual meeting. This revised process has been used to develop the CSC's workplans since 2021/22 and will continue to be the template for CSC workplans moving forward.

**Current Assignments**

1. Environmental change and the PST. The Commission authorized the CSC to work on environmental change and its ramifications for management and assessment of salmon stocks covered under the PST in 2020. This assignment grew, in part, out of entries in the 2019, 2020, 2021 and 2022 Chinook Technical Committee (CTC) and Southern Panel's Work Plans that included actions for consideration by the CSC regarding this topic.
2. PSC Pacific Salmon Run Size Shiny App. Starting in 2023/24 the commission authorized the CSC to support secretariat staff in the development and publication of a Shiny App that summarizes historical datasets on run size and harvest across PST chapters, following sign off from the different panels/committees. The CSC's primary role in this effort is to provide oversight of the project and ensure sign-off from the different panels/committees prior to publication.
3. Standards for genetic analysis of sockeye intercepted in Alaska District 104 Purse Seine Fisheries. At the 2024 fall meeting commissioners instructed the CSC to participate in the ad-hoc GSI working group meetings to observe discussions and stay briefed on developments, receive correspondence from the working group as it plans next steps, provide guidance when requested, update the CSC Liaison Group ahead of the January 2025 meeting, and report out to commissioners as appropriate.

**Progress to Date**

1. Environmental change and the PST.

The CSC's multi-year, cross-PSC, assignment to work on environmental change and its ramifications for management and assessment of salmon stocks covered under the PST has advanced in two phases. The first phase of work consisted of documenting the extent to which the assessment and management frameworks of the PST account for, and are responsive to, uncertainties and impacts posed by the changing environments to which salmon are exposed. This work was presented to the Commission at the 2023 Annual Meeting and published as a PSC special report in May of 2023[1].

The second phase of the CSC's assignment has focused on initiating, and providing a dedicated forum for, facilitated discussions across the PSC community about whether PST assessment and management frameworks can be made more robust to environmental change. This phase of the CSC's assignment has been supported by the Southern Endowment Fund and an external consulting firm, ESSA Technologies, who have contributed to project design and provided technical facilitation.

In year one of phase two (2023/24) of the project the CSC and ESSA held a series of virtual workshops and engagement meetings with PSC panels and technical committees to solicit input on a proposed series of workshops for Year 2.

Based on the input received from PSC panels and technical committees, and as approved by the CSC's Liaison Group, Year 2 (2024/25) focused first on a project "outreach meeting" to share reflections on the feedback received and outline the project plan and workshops for Year 2. Participants in this virtual meeting included 48 PSC members across most Panels and Technical Committees, as well as several Commissioners. Following the outreach meeting the CSC and ESSA have hosted two Year 2 workshops.

1. **Climate Resilient Fisheries Management and the Pacific Salmon Treaty** (virtual, November 2024): This workshop was held in response to a request from the PSC community for opportunity to reflect on key characteristics of climate resilient fisheries management systems and their relevance to salmon management and PST contexts. The workshop was supported by a background document that detailed characteristics of climate resilient assessment and management frameworks, and examples of their application in salmon and other fishery contexts. Approximately 60 people from across the PSC participated in the workshop, and all materials (including presentation, background document and summary of break-out group discussion) were subsequently made available to the PSC on the Sharepoint website.
2. **Accounting for Changes in Salmon Dynamics when Providing Management Advice (hybrid, January 2025):** This hybrid seminar and panel discussion was held at the 2025 Post-Season PSC meeting and provided an overview of what is meant by "time-varying dynamics", how common they are among Pacific Salmon stocks, aspects of assessment and management that can be impacted, and some emerging "good" practices. The seminar portion of the workshop leveraged a recent multi-agency and institution project focused on developing guidance around when, where, and how to account for time-varying dynamics in Pacific salmon science advice. Over 100 people from across the PSC participated in the workshop, and all materials (including presentation, background reading and summary of discussion) will be made available to all of the PSC on the SharePoint website. Post workshop feedback from 34 participants scored it 6.4, 8.2 and 6.8 in terms of the level of benefit, organization and level

[1] Standing Committee on Scientific Cooperation. 2023. Assessment and management frameworks of the Pacific Salmon treaty and their robustness to environmental change. Pacific Salmon Commission, Vancouver, BC.

of enjoyment respectively with 10 indicating high and 0 indicating low levels. The level of technical detail was scored 5.7, which was neither too detailed (0) nor too general (10).

A final virtual workshop is in development for the spring of 2025 (under Year 2 of the Southern Endowment funded project). This workshop will likely focus on an introduction to Scenario Planning, a topic that has been identified multiple times in past CSC workshops as an area of broad interest to the PSC community. Scenario Planning is an approach for evaluating the implications of future climate scenarios on fisheries. In this context scenarios focus on exploring ‘what could happen’ as an alternative to deterministic forecasts of the future that should or will happen and describe how different combinations of driving factors (e.g., climate, species abundance, fisheries industry trends, access to capital, etc.) contribute to different outcomes (e.g., status quo, greater abundance but less access, etc.). Scenario-based participatory engagement can help to deal with uncertainty at multiple scales, and can help groups collaboratively think through uncertainties about the future, and decide on strategic directions for specific outcomes or robust to a variety of outcomes. Scenario planning also presents opportunities for capacity building and social learning about participant perspectives and preferences that can inform management strategies.

2. PSC Pacific Salmon Run Size Shiny App.

At the October 2024 fall commissioner’s meeting the CSC supported the PSC secretariat in presenting a proposed plan for addressing ShinyApp development and general data management and sharing issues. Commissioners subsequently approved moving forward with the development and eventual publication of the Pacific Salmon Run Size Shiny App. The application aims to improve accessibility to data curated by the PSC. It visualizes information on run size, escapement, harvest, and exploitation rate for each salmon species and region in the Pacific Salmon Treaty. The CSC has provided oversight of the project and chapter-specific review and approval of the data and documentation by relevant Technical Committees is currently underway. An internal beta version of the application is available here: Pacific Salmon Run Size App.

3. Standards for genetic analysis of sockeye intercepted in Alaska District 104 Purse Seine Fishery.

Sockeye salmon from the Fraser River are incidentally harvested in the SEAK District 104 (D104) purse seine fishery, which targets pink salmon. Information and samples from fisheries outside the Fraser Area are provided to the Fraser River Panel each year for complete catch accounting and stock composition analyses, including samples from D104.

In April 2024 ADF&G expressed concerns about the way the D104 genetic samples were being analyzed and communicated in a letter to the PSC. In response, an ad-hoc workgroup was formed to address the concerns raised in the ADF&G letter, and specifically to “sort out the history, analytical approaches, and any next steps needed, including the potential of developing certain protocols that might be suggested to the Commission”. The workgroup consisted of staff from the DFO, ADF&G, and NOAA genetics labs, PSC staff and the chairs of the Fraser River and Northern Boundary technical committees. The workgroup met to discuss the issues raised, devised interim solutions to allow genetic analyses to resume, and made several recommendations for moving toward long-term solutions. These recommendations included a request for Commission support for an in-person workshop to develop agreements on fundamental issues, standards, and technical understanding of application and interpretation of GSI within the PSC. The US State Department allocated ~150k USD to support this effort and at the 2024 fall meeting commissioners instructed the CSC to participate in the ad-hoc GSI working group meetings to observe discussions and stay briefed on developments, receive correspondence from the working group as it plans next steps, update the CSC Liaison Group ahead of the January 2025 meeting, and report out to Commissioners as appropriate.

In November 2024, the CSC met with the ad-hoc working group (now named the Planning Inter-Panel Workshop on GSI [PIPWOG]) to receive an update on their activities and workshop planning. Two workshops have been proposed. The first workshop, proposed for April 2025, is focused on development of shared standards/guidelines for the collection, analysis, and reporting of Fraser River sockeye salmon intercepted in the District 104 fisheries based on fishery samples and genetic stock composition analyses. The second workshop, which is much earlier in the planning stages, is proposed to focus on development of "Good" practices for the analysis and use of GSI data to support assessment and management across the PST.

The CSC briefed the commission on PIPWoG planning and activities at the 2025 post-season meetings and commissioners approved the plan to host the first workshop and requested the CSC provide an update to the commission on the first workshop and plans for the second one at the fall 2025 meeting. The commissioners re-affirmed their instructions to the CSC to continue to track PIPWoG activities, provide input on opportunities to strengthen scientific cooperation with respect to GSI across PSC, participate in workshops, and report back to CSC Liaison Group and commissioners as requested.

**<u>Proposed 2025-26 activities:</u>**

<u>Environmental change and the PST.</u>

Year 3 of the CSC-ESSA project aims to further advance the mandate the commissioners gave the CSC to provide a dedicated forum for facilitated discussions across the PSC community about opportunities to strengthen robustness of PST assessment and management frameworks to environmental change. Specifically, the CSC proposes to engage PSC community members in several independent workshops that cover topics that emerged as recommendations for further exploration through engagement with PSC members in Year 1 and 2 and explicitly build upon thematic workshops held in Year 2. Year 3 also aims to leverage strategic collaboration with the PSC Seminar Series Committee for mutual benefit of the two adjacent processes. Furthermore, Year 3 will include initial planning and development of the end-of-project synthesis reporting in Year 4 to communicate the learnings and insights from the project back to the PSC community. This proposed approach for Year 3 is comprised of five main components and summarized in Table 1.

*Table 1. Main elements and activities for Year 3 of CSC-ESSA project "Managing through uncertainty: improving robustness of PSC frameworks to environmental change and variability".*

| # | Type | Topic | Delivery | Potential. Timing* |
|---|---|---|---|---|
| **1** | Conceptual / Technical | **<u>Workshop 1:</u> Demographic Changes (Technical Concept Workshop) –** This introductory workshop (seminar and discussion) will be intended for a general audience and will be focused on presenting evidence of demographic changes, exploring potential mechanisms underlying these shifts, and identifying emerging approaches for more explicitly accounting for demographic change in assessment tools. The goal of the workshop is to provide participants with a comprehensive background on the topic and increase awareness about the importance of considering changes in demographic traits alongside trends in abundance. | 2-2.5 hr *(virtual & recorded)* | Fall 2025 |
| **2** | Technical Training | **<u>Workshop 2</u>: Time-varying Dynamics (Capacity-building Training Workshop) –** Technical training workshop as a follow up to the conceptual workshop on the same subject in year 2.<br>The goal of the workshop will be to demonstrate statistical techniques to practitioners and increase their capacity to identify time-varying dynamics and, where appropriate, begin to develop and evaluate assessment frameworks that account for these changes. | Full-day *(in-person)* | Feb. 2026 |
| **3** | Conceptual / Climate Resilience | **<u>Workshop 3</u>: Approaches for evaluating the implications of future climate change scenarios on fisheries** – The goal of the workshop will be to focus on exploring how one approach - scenario planning – has been implemented in practice in other regions. The workshop will include presentation and participatory exercises to help better understand the core concepts of scenario planning and initiate discussion on what it means to account for multiple possible futures. The outcomes of this workshop will provide insight into whether a deeper, full-scale scenario planning exercise might be beneficial to consider moving forward. | ≤ Half-day *(virtual & recorded)* | April/May 2026 |
| **4** | Conceptual and/or Dialogue | **Strategic collaboration with PSC Seminar Series:**<br>The CSC and the PSC Seminar Series Committee (SSC) will collaborate for the mutual benefit of both groups. This may include identifying seminar topics that would strategically support the Year 3 process and/or leveraging the SSC's reach and experience to organize expert contributors to the Year 3 workshops. We envision adding facilitated discussion to a limited set of seminars to more fully explore the relevancy of the seminar topic to the PSC context. | TBD | TBD |
| **5** | Reporting | **Planning and development of a "Synthesis and Insights" Report**<br>Developing annotated outline for the CSC's synthesis report to be prepared at the end of Year 4. | Document | June/July 2026 |

***** Dates indicate *potential* timing of proposed workshops to distribute participation load and avoid known busy/holiday periods. Final schedule will be determined as part of project development.

PSC Pacific Salmon Run Size Shiny App.

The Commissioners approved the public release of the PSC Shiny app that summarizes historical run size and harvest datasets across PST chapters, contingent upon chapter-specific approvals of the data and documentation by the relevant panels and technical committees. Technical committee reviews are currently proceeding, and no issues have been raised to date. The app will continue to be annually updated by PSC staff as new annual data are released by the relevant panels and committees. The role of the CSC will be to continue providing oversight and ensure sign-off from the different panels/committees.

Standards for genetic analysis of salmon intercepted in PST fisheries.

The Planning Inter-Panel Workshop on GSI (PIPWoG) was formed in response to concerns regarding the way genetic samples from sockeye harvested in Alaska fishing District 104 were analyzed and communicated by the PSC. During this planning, the PIPWoG determined that the issue at hand was larger than just standards for the genetic analysis of sockeye samples from District 104 and that standards should be developed that would apply to all species and chapters of the PST. To that end, the PIPWoG proposed that there should be two workshops (Table 2), the first focusing solely on District 104 data collection, analysis and reporting issues and the second on treaty-wide handling of these issues. The U.S. state department has provided $150,000 for the purpose of conducting the workshop(s). At the PSC Post-Season meeting in January of 2025, the Commission gave its approval for Workshop 1 to proceed, however, the determination on the necessity of Workshop 2 will occur after the results of Workshop 1 are reported to the Commission which we propose to be accomplished jointly by CSC and PIPWoG co-chairs.

Table 2. Details of the two GSI related workshops proposed by the PIPWoG.

| Workshop | Objectives | Agenda items |
|---|---|---|
| 1. Estimates of Fraser sockeye catch in D104 fisheries (Proposed for April 23-24, 2025 in Olympia, WA, estimated cost of $80,000 to $85,000) | Development of shared standards/guidelines for the collection, analysis and reporting of Fraser River sockeye salmon intercepted in the District 104 fisheries based on fishery samples and genetic stock composition analyses. | ● Evaluation of limitations of small sample sizes and how small samples may be used while minimizing over-interpretation<br>● Exploration of costs and benefits of aggregation of spatial and temporal samples and reporting groups for both GSI analysis and reporting<br>● Discussion of alternate frameworks (e.g., 1- or 2-tiered) and specific methods for improving Fraser substock estimation in District 104, evaluation of subsample selection (stocks and probabilities), error estimation and propagation, potential merging of baselines, and definition of the Fraser substocks. |
| 2. Guidance and standards for the use of GSI data to support PST assessment and management | Improved and shared technical understanding of the use of GSI tools across PSC Treaty Chapters, and identification of where | Agenda items TBD pending outcomes of workshop 1 |

| | | |
|---|---|---|
| | shared standards/guidelines can lead to increased collaboration and transparency. | |

The CSC will attend the PIPWoG meetings and workshop(s) and report to the CSC liaison group, and the Commission when requested, on the progress and results of the PIPWoG's work. In addition, the CSC will provide logistical or other assistance to the PIPWoG when requested to aid in the furtherance of their work as mutually agreed upon by the two committees.

**Proposed timeline:**

Table 3. Summary of proposed tasks and timelines for CSC 2025/26 workplan.

| Task | Timing | Comments |
|---|---|---|
| Attend PIPWoG meetings. | February – April 2025 | Dependent on PIPWoG outreach. |
| CSC participation in the D104 GSI workshop. | April 23-24, 2025 | The CSC will report to the CSC liaison group, and the commissioner as requested. |
| Prepare for and then deliver the final Year 2 workshop with ESSA (Scenario Planning). | May 2025 | Exact timing and content will be developed with ESSA February-April 2025 |
| Engagement with PSC staff and panels/committees to oversee the continued development and updating of the Shiny App. | March 2025-February 2026 | Dependent on the schedules of the panels/committees. The App will be published in June 2025, including those chapters for which sign-off has been obtained. Additional chapters will be added following future sign off. |
| Updates to the PSC staff, CSC liaison group and panels/committees on a quarterly basis regarding environmental variability workshops and related activities. | March 2025-February 2026 | The updates will likely be disseminated via emails to PSC staff, CSC liaison group and panel/technical committee co-chairs. |
| Draft a report to the Commission that reviews the progress to date and lessons learned from Years 1 and 2 of the project on Environmental Change and the PST. | Summer 2025 | This report will inform commissioners of the progress to date. It will help the Commission determine the scope of continued CSC support for the project going forward which they can communicate at fall commissioner meeting... |
| Collaborate with PIPWoG to identify the need (or not) for a second workshop and communicate rational and proposed 2nd workshop plans to the liaison group. | June – October 2025 | Rational for a 2nd workshop will be presented to the Liaison group at or before the October 2025 fall commissioners meeting. |
| Planning and delivery of Year 3 workshops with logistics provided by ESSA. | June 2025 – February 2026 | Will be dependent on having the appropriate topics identified and the presenters lined up and constrained by the financial resources available and schedules of the participants. |
| Application of Endowment funding for Year 4. | September – December 2025 | The funding proposal will depend on funding received for Year 3 of the project and either request additional funding to complete current plans for workshops or focus on chapter specific workshops. Detailed proposal of the latter would however benefit from the additional |

| Task | Timing | Comments |
|---|---|---|
| | | Panel and Technical Committee engagement in Fall 2025 – winter 2026. |
| Review of 2025/26 panel/committee work plans. | Fall 2025 | Examine for new/emerging tasks where CSC support is requested, do preliminary prioritization for CSC workload. Present plan for PSC Shiny App/data management approach to Commissioners. |
| Liaison meeting. | Fall 2025 (before October Commission meeting) | Meeting to provide an update on the workshop series and discuss other CSC assignments as appropriate. |
| Fall commissioner meeting | October 2025 | Report out to commissioners on (1) lessons learned from Years 1 and 2 of the project on Environmental Change and the PST, and (2) outcomes of D104 GSI workshop (jointly with PIPWoG leadership). Seek approval to proceed with year 3 of Environmental Change project. |
| Engagement with PSC panels and technical committees to get feedback on the Year 3 workshops. | Fall 2025 – January 2026 | These would most likely consist of virtual meetings with the panels and technical committees. |
| Evaluate the learning and feedback from Year 3 workshops to inform the possible incorporation of techniques that take environmental change into account to inform Chapter specific workshops. | January – February 2026 | If not funded by the Southern Endowment Fund, the CSC, Liaison Group and PSC Secretariat will develop a strategy for moving forward. |
| Draft 2026/27 workplan. | January 2026 | Seek input from Liaison Group as it is drafted. |
| Deliver annual CSC report to commission. | February 2026 | Seek approval of 2026/27 workplan. |

**Proposed activities beyond this cycle:**

The CSC emphasizes that the principal charge from 2020 to help confront the impacts of environmental change is a multi-year endeavor as is the more recent assignment focused on GSI and the PSC. The CSC is a small 4-person committee (plus PSC Secretariat staff) whose members have commitments beyond CSC obligations. The CSCs charges to adapt assessment and management to environmental variability, and develop standards and guidelines for the use of GSI, are complex and far-reaching and have been recognized as such for decades.

**Development of the 2026/2027 work plan** will be initiated at the Fall 2025 meeting with the Liaison Group.

Other issues will likely be presented in workplans in October 2025, from which the CSC and Liaison Group will develop priorities and the next CSC workplan.

**Obstacles to Completing above Bi-lateral Tasks:**

The most likely obstacle to completing the above tasks is competing priorities both within the CSC and within the organizations individual members work in. This workplan has been scoped to minimize the potential for competing priorities to impact the completion of assigned CSC tasks. The other potential obstacle is lack of funding from endowment funds to support development and delivery of the proposed Year 3 workshop series with ESSA Technologies. If no funding is forthcoming from the endowment funds, the CSC, Liaison Group and PSC Secretariat will need to develop an alternative strategy for moving forward.

**Outline of Other Panel / Committee Tasks or Emerging Issues:** There were no other tasks or emerging issues for the CSC identified in 2025/26 work plans from other PSC bodies.

**Potential Issues for Commissioners:**

This is a multi-year assignment which requires additional work and cooperation by PSC panels and technical committees to achieve the CSC's objectives. In addition, the CSC may need other experts and financial support to further explore topics of interest and options to the PSC, either through facilitated workshops or expert panels. The CSC did, with approval by commissioners, help request funding from the SEF to support year 1 and 2 of phase two of the environment change/management project. Those proposals outlined a 3-year process (funding dependent all 3 years).

**Potential Issues for Committee on Scientific Cooperation:**

The CSC notes that the southern Coho Technical Committee has organized, with assistance from the CSC and the PSC Secretariat and other interested PSC family members, a monthly seminar series via webinar to continue educational opportunities stemming from the May 2021 workshop regarding environmental variability and implications for salmon. The CSC has dedicated one member to remain in contact with the steering committee. Through January 2025, nearly two dozen engagements or workshops have been held on various topics related to the workshop theme.

**Proposed Meeting Dates and Draft Agendas:**

The CSC plans to meet via webinar approximately every two weeks over the next few months (February – April) to review the feedback from previous workshops and to finalize the type and number of environmental assessment workshops as well as the appropriate presenters. As was stated earlier, the format, scope and timing of the workshops will be influenced by funding decisions from the SEF as well as the availability of the participants. We also will meet approximately monthly via webinar from September 2025 – February 2026 to complete other assignments and the next workplan. These meetings will require attendance from the four national CSC members (Connors, Carlile, Freshwater and Beckman), plus ex officio members John Field and Catherine Michielsens from the PSC Secretariat. These meetings will last 1-2 hours and all will be conducted remotely. Additionally, these 6 members will meet with the 4-member Liaison Group (Thomson, Auger, Klumph and Farlinger) this spring, fall and winter via webinar.

**Status of Technical or Annual Reports:**

The PSC Special Report entitled "Assessment and management frameworks of the Pacific Salmon Treaty and their robustness to environmental change" was published in May of 2023.

**<u>Comments:</u>** N/A

## **Attachment 2:** Proposed Workshop 1 Agenda and Preliminary Budget

PIPWOG participants have developed a draft agenda for Workshop 1, which will focus on using GSI data to develop estimates of Fraser sockeye catches in the District 104 purse seine fishery. The outcome of the first workshop will affect the scope and focus Workshop 2 (if approved), which is intended to address issues of general interest across PSC chapters and target a broader audience.

**Workshop 1**

Workshop 1 objective: Improved technical understanding of Fraser River and U.S. District 104 sockeye salmon genetic stock composition estimates for:

- Improved transparency and collaboration
- Improved data use and interpretation to satisfy management requirements

The workshop will include:

- Evaluation of limitations of small sample sizes and how small samples may be used while minimizing over-interpretation
- Exploration of costs and benefits of aggregation of spatial and temporal samples and reporting groups for both GSI analysis and reporting
- Discussion of alternate frameworks (e.g., 1- or 2-tiered) and specific methods for improving Fraser substock estimation in District 104, evaluation of subsample selection (stocks and probabilities), error estimation and propagation, potential merging of baselines, and definition of the Fraser substocks themselves.

- Proposed dates: April 23-24, 2025
- Location: Olympia, WA (NWIFC offices)
- Attendees:
    - Including GSI practitioners, and technical GSI users, and fishery managers
    - Approximately 35 in-person
    - 20+ remote

Draft Workshop Agenda:

- **Day 1** (9 am-5:30 pm) (times may need to be shuffled)
    - 1 – Introductions (30 mins)
    - 2 – Framing the Issue in D104-Fraser (2 hours)
        - Origin of the project
        - Sampling design
        - Treaty objectives for Northern, Transboundary, and Fraser panels
        - Current uses of data
        - Multiple presentations (NOAA/ADFG, PSC/DFO)

        - NOAA/ADFG: sampling design, GSI estimates, use of data, potential (or lack of) for additional sampling
        - PSC/DFO: finer-scale GSI, modeling efforts, in-season vs post-season
    - 3 – What do we need/want to get out of data/this meeting? (30 min)
        - Future uses of data
        - Opportunity to bring in all participants back in and get opinions
        - Define and prioritize substock requirements
        - Assess reasonable reporting aggregates for stocks and spatio-temporal strata
    - Lunch 1.5 hours (noon - 1:30 pm)
    - 4 – Reporting unit Design (2 hours)
        - ADFG/NOAA presentation on theory/approaches and reporting group evaluation, density of baseline
        - DFO presentation on theory/approaches - deep into Fraser reporting groups, talk about confidence, use of data
    - 5 – Open forum (2 hrs)
        - Summary of the day and opportunity for everyone to ask questions/start discussion
    - Group Dinner

- **Day 2** (8:30 am-5 pm) (heavy stats day, day 1 may go into morning of day 2)
    - 1 – Individual Assignments (1 hour)
        - ADFG/NOAA/DFO presentations and comparison of standards
        - PBT assignments compared to GSI assignments
        - Individual assignment requirements and cut-offs re: reporting groups
    - 2 – Precision trade-offs/sample size determinations (3 Hours)
        - More statistical than genetic
        - Consider management realities and implications
        - ADFG/NOAA/DFO/WDFW/NWIFC comparison of methods
    - Lunch 1.5 hours (11:30 am – 1:30 pm)
    - 3 – Reporting uncertainty (2 hrs)
        - ADFG/NOAA/DFO/WDFW/NWIFC approaches
        - Where we report uncertainty (presentations/reports)
        - How is uncertainty conveyed
    - 4 – Open forum (2 hrs)
        - Technical agreements
        - Discussion of products
        - Potential improvements to choose or explore

- Goal: capture discussion/decisions of workshop in document
- Next steps

***W*orkshop 2** (under development)

Note: Workshop 1 is expected to inform the content of Workshop 2. The attendees, agenda, and budget are yet to be determined. The proposed objective is not considered final.

Workshop 2 Objective: Improved and shared technical understanding of the use of GSI tools across PSC Treaty Chapters, and identification of where shared standards/guidelines can lead to increased collaboration and transparency.

- Dates: TBD (likely April-May 2026)
- Attendees: TBD (primarily GSI practitioners and technical GSI users, similar to Workshop 1, but with broader representation of salmon and geographic areas)
- Agenda: TBD
- Budget: TBD (approximately US$70,000 remaining from initial U.S. contribution for this potentially larger workshop, additional funding may be required)

Quick draft of in-person invitees for Workshop 1 in Olympia; some invitees will certainly decline, but this list is not necessarily complete.
This list does not include participants that we already know expect to attend online.

| Reimbursement? | Type of attendee | Agency | # In-person | Rationale for their attendance |
|---|---|---|---|---|
| y | Genetics Labs | ADFG | 2 | GSI experts, 1 SEAK (baseline), 1 broader perspective |
| y | | NOAA AK | 2 | GSI experts, genomics, actual conduct of Step1, chain of custody |
| y | | DFO | 2 | GSI overall and genomics, NBTC geneticist from Canada |
| y | | NOAA WA | 1 | Worked on a 2-step method |
| local | | NWIFC | 1 | Local genetics expert, works for Tribes (role with PSC?) |
| local | | WDFW | 1 | Local genetics expert, works for State (also chum TC) |
| y | | IDFG | | Expert in analytical issues re low abundance sockeye |
| y | | Other | | |
| y | Statistics Labs | ADFG | 1 | Genetic analysis / biometrics expert |
| y | | NMFS | 1 | Genetic analysis / biometrics expert, CBAYES expert |
| y | | Consultant | | Reconstructions |
| y | | Consultant | | Statistician |
| local | US FRTC | NWIFC | 1 | Fraser TC co-chair |
| local | | WDFW | 1 | Fraser TC manager |
| local | | NOAA | 1 | Federal rep in FR process |
| y | Can FRTC | DFO | 1 | Fraser TC co-chair |
| y | | DFO | 1 | Fraser TC manager |
| y | | FN | 1 | Interior Fraser manager |
| y | PSC | PSC staff | 2 | GSI |
| y | | PSC staff | 2 | Fishery management |
| y | | PSC family | 1 | Fishery management |
| y | US NBTC | ADFG | 2 | TC co-chair, D104 management, sampling project expertise |
| y | Can NBTC | DFO | 2 | TC co-chair, GSI - implementation expert |
| y | CTC | | | Knowledgeable about how PSC deals with low n, high identifiability |
| y | CSC | | | Knowledgeable about inter-panel collaboration |

PACIFIC SALMON COMMISSION

ESTABLISHED BY TREATY BETWEEN CANADA
AND THE UNITED STATES OF AMERICA
MARCH 18, 1985

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**MEMO**

**Date:** **February 7, 2025**

**To:** **CSC Liaison Group**

**CC:** **Committee on Scientific Cooperation**

**From:** **John Field, Executive Secretary**

**Re:** **Expenses for Genetic Stock Identification (GSI) workshop**

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In January 2025, the Commission approved a GSI workshop to address concerns raised by Alaska in summer 2024 regarding the use and analysis of District 104 samples by Commission staff within the Fraser River Panel process.

This two-day workshop, scheduled for April 23-24, 2025, will occur at the Northwest Indian Fisheries Commission offices in Olympia, WA with space provided in-kind. A virtual option for remote attendance will also be available. Attendees will include scientists within and outside the PSC Community, including Secretariat staff. The U.S. Department of State (DOS) has provided $150,000 USD to offset PSC costs associated with the workshop.

DOS has stated there are no restrictions on types of expenses their voluntary contribution can be used for, as long as they're necessary for organizing the workshop. The Secretariat is providing this memo to ensure the Liaison Group knows clearly what the funds are being used for. The Secretariat will account for expenditures consistent with auditing requirements.

It is expected that 40-50 people will attend the workshop[1] in-person with approximately half of those attendees needing travel costs reimbursed. The Secretariat is providing this memo to clarify the expected categories of expenses, with preliminary cost estimates totalling $100-125K USD. These preliminary estimates are uncertain due to unknown facilitator fees, total attendance, and agency capacity to fund their delegates' travel costs.

The expected expenses will include:

- For those without agency funding:
    - Flights and/or car rentals
    - Lodging

[1] A list of invitees is available upon request to the Secretariat

- Per diem consistent with the delegates' respective national policies
- Facilitator fees (an Expression of Interest for contractors, drafted with the PIPWOG, will be circulated by mid-February)
- One group dinner for all interested attendees

The Secretariat will absorb as many costs as possible for its staff (four individuals) in the ordinary PSC budget. We will also process all expense claims for delegates consistent with past practice and account.

Liaison Group members are invited to review this memo and provide guidance or redirection to the Secretariat by the conclusion of the February 2025 annual meeting. This timing is important to ensure timely communication with workshop attendees.

**Attachment 1:** Terms of Reference (TOR)

## Pacific Salmon Commission Planning Inter-Panel Workshop on GSI (PIPWOG)

## February 12, 2025

**Background:**

- Sockeye salmon from the Fraser River are incidentally harvested in the District 104 (D104) purse seine fishery, which targets pink salmon.
- Information and samples from fisheries outside the Fraser Area are provided to the Fraser River Panel each year for complete catch accounting and stock composition analyses.
- Historically, the estimated Fraser-river catch, scale samples, and genetic samples have been provided from D104.
- In an April 16, 2024, the Alaska Department of Fish and Game (ADF&G) expressed concerns about the way the D104 genetic samples were being analyzed and communicated in a letter to the Pacific Salmon Commission (PSC).
- In May 2024 an *ad hoc* workgroup comprising geneticists, Commission staff, and technical committee leads from both parties was formed to address concerns raised in the ADF&G letter, specifically, to "sort out the history, analytical approaches, and any next steps needed, including the potential of developing certain protocols that might be suggested to the Commission."
- By July 2024, the workgroup had discussed and resolved many of the issues raised, devised interim solutions to allow the process to resume, and made several recommendations for moving toward long-term solutions and shared understanding of estimates of Fraser sockeye catches in D104 fisheries using genetic tools.
- The *ad-hoc* committee also requested Commission support for an in-person workshop of technical experts and Genetic Stock Identification (GSI) practitioners to develop agreements on fundamental issues, standards, and technical understandings with respect to application and interpretation of GSI within the PSC. It was determined that a two-workshop format would best address (1) issues around estimates of Fraser sockeye catch in D104 fisheries and (2) issues of more general interest across the different PSC chapters regarding the use and interpretation of GSI data.
- In October 2024, PSC commissioners gave permission for the work of the *ad hoc* group to continue, including development of workshop plans, and they directed the Committee for Scientific Cooperation (CSC) to assist as necessary.
- As the group began focusing on development of workshops, the name of the group was changed to the Planning Inter-Panel Workshop on GSI (PIPWOG), and membership was broadened and became more formalized.

**PIPWOG Goal:**

The goal of the PSC workgroup Planning Inter-Panel Workshop on GSI (PIPWOG) is to identify and develop plans to address issues regarding the use of U.S. District 104 fishery samples for Fraser sockeye stock composition estimation and catch accounting, and to develop shared technical understandings and agreements regarding the use of genetic data in PSC fisheries.

**PIPWOG Objectives:**

- Overseeing and advising on the development and implementation of interim analyses and measures (as outlined below) for the use of U.S. District 104 fishery samples in catch accounting and genetic stock composition analyses of Fraser River sockeye salmon.
- Developing and convening up to two workshops to provide improved and shared technical understanding, throughout the PSC, with respect to the applicability and interpretability of GSI estimates for various salmon species under each of the PSC Treaty chapters. Workshop 1 will address the U.S. District 104 and Fraser issues; Workshop 2 would be intended to have a wider scope and examine the generation and application of genetic data across various chapters of the Pacific Salmon Treaty.

Specific activities for PIPWOG will include *Interim Activities to develop a shared understanding of Fraser catches in D104*

- Review the choice and calculation of uncertainty metrics to be included in future public presentations of Fraser sockeye substock composition and catch in Alaskan fisheries.
- Review caveats/footnotes regarding small sample size concerns to be attached to past presentations of Fraser substock estimates in Alaskan catch, as time permits.
- Review analyses completed by DFO's Molecular Genetics Laboratory (MGL) to compare the MGL coastwide SNP and microsatellite baselines.
- Continue work and communication regarding relevant issues with co-chairs of the Fraser Panel and Northern Boundary technical committees.

*Workshop development*

- Summarize the main content of each workshop, including take home messages and recommendations, which will be conveyed in a written report and presented to the Commission. Workshop 1 objectives (in addition to proposed date, location, agenda, attendees, and budget) are provided in Attachment 2: "Proposed WS 1 Agenda and Budget."

**Membership:**

- PIPWOG initially consisted of members with specific expertise in Fraser or Northern Boundary Area sockeye salmon biology or salmon genetics. These members included staff from the PSC, ADF&G, DFO, National Oceanic and Atmospheric Administration (NOAA), Northwest Indian Fisheries Commission (NWIFC), and Upper Fraser Fisheries Conservation Alliance (UFFCA).
- To broaden perspectives represented, PIPWOG recently invited membership and input from staff or advisors of Washington Department of Fish and Wildlife, Idaho Department Fish and Game, Columbia River Inter-Tribal Fisheries Commission, Oregon Department of Fish and Wildlife, and California Department of Fish and Wildlife.
- Current PIPWOG Chair: Steve Latham (PSC Secretariat)

**Roles and Responsibilities:**

PIPWOG participants will lead the development of scientific advice pertaining to the review, interpretation and use of genetic information through continued work on interim analyses, developing and convening workshops, and producing documentation to communicate workshop proceedings.

The bilateral PSC Committee for Scientific Cooperation (CSC) has been tasked by PSC commissioners to track PIPWOG activities, provide input on workshops as they are developed and delivered, and to report back to the CSC Liaison Group and commissioners as requested.

Specific roles include

- PIPWOG participants
  - Developing scientific advice to support interim measures (described above under "PIPWOG Objectives"),
  - Contributing to organization and planning for Workshops 1 and 2,
  - Reviewing documents and conducting analyses where appropriate,
  - Attending regular meetings,
  - Contributing to workshop proceedings and helping to draft/edit meeting summaries.
- CSC
  - Reviewing PIPWOG documents and meeting with PIPWOG to remain apprised of developments,
  - Providing input into workshops as they are developed,
  - Identifying opportunities to strengthen scientific cooperation among parties with respect to the use of GSI,
  - Participating in workshops,
  - Reporting out on PIPWOG activities to the CSC Liaison Group and PSC commissioners as appropriate.

**Deliverables:**

The key deliverable for the PIPWOG process will be a series of two workshops which are expected to have implications for genetics projects under multiple PSC Treaty Chapters. Workshop proceedings will be communicated in several technical documents, including:

- Workshop 1 proceedings and summary notes. These will include, relative to the issue of Fraser sockeye GSI in D104:
  - Reporting metrics clarified,
  - Agreements reached,
  - Standards proposed,
  - Decisions made.

- Workshop 2 proceedings, summary notes, and recommendations and/or guidelines (if approved).

- Technical documentation outlining topics addressed and decision points from both Workshop 1 and (if approved) Workshop 2. Remaining concerns will be prioritized, and next steps will be proposed.
- Recommendations based on workshop findings will be disseminated for review, to be considered for integration by relevant Panel-level and Commission-level processes.

# Report of the Standing Committee on Finance and Administration

February 13, 2025

The Standing Committee on Finance and Administration met virtually on January 9, 2025 and by hybrid mode on February 11, 2025. The Committee addressed several issues and made recommendations for the Commission's consideration as noted below.

## Budget proposal for FY2025/2026

The Committee reviewed the proposed budget for FY 2025/2026 as amended on January 28, 2025 (Attachment I) to incorporate potential budget savings of $108,700, as identified by Secretariat staff at the Committees direction.

As in prior years, the Committee agreed to a budget presentation that included annual contributions from the Parties calculated such that the cumulative deficit/surplus at the end of the fiscal year would be NIL. The Committee agreed to include a footnote to the budget schedule that addressed the mechanism through which Canada would process its dues, with the understanding that the final amount contributed from each Party will be equal for each fiscal year.

The Committee emphasized the importance of controlling cost increases in the Secretariat's budget over the coming years, in light of the current economic environment. To support decision-making, and in response to these concerns, the Committee requested that the Secretariat develop a report outlining options for further efficiencies, ensuring financial sustainability while maintaining the Secretariat's operational effectiveness.

Accordingly, the Committee recommends that the Commission adopt the proposed budget for FY2025/2026 as shown in Attachment I.

## Mission Hydroacoustics bank remediation and dock implementation project (the Project)

The Committee received updates from Secretariat staff on the Project's progress. The Committee understood that the Project was on track in terms of budget ($710,000) and completion date (March 31, 2025).

## Test Fishing

Test fishing finances remained a significant issue for the Parties, after record-low return of Fraser River sockeye salmon over the last several years. The low returns have precluded the capture and sale of adequate number of fish to recover test fishing costs in those years, and the Parties have made supplementary financial contributions to the Test Fishing Revolving Fund (TFRF) to help offset the test fishing costs.

The Committee recognized that test fisheries represented a significant cost to the Parties in the Fraser River assessment process, and advocated for the adoption of a cost/benefit approach to determining the scope and length of the test fishing program in any given year. The Secretariat is conveying this message to the Fraser River Panel as the panel plans annual test fishing regimes.

The Committee understood that ahead of the 2025 season, the Parties will be invoiced by the PSC Secretariat in order to replenish the TFRF, in a manner consistent with the Test Fishing Regulations adopted in February 2022:

- Canada: 50% of the test fishing deficit incurred in the 2024 season, and
- U.S.A: 50% of the projected 2025 deficit, as determined from the test fishing schedule agreed upon by the Fraser River Panel (FRP) using the adopted run size as of February 2025.

Efficiencies and Cost Controls for PSC Meetings

The Committee reviewed the Secretariat-prepared discussion paper "Efficiencies and Cost Controls for PSC Meeting" (dated February 5, 2025), which outlined certain proposed measures to streamline the process of booking hotel rooms for national delegates and to reduce meeting costs borne by the Secretariat.

The Committee agreed to the revised lodging room booking process that reduced the Secretariat's staff involvement in delegates' room booking and should expedite future preparation for all PSC meetings.

The Committee also agreed to recommend implementing processes within the national sections to reduce ad-hoc meeting room bookings that lead to increased costs for the Secretariat.

**ATTACHMENT I**

**PACIFIC SALMON COMMISSION**

**FORECAST BUDGETS**
(February 2025)

| | **Forecast results 2024/2025** | **Proposed Budget 2025/2026** | **Forecast Budget 2026/2027** | **Forecast Budget 2027/2028** |
|---|---|---|---|---|
| 1 INCOME | **(none)** | **(pink)** | **(Adams)** | **(pink)** |
| A. Contribution from Canada (Notes 1, 2) | 2,279,654 | 2,579,272 | 2,718,950 | 2,811,509 |
| B. Special contribution pension CA (Note 3) | 146,100 | 146,100 | 146,100 | 146,100 |
| C. Contribution from U.S.A. | 2,279,654 | 2,579,272 | 2,718,950 | 2,811,509 |
| D. Special contribution pension U.S.A. (Note 3) | 146,100 | 146,100 | 146,100 | 146,100 |
| Sub total | 4,851,508 | 5,450,744 | 5,730,100 | 5,915,218 |
| E. Interest | 120,000 | 100,000 | 100,000 | 100,000 |
| F. Other income | 614,000 | 643,000 | 600,000 | 600,000 |
| G. Carry-over from previous fiscal year | 0 | 0 | (0) | 0 |
| H. Total Income | 5,585,508 | 6,193,743 | 6,430,100 | 6,615,218 |
| 2 EXPENDITURES | | | | |
| A. 1. Permanent Salaries and Benefits | 3,851,971 | 4,035,586 | 4,173,099 | 4,260,815 |
| 2. Unfunded pension liability payments (Note 3) | 292,200 | 292,200 | 292,200 | 292,200 |
| 3. Temporary Salaries and Benefits | 210,504 | 324,497 | 345,496 | 322,688 |
| 4. Total Salaries and Benefits | 4,354,675 | 4,652,283 | 4,810,795 | 4,875,703 |
| B. Travel | 181,197 | 220,097 | 217,217 | 237,989 |
| C. Rents, Communications, Utilities | 198,669 | 215,635 | 217,275 | 371,405 |
| D. Contractual Services | 584,281 | 812,544 | 873,663 | 843,904 |
| E. Supplies and Materials | 43,686 | 70,184 | 88,150 | 63,217 |
| F. Equipment | 223,000 | 223,000 | 223,000 | 223,000 |
| G. Total Expenditures | 5,585,508 | 6,193,743 | 6,430,100 | 6,615,218 |
| 3 BALANCE (DEFICIT) | 0 | 0 | 0 | 0 |
| Carry-over generated (expended) in the year | $0 | ($0) | $0 | $0 |

Note 1
For presentation purposes, the Parties' contributions are shown as the amounts required to generate a cumulative surplus/deficit of NIL at the end of each fiscal year.

Note 2
Canada's commitment is limited to $1,879,636 (historical contribution), plus 50% of the deficit for the respective fiscal year, as forecasted each December of that fiscal year, and calculated based on a notional contribution from the U.S. of $1,879,636.

Note 3
The unfunded pension liability payments are derived from recent actuarial valuation performed as of January 1, 2023. The amount shown is comprised of a cash payment from the U.S. equal to the annual pension liability amortization amount outlined in the valuation document ($146,100), matched by an equal amount amortized from Canada’s advance payment from FY 2020/2021.

Meeting Summary: Chinook Interface Group

2025 Pacific Salmon Commission Annual Meeting

The Chinook Interface Group (CIG) met twice during this week, on February 10, 2025, from 3:00 – 5:00 pm PST and on February 11, 2025, from 3:00 pm – 5:00 pm PST. The following report includes the CIG's recommendations for the Commission's consideration.

CIG Members in Attendance: Phil Anderson, Russ Jones, John McCulloch, McCoy Oatman, Andrew Thomson, Doug Vincent-Lang

Chinook Technical Committee (CTC) Members in Attendance: Milo Adkison, Jon Carey, Dani Evenson, Elisabeth Fox, Tommy Garrison, Nicholas Komick, Marianne McClure, Elinor McGrath, Jeff Nichols, Antonio Velez-Espino, Erika Watkins, Oliver Miler, Anne Reynolds-Manney, Galen Johnson, Laura Tessier

Pacific Salmon Commission (PSC) Secretariat Staff in Attendance: John Field, Aimee Liu, Mark McMillan, Jordan Maguire, Angela Xu, Serena Wong

Observers in Attendance: Katrina Connors, Larry Edfelt, Joshua Mann, Murray Ned, Chuck Parken, Matt Sweeting-Woods, Sue Farlinger, Dean Allan, Helena Lam, Joshua Bragg, Aaron Foos, Mike Hawkshaw, Susan Bishop, Judy Lum, Bill Auger, Nate Pamplin, Scott Rumsey, Ryan Lothrop, Jim Scott, Craig Bowhay, Cathy Laetz, Christine Mallette, Rick Klumph, Bill Templin, Mike Matylewich, James Dixon, Jamal Moss, Deborah Lyons, Jacob Miller

1. **Adoption of the agenda**
   - The agenda was adopted as proposed.
2. **Review of the U.S. Letter to Canada with questions regarding the Canadian response for Snohomish**
   - Commissioner Anderson presented an overview of the letter from the U.S. "*Additional Questions Concerning Canada's Paragraph 7(c)(i) Response*" **(Attachment 1)** emphasizing the importance of understanding how the management changes Canada has made to address Southern Resident Killer Whales and Canadian origin stocks will also benefit the Snohomish River Chinook Calendar Year Exploitation Rates (CYERs).
     - Commissioner Thomson stated that Canada had reviewed the letter and provided the CIG with a verbal response to the questions from the U.S., noting which items required additional time for completion. Commissioner Thomson said that Canada would provide a written response as well within 2-3 weeks.
     - Commissioner Anderson noted his appreciation for the verbal report and requested a written report be provided to the U.S. In addition, he suggested the CIG hold a virtual meeting in late April to review the results of the ERA analysis as it relates to the Snohomish Chinook stock.

  - Commissioner Vincent-Lang asked about how much the Snohomish 2021 data point factored into Canada's response.
  - Ms. Tessier explained that the CTC is still analyzing the 2021 point, with several potential factors contributing to the overage.
  - Dr. Velez-Espino noted that the Snohomish 2021 data point would impact three-year averages for 2019-21, 2020-22, and 2021-23.
- Commissioner Anderson noted the reduction in the Canadian CYER on Snohomish Chinook that occurred in 2022 and expressed hope that the downward trend from 2021 to 2022 would continue in 2023. He stated that if the CYER rate for 2023 were to increase from 2022, the U.S. expectation would be that Canada would take additional management action in 2025 that has the goal of reducing the Canadian CYER for Snohomish Chinook to levels at or below the 2022 rate of 0.134 estimated in the preliminary Canadian analysis from December 2024.
- Commissioner Anderson noted that the U.S. commissioners would be commenting on the Snohomish Chinook issue during the Thursday bilateral meeting consistent with the provisions of Paragraph 7(c)(i).
- CIG agreed to work with the PSC Secretariat to determine the best date for a Spring 2025 CIG virtual meeting. The U.S. proposed a meeting on April 29.
- <u>Canada will provide a written response to the questions provided by the U.S. in its Feb. 4, 2025, letter and a Spring 2025 CIG meeting be held to review the results of the 2025 ERA analysis (with the 2023 Snohomish data point from the 2025 ERA) for Snohomish Chinook and discuss what additional management actions, if any, are needed.</u>
- <u>Recommendation: The CIG recommends a Spring 2025 meeting.</u>

**3. Paragraph 7(c) follow up including an update from the CTC on the status of a side-by-side ERA analysis**

- Dr. Velez-Espino and Mr. Carey summarized the Chinook Technical Committee's (CTC) memo "*CTC's Response to CIG Request*" **(Attachment 2)** noting that the CTC successfully completed all tasks assigned by the CIG during the January 2025 meeting.
- Commissioner Anderson raised concerns about the reduction in CYER limits for the 2009-15 base period, highlighting that even a 1% decrease could significantly disrupt Puget Sound U.S. fisheries.
  - Commissioner Thomson responded that Canada is using the best available data and that such updates are not unprecedented, as the CTC regularly revises inputs to reflect historical trends.
  - Commissioner Anderson expressed concerns about the long-term implications of the iREC updates, pointing out that many of the CYER

limits for Canadian fisheries increased while the U.S. CYER limits for Puget Sound stocks decreased.

  - Dr. Velez Espino stated that the CTC updates the time series annually, including the base period, and that recent changes (2019-2024) were not exceptionally large compared to past updates.

- Commissioner Anderson requested that, pursuant to Chapter 3, Paragraph 7 (g), the CYER limits for Puget Sound Southern U.S. fisheries (Nooksack, Skagit (Spring and Summer), Stillaguamish, and Snohomish remain consistent with those provided by the CTC in April 2024. He noted that the Commission would need to approve this request. The CIG agreed that the CIG co-chairs would confer prior to the CIG report being finalized on this request.
- In addition, Commissioner Anderson proposed that the CTC:
  - Develop a CYER rate consistent with 2024 rates in an unmarked equivalent format.
  - Identify Chapter 3 obligations affected by catch and release updates in Canadian catches. Specifically changes to Coded Wire Tag (CWT) Recoveries and catch levels that resulted.
  - Identify the model inputs, outputs, and tools that will be affected by the updates as well as the time and effort required to complete the tasks above and report back if the tasks are not feasible to be completed.
- The CIG agreed that CTC co-chairs would discuss these tasks internally with the full CTC and provide feedback to their respective Parties, incorporating the discussions into the CIG report for review and discussion during the Thursday bilateral session.
- In response to the CIG's potential additional assignments to the CTC, the CTC Co-Chairs as well as Tommy Garrison and Nick Komick, met and discussed several potential options to complete the request. They came to agreement on an approach to produce a modified version of the September 2024 ERA that would reflect the September 2024 unmarked CYERs adjusted for the change in release estimates in Canadian recreational fisheries between the February and September 2024 ERAs. From this modified version of the ERA the CTC could calculate U.S. ISBM CYER limits for each of the five Puget Sound stocks in Attachment I, which could be used to assess performance in U.S. ISBM fisheries relative to the three-year averages that result from the 2025 ERA. The CTC Co-Chairs believe that it will be possible to complete this request by April 2025, in advance of the additional Spring 2025 CIG meeting, provided there are no unexpected analytical challenges.

  At the 2025 spring CIG meeting, the CTC Co-Chairs will also be prepared to speak to the time and effort that would be required to complete the additional tasks identified that involve identifying Chapter 3 obligations and inputs/outputs to CTC models and tools that will be affected by the updates to Canadian recreational catch and release estimates.

- The CIG recommends the following actions for approval by the Commission:
  1) Pursuant to Chapter 3, Paragraph 7 (g), the CYER limits for U.S. ISBM fisheries for the Nooksack, Skagit (Spring and Summer), Stillaguamish, and Snohomish stocks will remain consistent for 2025 with those provided by the CTC in April 2024 as adjusted for unmarked Chinook salmon using methods developed by the CTC.
  2) Request that the CTC report at the spring CIG meeting on the following tasks:
     a. The time frame and resources required to identify the Chapter 3 obligations affected by catch and release updates in Canadian catches. These may include incidental mortality limits, AABM catch levels, and ISBM CYER limits.
     b. The feasibility, time frame, resources required to identify the model inputs, outputs, and tools that will be affected by the updates and report back if the tasks are not feasible to be completed.

**4. Okanagan Work Group Update**

- Mr. Lothrop presented a progress update on behalf of the Okanagan Work Group (OWG) to the CIG.
- Commissioner Vincent-Lang and Commissioner Thomson both expressed gratitude for the opportunity to tour the Okanagan Nation Alliance noting that they are impressed with the work being conducted and are interested in providing help to allow them to restore Chinook in their area.
- Mr. Parken noted that the OWG will be able to provide another update to the CIG by September or late October 2025. However, upon request, information can also be provided before that time.

**5. C2 Work Plan Update**

- Mr. Garrison and Mr. Foos presented an update on the C2's work plan "*2025 C2 Work Plan Progress Report to CIG*" **(Attachment 4)** and highlighted the following:
  - The C2 work group met on January 27th, 2025. At this meeting several high priority gaps in knowledge were identified by each Party and a plan for reporting on these gaps was discussed.
  - The C2 work group plans to meet on April 16, 2025, to further advance work on task iii.
- The C2 work group agreed to provide an update at the interim CIG meeting in the Spring of 2025, provided that it is after their scheduled April 16, 2025, meeting.

**6. Update from the R&D Work Group**

- Dr. Adkison presented an update on progress up to date from the Research and Development (R&D) work group noting that an alternative approach to the Chinook Model will be prepared for the CIG by the end of 2025 to include in their review for the Treaty renegotiations.

**7. Review of the Updated Treaty Booklet Insert**

- Mr. Field presented the document, "*Updated Treaty Booklet Insert*" **(Attachment 5)** to the CIG.
- Canada and the U.S. noted the need for additional time to review the updated treaty booklet insert.
- Both Parties agreed to a deadline of 60 days after the close of the February CIG meetings to provide national edits, with the Secretariat preparing another updated version of the insert for presentation in October 2025.

**8. Discussion on the PST Renegotiation Schedule – Specifically Chapter 3**

- Commissioner Anderson noted that the U.S. proposed additional meetings to support Treaty renegotiations in 2026 and 2027. The schedule provided by the U.S. during the January 2025 CIG meeting still holds true.
    - Commissioner Thomson stated that Canada has not had a chance to review the dates proposed by the U.S. in detail and will prepare early information regarding additional meeting needs to the U.S. and PSC Secretariat as soon as possible.
    - Mr. Field emphasized the importance of identifying extraordinary meetings by December 2025 for budget planning beyond April 1, 2026.
- The CIG agreed to discuss this topic further during the Spring CIG meeting.

**9. Preliminary List of Issues Related to Chapter 3 Renegotiations.**

- Mr. Anderson presented the document "*U.S. Preliminary Proposed Chapter 3 Renewal Issues Draft*" **(Attachment 6)** to the CIG.
- Commissioner Thomson noted that Canada generally agrees with the issues raised by the U.S. and will prepare a document for the U.S. review before the Spring 2025 CIG meeting. He emphasized Canada's support for actions that enhance accountability, improve the completeness and timeliness of data, and appreciates the need for adaptability to address climate change.
- Canada will provide a list of issues related to Chapter 3 renegotiations to the U.S. prior to the Spring CIG meeting.

**10. Discuss Chinook Interface Group (CIG) forward agenda**

The following topics were identified for discussion at the spring CIG meeting.

- CTC to provide updates on the AI and ERA calculations
- Discussion on Canadian actions on Snohomish

- Update from the CTC on February tasks from the CIG
- Discussion on Canadian Chapter 3 negotiation priorities
- Forward planning for upcoming Treaty negotiations
- Update from the C2 work group

**U.S. Commissioners**
Douglas Vincent-Lang, Chair
W. Ron Allen
Philip Anderson
Scott M. Rumsey

# UNITED STATES SECTION of the PACIFIC SALMON COMMISSION

**Office of the U.S. Section Coordinator**
7600 Sand Point Way N.E.
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Seattle, WA 98115

February 4, 2025

Andrew Thomson, Chair
Pacific Salmon Commission
1155 Robson Street
Vancouver BC V6E 1B5

**RE: Additional Questions Concerning Canada's Paragraph 7(c)(i) Response**

Dear Chair Thomson,

The United States section of the Pacific Salmon Commission appreciated the information provided in the January 10, 2025, letter regarding the management of the Canadian individual-stock-based management (ISBM) fisheries. The preliminary Canadian assessment indicates that the running-three-year average for the Snohomish stock in the Canadian ISBM fishery exceeds the limit of 0.148 by 43%. Accordingly, the United States and Canada are now working to fulfill the requirements of paragraph 7(c)(i) of the Chinook Chapter of the Pacific Salmon Treaty. That paragraph requires the following action:

> "the Commission shall request that the management entities responsible for the management of the ISBM fishery take necessary actions to minimize the deviation between the three-year CYER average and the CYER limits in Attachment I. By the end of the annual meeting of the Commission, the Commission shall discuss proposals from the management entity regarding the actions to be taken and the expected outcomes of those actions before those actions are implemented,"

It has been our experience that achieving a substantial reduction in fishery impacts for a stock that is widely distributed, like Snohomish Chinook, can be challenging. Also, in our review of the January 10 letter, we were unable to find specific management actions that were directly targeted at reducing fishery impacts on this stock. The letter does reference the potential benefits that may occur for Snohomish Chinook salmon from actions directed at Canadian stocks and SRKW prey management measures.

The United States would appreciate receiving the additional information discussed below so that the obligations described in paragraph 7(c)(i) are fulfilled. We remain interested in discussing other management options and receiving additional details regarding the estimated reductions in fishery impacts that have been observed with the recently enacted SRKW management measures and fishery regulations changes. The specific clarifications and technical details that we are interested in are provided below.

1) **Introductory Paragraphs – Heat Maps**. The third paragraph of the January 10, 2025, letter indicates that Canada's ISBM fishery planning was informed by "heat maps showing monthly impacts of relevant fisheries by Pacific Fishery Management Areas". We have several questions regarding the heat maps and application to fishery management in Canada.

    a. Would Canada be willing to share with the U.S. the data (workbook?) used to create the heat maps?

    b. Did the catch data utilized to construct these heat maps include all of the iREC catch updates (i.e., the heat maps are based on the same dataset as the preliminary exploitation rate analysis conducted by Canada)?

    c. Based upon these heat maps, what are the 10 gear-area-month strata that Canada would identify as the particular strata of concern for Snohomish Chinook salmon?

    d. What are the catch and effort trends for these areas and ratio of legal to sublegal encounters?

    e. Do the heat maps based on genetic data (workbook "Snohomish DNA_Single YR.xlsx") use the updated kept catch and release information?

2) **2024 Canadian Domestic Chinook ISBM Fisheries Planning**. We appreciated the information provided in this section of the January 10, 2025, letter and the reiteration that "Conservation remains Canada's number one priority." We have several follow-up questions to help us understand the domestic fishery planning process.

    a. The letter notes that "conservation planning was focused on meeting conservation objectives of Chinook stocks of concern, including Fraser Chinook." How does Canada define "Chinook stocks of concern" and, in particular, are Snohomish Chinook salmon included in that category?

    b. The letter indicates that "Canada projected the returns and expected exploitation rates for….Snohomish Chinook." We would appreciate it if Canada would share that analysis with us.

    c. Canada notes that areas closed to reduce disturbance and increase prey availability for SRKW were modified in 2022 with "significantly more spatial; areas added, in effect from July 15 to October 31 which may further reduce impacts to Snohomish Chinook."

        i. In the southern U.S. we have seen that area and time closures can redirect recreational fishing effort rather than reducing it. Can Canada provide the U.S. with the effort and catch data that indicates these management actions resulted in fishery impact reductions that were not negated by shifts in fishing effort?

ii. For 2022 our review of the heat map (January 10 letter, Fig. 3) suggests that the highest impact rates for Snohomish Chinook salmon occurred in the Area 20 recreational fishery in August. Is that consistent with Canada's interpretation of the heat map?

iii. Similarly, when we review the genetic information for 2022 and 2023 based on all years of genetic information (sheet "all years DNA - Snohomish"), Area 20 in the months of August and September (cells M138:M139, M196:M198) and Area 23 from June through August (cells N136:N138, N196:N198) appear to contribute at the highest rate to mortality for Snohomish Chinook salmon. This pattern also appears to be evident in the sheet using only the genetic information from 2019-2021 (sheet "2019-2021 DNA – Snohomish"). Is that consistent with Canada's interpretation of the genetic data?

3) **2024 Updates to CTC model baseline recreational data**. At the January 2025 CIG meeting the U.S. expressed our appreciation for the updates to catches, releases, and estimated coded-wire-tag (CWT) recoveries in Canadian recreational fisheries. The letter provides a useful summary of those updates, but the U.S. may have additional questions after the Chinook Technical Committee provides the information requested by the Commission at the close of the January meeting. While we await that information, we have three higher level questions:

   a. Does Canada anticipate that the methods for predicting catches from the iREC information will be further refined? For example, might the recreational catch be predicted from analyses conducted at a finer temporal or geographic scale? If Canada anticipates additional refinements, when might that work be completed?

   b. The PSC Chinook model relies on CWT recoveries from years prior to 2005 to estimate base period exploitation rates, and some fisheries are modelled based on the ratio of current to base period exploitation rates. Does Canada anticipate predicting fishery catches and releases in years prior to 2005 to facilitate these analyses?

   c. Does Canada anticipate refreshing estimates of the catches and releases of commercial or First Nation fisheries?

4) **Snohomish Chinook Measures Document**. We appreciated the annual and area specific detail provided in the tables in this document and have several follow-up questions.

   a. Is the base management regulation package "Two Chinook per day" with exceptions for the time periods and areas specified in the tables?

b. In the southern U.S. we have found that reductions in bag limits do not have a proportional effect on the catch (i.e., a 50% reduction in the bag limit does not result in a 50% reduction in the catch). Can Canada provide data on the fishery impact savings from the bag limit reduction from 2 to 1 Chinook per day in the table?

c. We were unable to find the management measures for Area 23 in the tables. If they are not included in the document we would appreciate Canada providing that information to us.

We thank Canada for the ongoing commitment to conservation measures for Chinook salmon and look forward to receiving the response to these questions.

Sincerely,

Douglas Vincent-Lang
Chair, U.S. Section
Pacific Salmon Commission

Cc: U.S. Commissioners and Alternate Commissioners
John Field, Executive Secretary, Pacific Salmon Commission

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**PSC Chinook Technical Committee**

**TO**: Chinook Interface Group

**FROM**: Chinook Technical Committee

**DATE**: February 5, 2025

**SUBJECT**: Chinook Interface Group Request (January 16, 2025)

**CC**: National Correspondents

# Chinook Interface Group Request (January 16, 2025)

The Pacific Salmon Commission Chinook Technical Committee (CTC) was asked by the Chinook Interface Group (CIG) to come up with a plan to illustrate the effect of recent changes to Canada's recreational catch estimates as well as improvements to address mark-selective fishery (MSF) assessment on the unmarked portion of stocks. Specifically, the CIG requested a review of CYERs, the accountability metric for ISBM fisheries, with and without the updated Canadian recreational catch improvements. The CTC Co-Chairs understood that the CIG was interested both in the effect on the CYER values and in the effect on the calculated CYER limits. This analysis should be ready before the February CIG meeting. The CIG indicated they were mindful of the CTC's time, and did not want to require a great deal of additional work. The CTC co-chairs plus Tommy Garrison and Nicholas Komick met and came up with the following suggested approach. CYER values from 2009-2022 will be taken from three ERA runs:

1) the February run, prior to incorporation of the latest Canadian sport fishery updates or MSF algorithms,
2) the September run, which includes the MSF algorithms and also incorporates updated fishery release estimates (including Canadian sport fisheries), and
3) the December run by Canadian CTC members that incorporated the updated CWT estimates into the September run.

After discussion, we noted that any run with MSF corrections had to include the updated release estimates, as marked and unmarked release rates depended on having these values. That is, it is not possible to produce an ERA run with MSF corrections but without updated Canadian sport fishery release estimates. The illustration of effects will consist of the following components/tasks:

1) A series of graphs that display and tables that provide 2009-2022 CYERs from each of the three ERA runs for each Attachment I stock for each party, for the marked indicator stock (i.e. no MSF corrections).
2) A series of graphs that display and tables that provide 2009-2022 CYERs from the September and December ERAs for each Attachment I stock for each party, for the unmarked indicator (i.e. with MSF corrections). Note that this could be combined with the figures in (1) if there is a way that can clearly illustrate the differences without the figures becoming too busy.
3) A table of relevant data changes within each of the three runs presented in the graph to aid with interpretations.
4) A table of CYER limits for each Attachment I stock for each party, with values from the February ERA in one column and values from the December ERA (marked and unmarked) in another.

As part of this assignment, the Canadian members of the CTC will ensure that the relevant input and output files from the December ERA in addition to the updated catch and release estimates are shared bilaterally within the CTC.

To support interpretation of results, relevant changes between ERA runs (task 3 from the request) are provided first. This is followed by graphs of CYER estimates for both marked (task 1 from the request) and unmarked (task 2 from the request) stocks. The final section of this memo provides the Canadian and U.S. CYER limits to address task 4 of the request. Although Task 4 refers only to the February ERA and the December ERA (marked and unmarked), CYER limits from the September ERA (marked and unmarked) are added for completeness.

# Chinook Technical Committee Response

## Relevant Data Changes (Task 3)

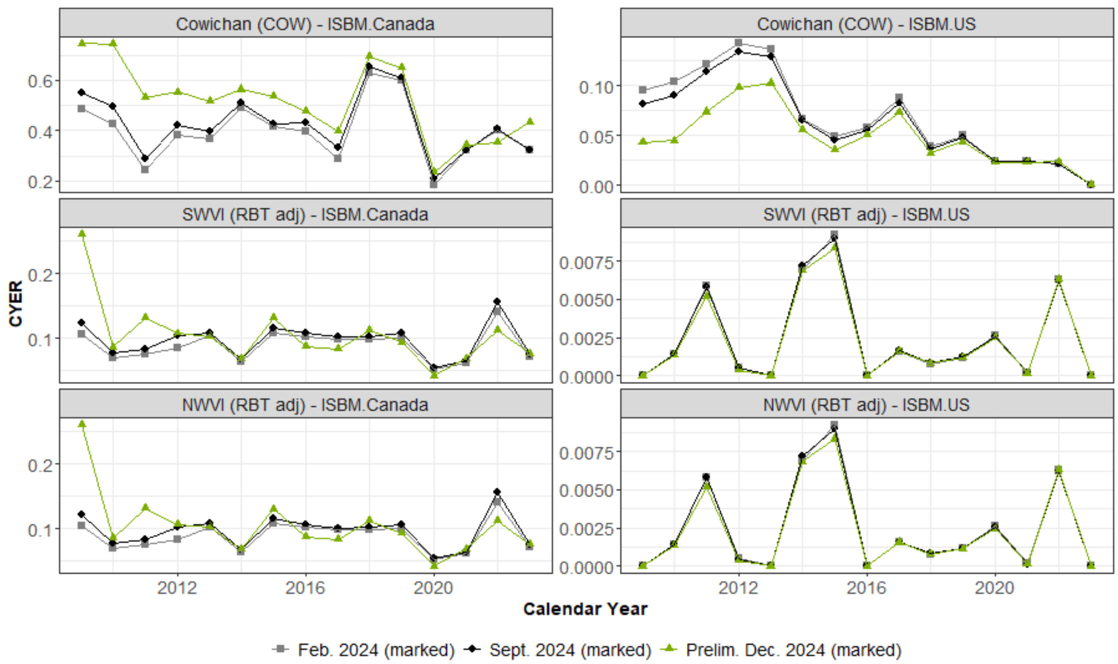
The table below summarizes some of the changes introduced with each instance of the Exploitation Rate Analysis shown in this memo. The table addresses the third task of the CIG request.

| ERA Version | Relevant Changes |
|---|---|
| Feb. 2024 | * Initial analysis for the 2022 run year |
| | * Proportion Non Vulnerable (PNV) files were updates to reflect current size limits in North and South Falcon troll and sport fisheries |
| | * Updates to ADF&G CWT recovery data (1996 – 2022, with the greatest impact to data from 2009 – present), including a new RMIS location code format for the sport fishery which impacted all records from 1977 – present |
| | * Other changes identified in Appendix I of TCCHINOOK (25)-01 |
| Sept. 2024 | * Updates to release estimates in both Canadian and U.S. fisheries (marked and unmarked). |
| | * Updates and revisions to finescale fishery categories and corresponding lookup entries (which map recoveries to finescale fisheries) which affect calculations of fisheries impacts in MSFs differentially from what has been done historically |
| | * Use of MSF analysis algorithm (SIT4) proposed by the CYER Working Group |
| | * Updates to Incidental Mortality (IM) equations to correct for small errors in CNR algorithms (including corrections to sublegal IM algorithms) |
| | * A new Nooksack Springs Terminal Area Adjustment was applied |
| Prelim. Dec. 2024 | * Updated Canadian recreational CWT estimates using catch estimation framework and stratification describe in previous CTC memos |

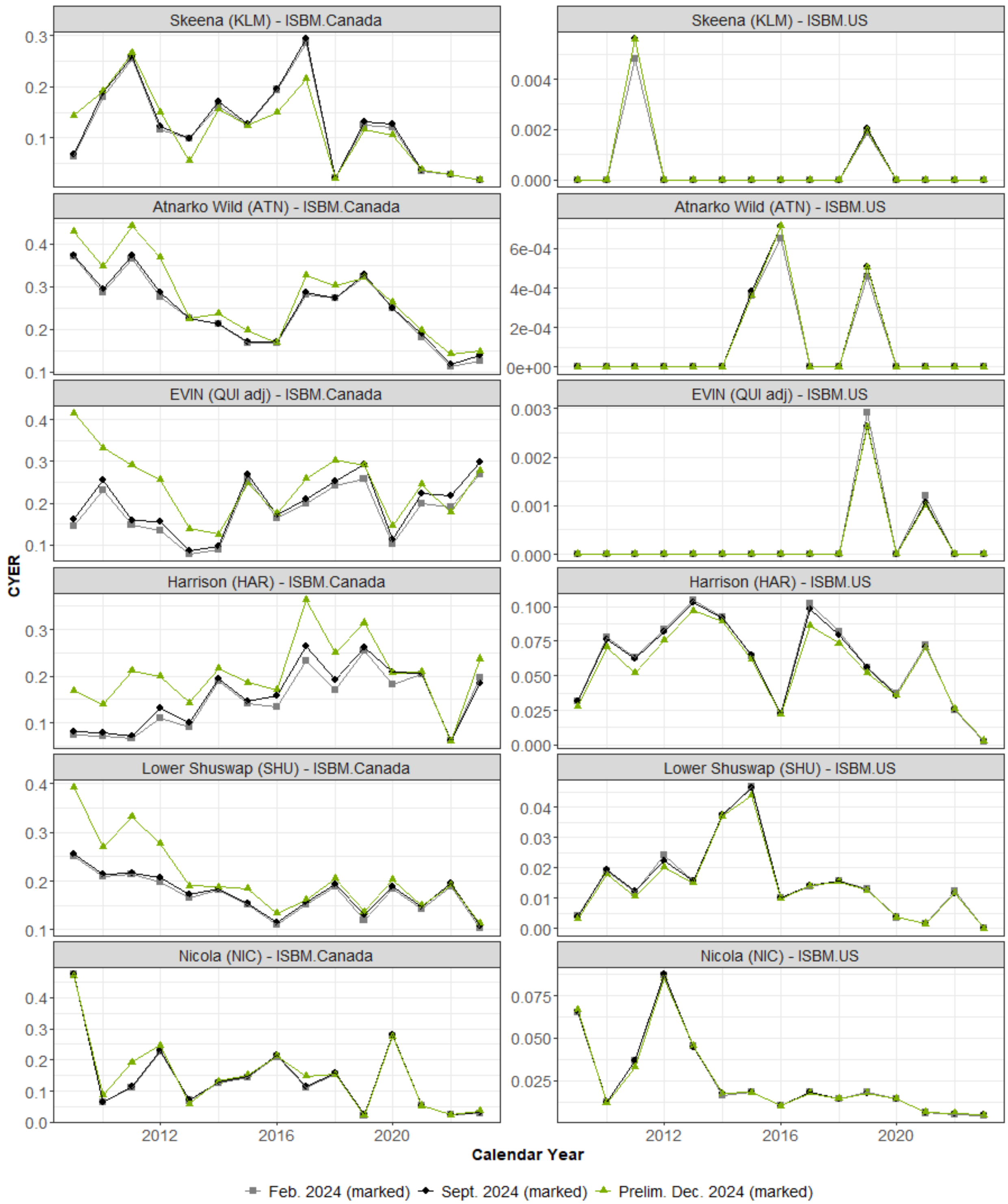
## Changes in Marked CYER Estimates (Task 1)

The sections below provide time series graphs of CYER estimates for marked Chinook from 2009 to 2022 for the three recent instances of the ERA. This section addresses the first task of the CIG request, with Canadian and Southern U.S. Attachment I stocks split into subsections. Estimated CYER values used for the graphs are provided as an attached file.

### Changes in Marked CYER Estimates for Canadian Stocks

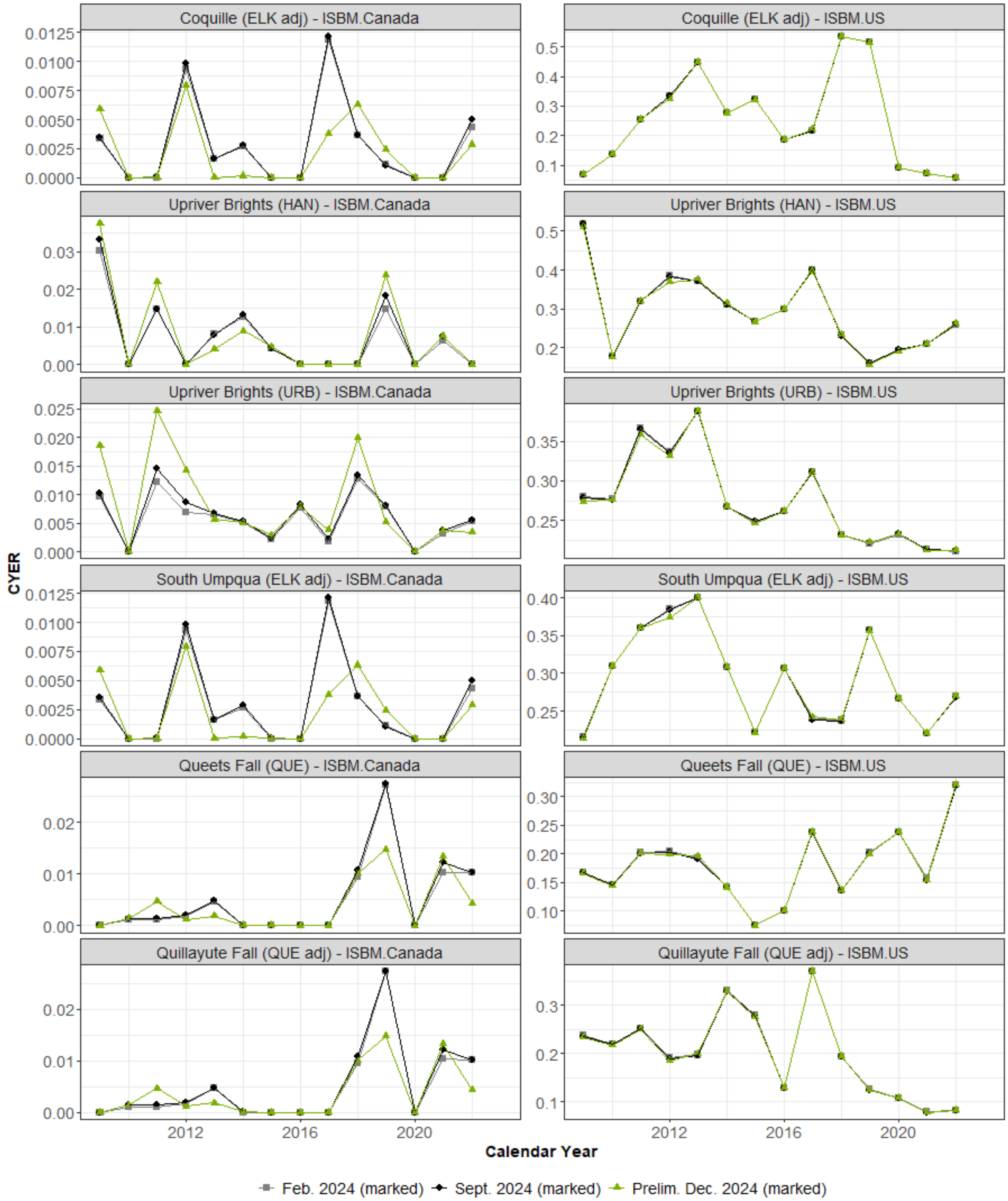



*CYER estimates for Canadian marked Attachement I Chinook stocks based on the February 2024 (grey), September 2024 (black), and preliminary December 2024 (green) Exploitation Rate Analysis.*

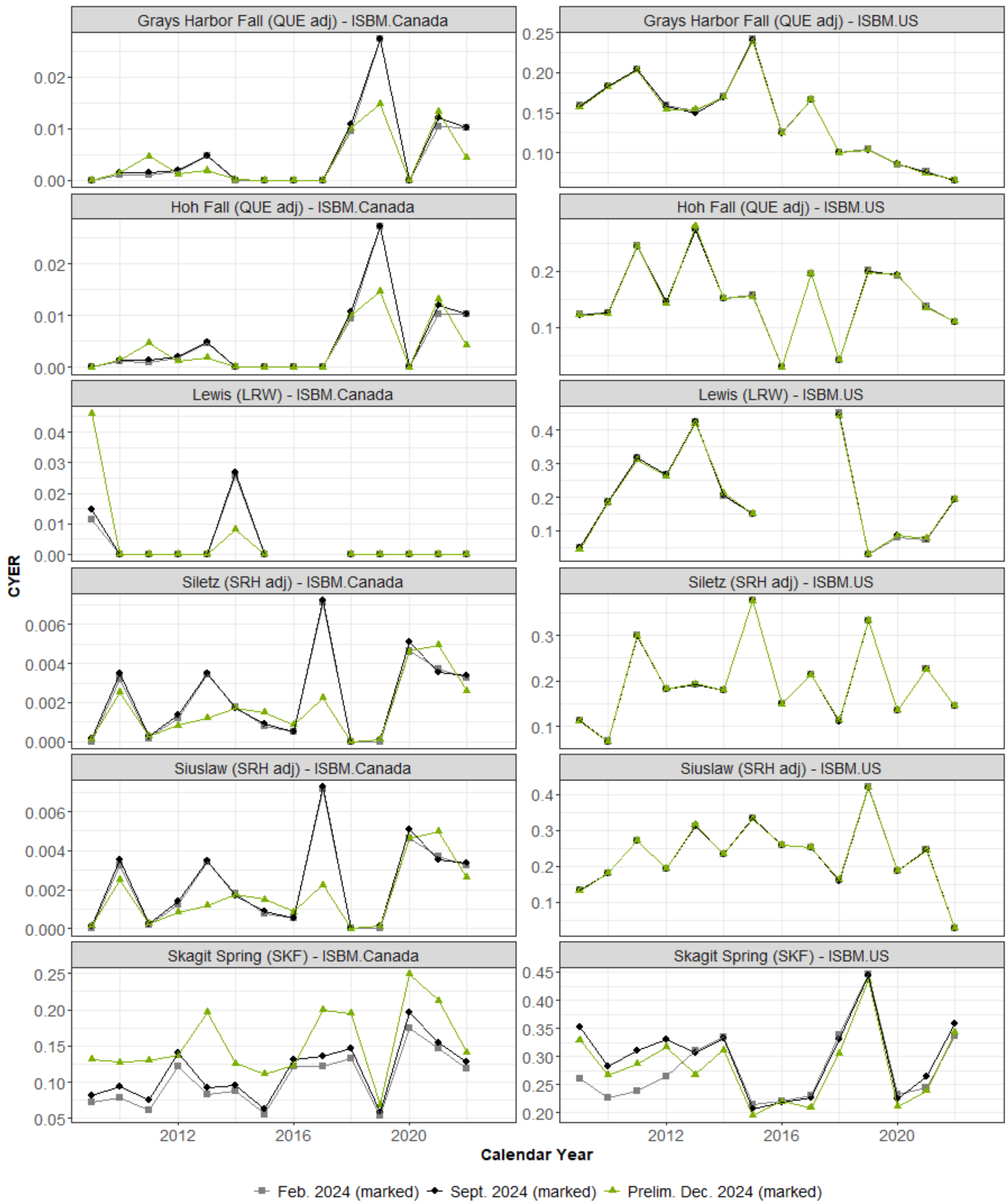



*CYER estimates for Canadian marked Attachement I Chinook stocks based on the February 2024 (grey), September 2024 (black), and preliminary December 2024 (green) Exploitation Rate Analysis.*

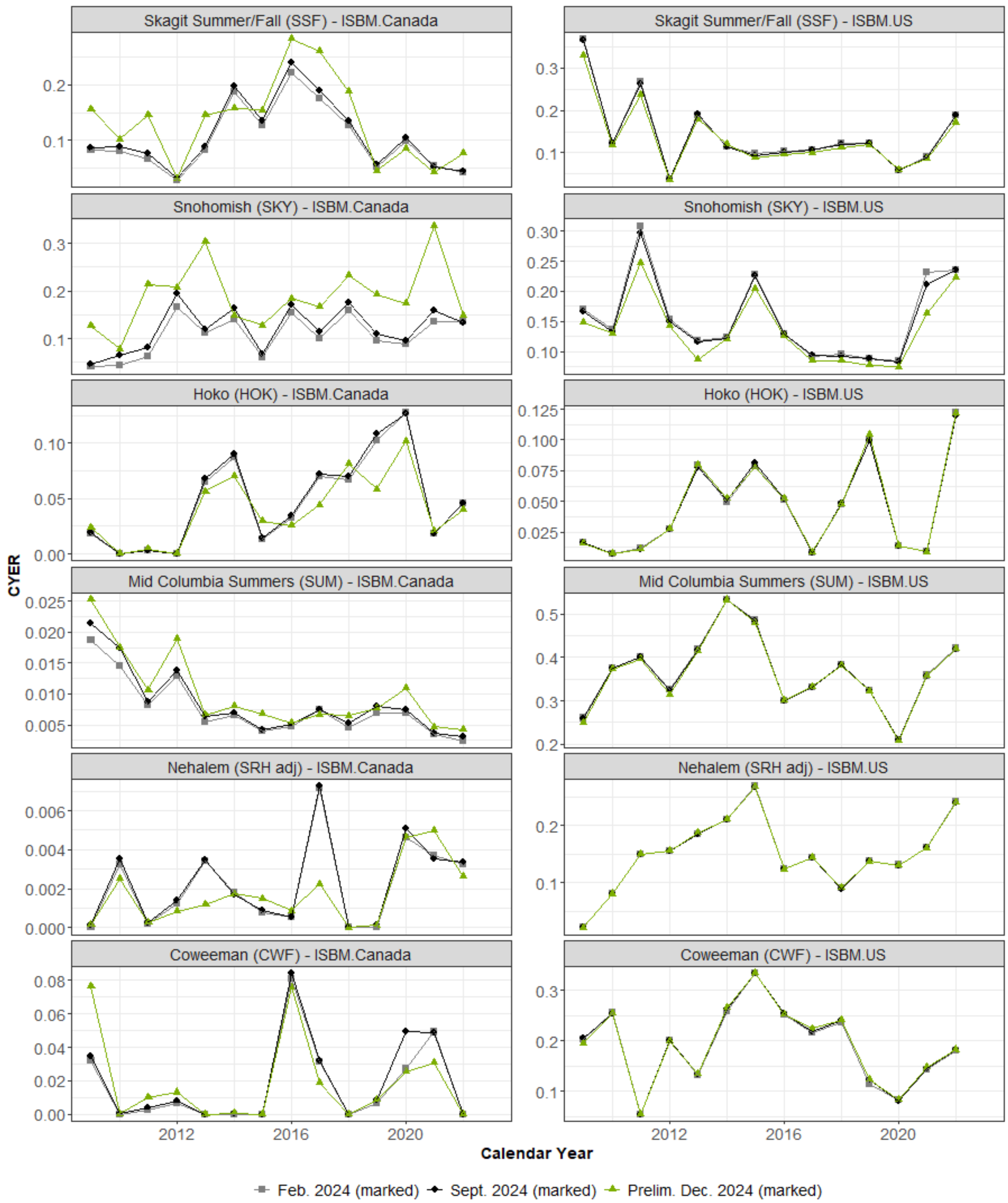
## Changes in Marked CYER Estimates for Southern U.S. Stocks



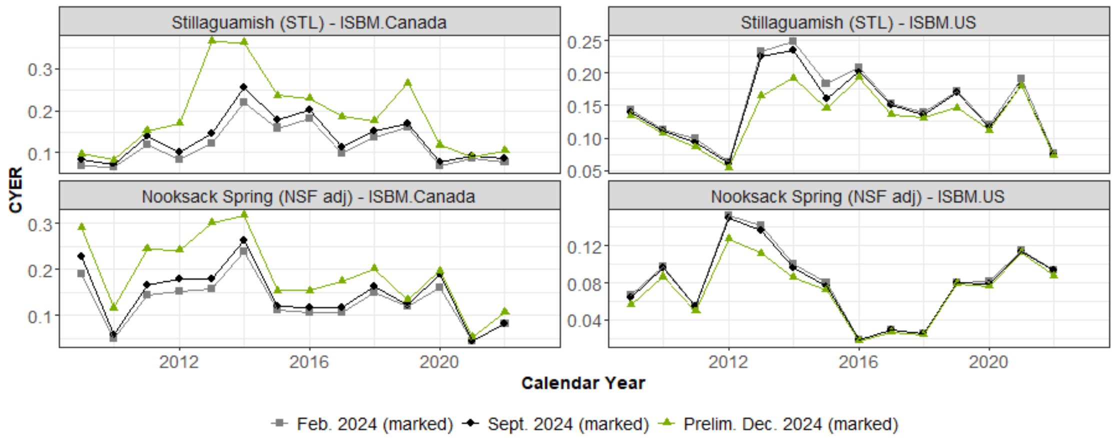

*CYER estimates for Southern U.S. marked Attachement I Chinook stocks based on the February 2024 (grey), September 2024 (black), and preliminary December 2024 (green) Exploitation Rate Analysis.*




*CYER estimates for Southern U.S. marked Attachement I Chinook stocks based on the February 2024 (grey), September 2024 (black), and preliminary December 2024 (green) Exploitation Rate Analysis.*




*CYER estimates for Southern U.S. marked Attachement I Chinook stocks based on the February 2024 (grey), September 2024 (black), and preliminary December 2024 (green) Exploitation Rate Analysis.*

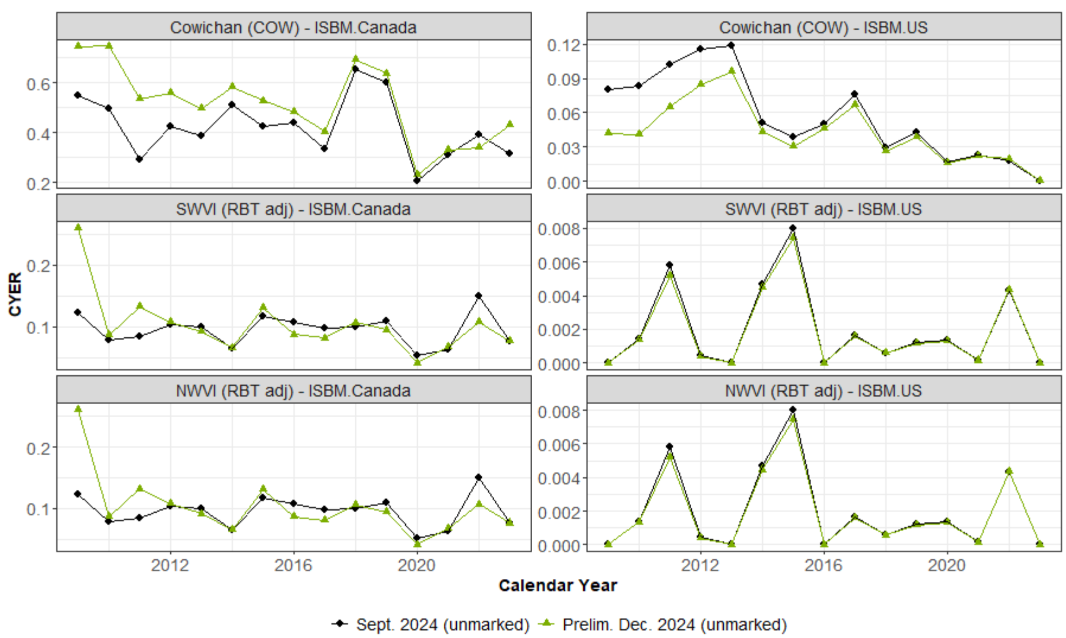



*CYER estimates for Southern U.S. marked Attachement I Chinook stocks based on the February 2024 (grey), September 2024 (black), and preliminary December 2024 (green) Exploitation Rate Analysis.*

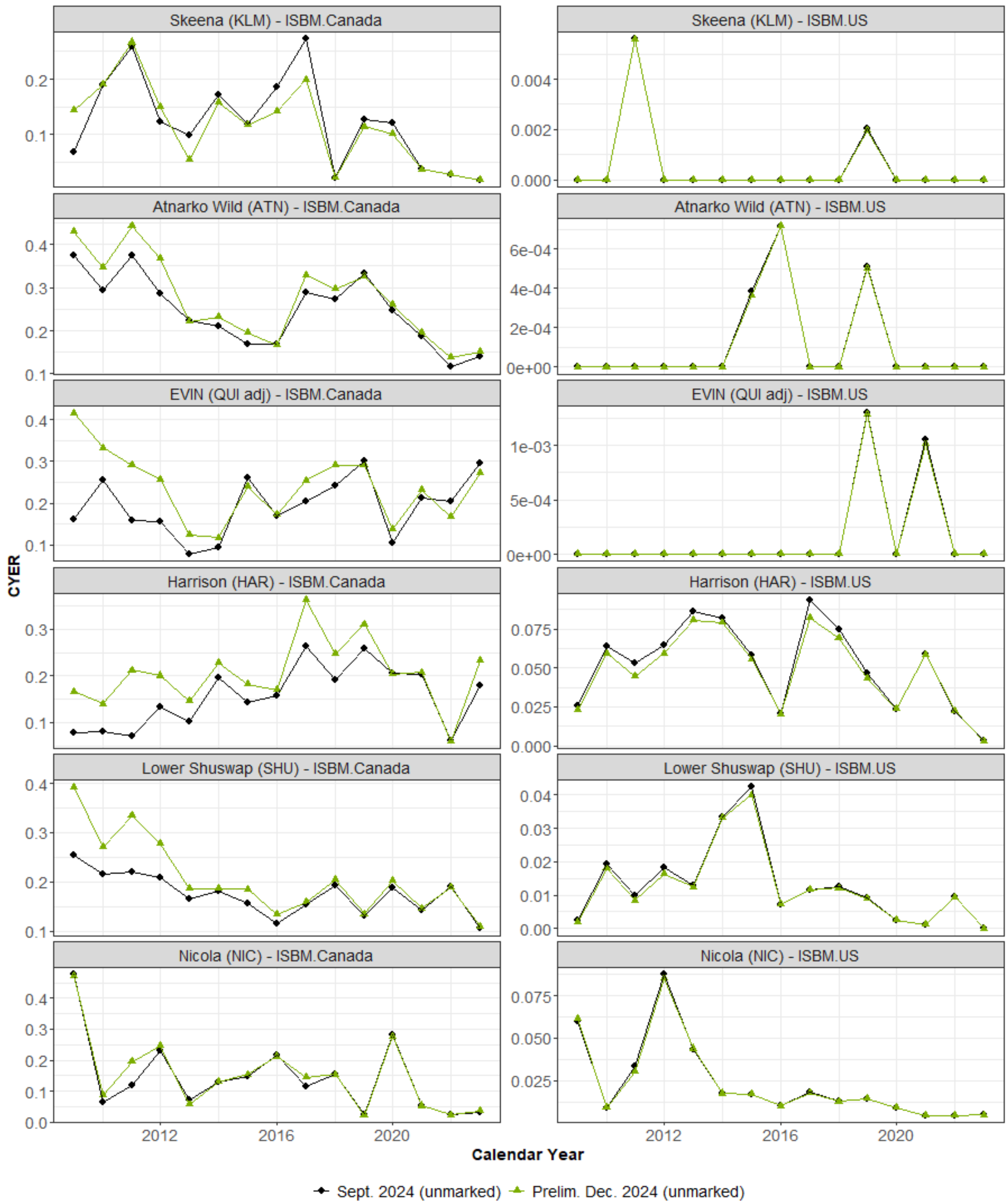
## Changes in Unmarked CYER Estimates (Task 2)

The sections below provide time series graphs of CYER estimates for unmarked Chinook from 2009 to 2022 for the two recent runs of the ERA. This section addresses the second task of the CIG request, with Canadian and Southern U.S. Attachment I stocks split into subsections. Estimated CYER values used for the graphs are provided as an attached file.

### Changes in Unmarked CYER Estimates for Canadian Stocks

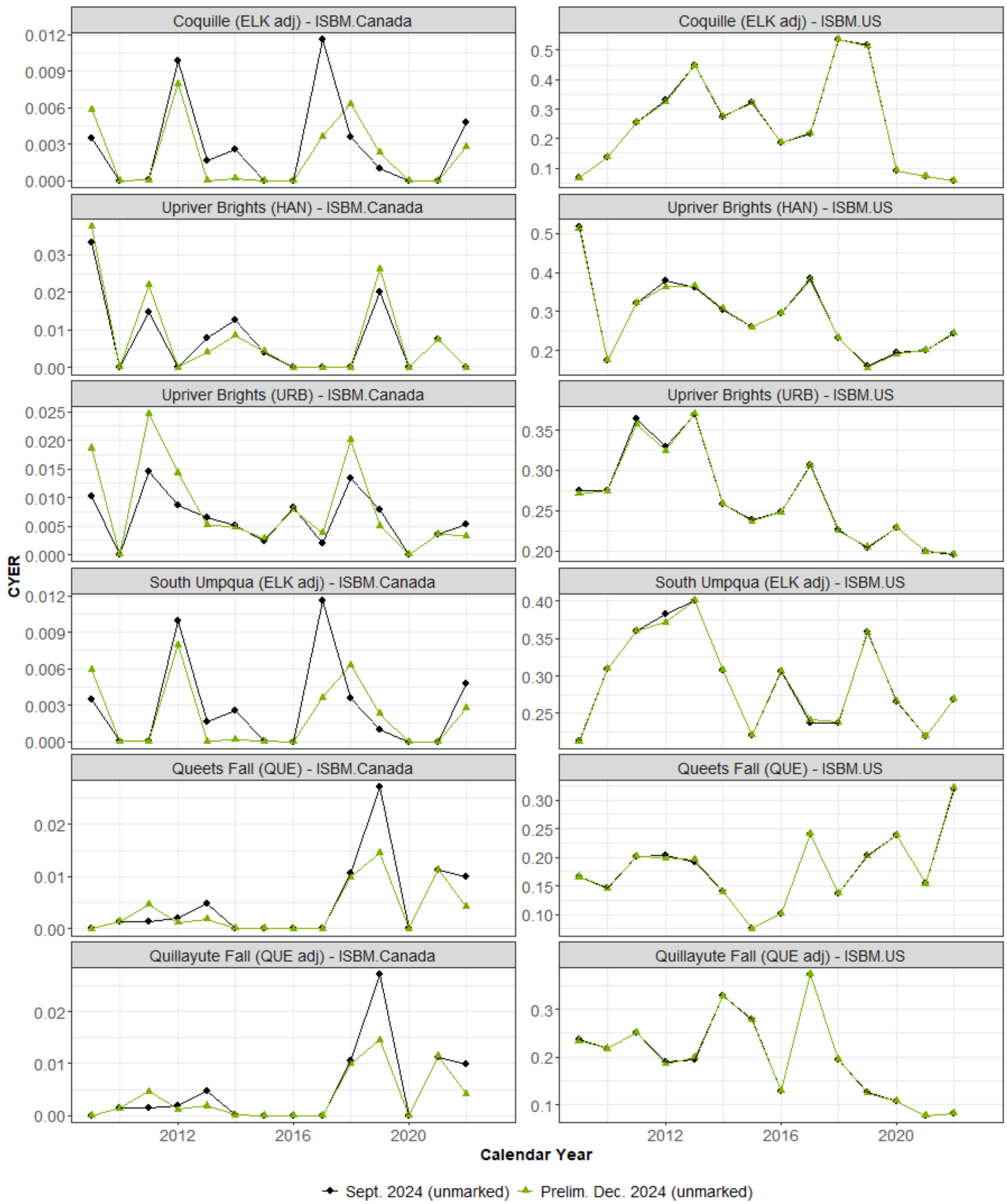



*CYER estimates for Canadian unmarked Attachement I Chinook stocks based on the September 2024 (black) and preliminary December 2024 (green) Exploitation Rate Analysis.*

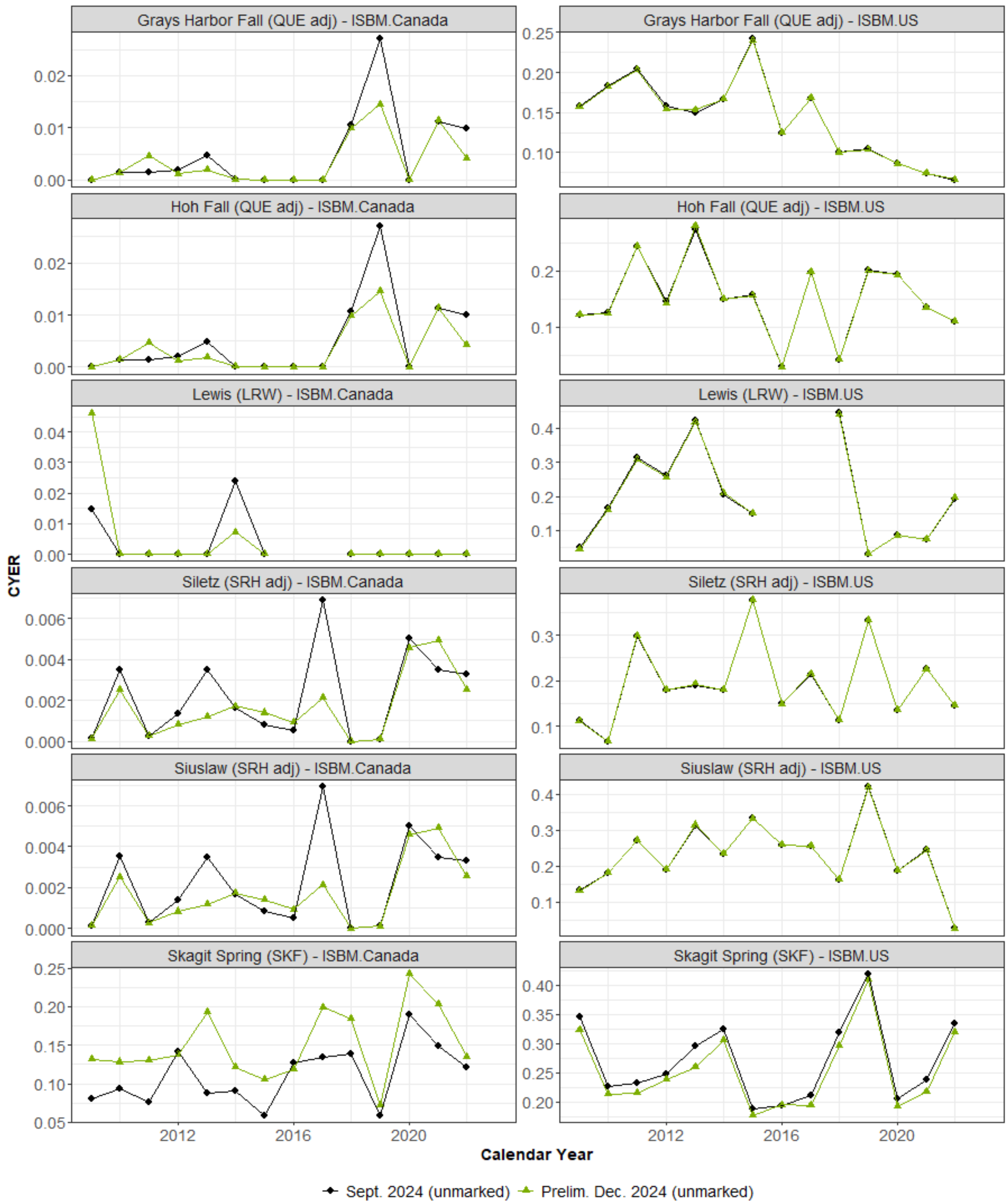



*CYER estimates for Canadian unmarked Attachement I Chinook stocks based on the September 2024 (black) and preliminary December 2024 (green) Exploitation Rate Analysis.*

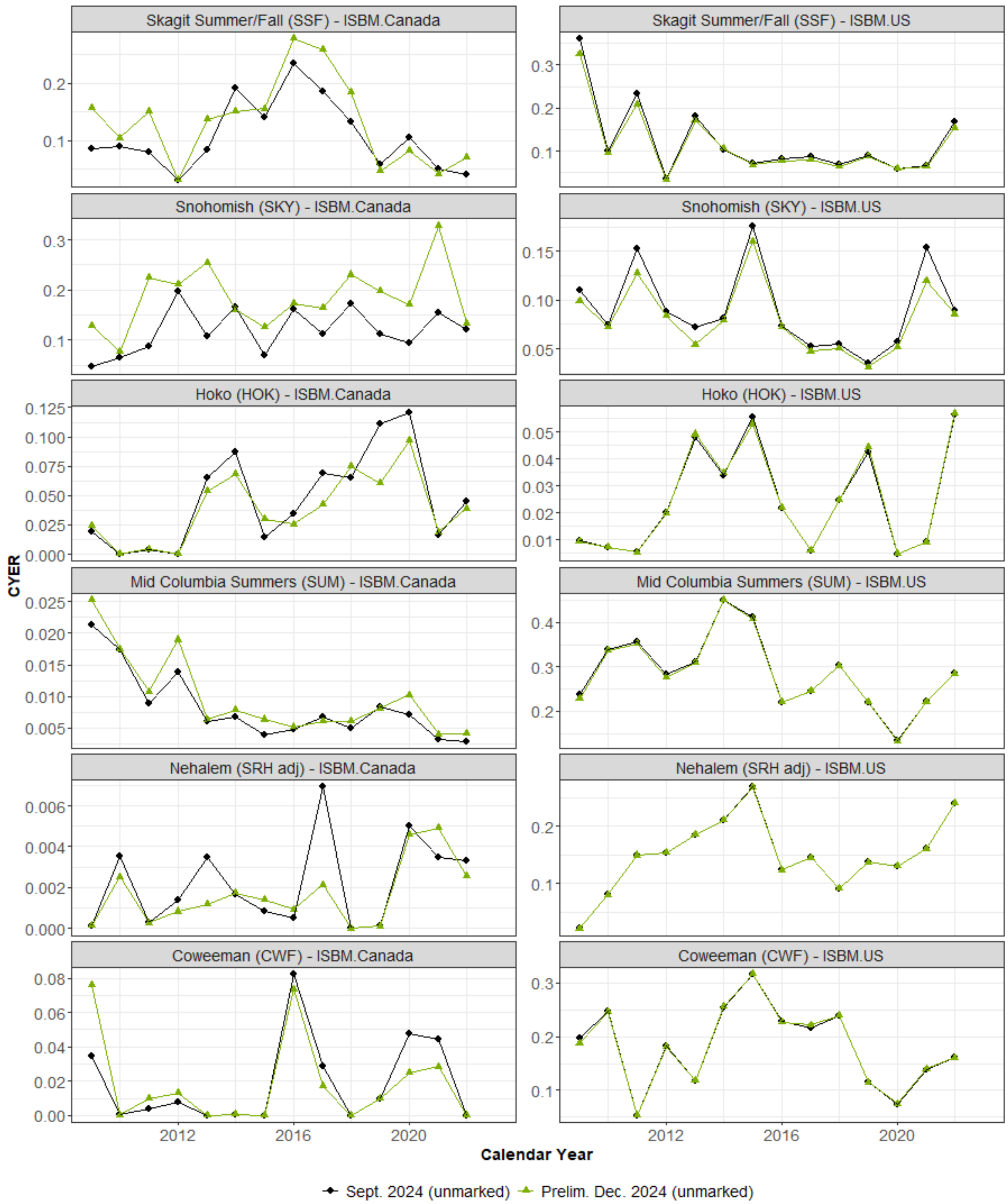
## Changes in Unmarked CYER Estimates for Southern U.S. Stocks



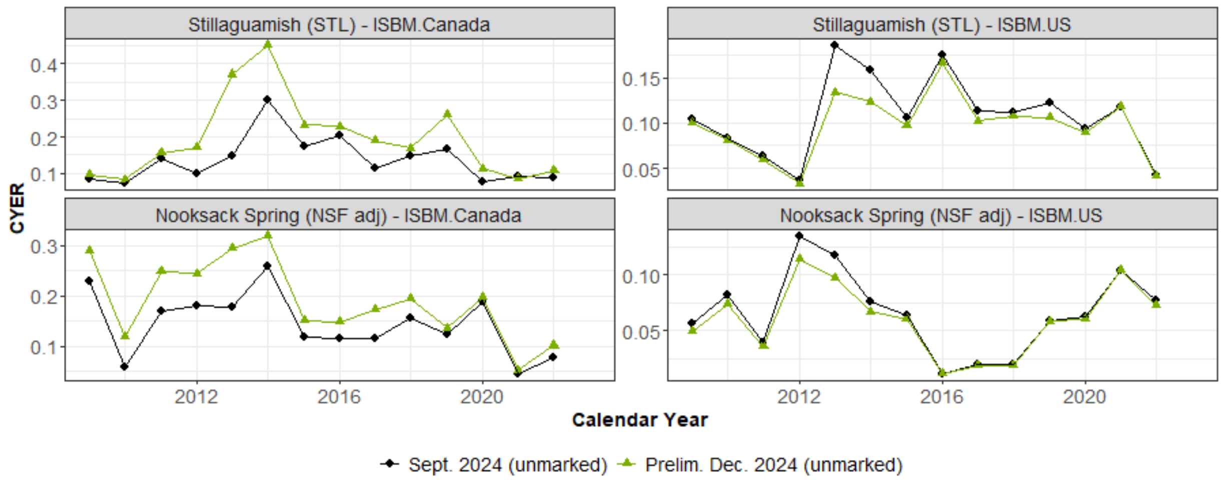

*CYER estimates for Southern U.S. unmarked Attachement I Chinook stocks based on the September 2024 (black) and preliminary December 2024 (green) Exploitation Rate Analysis.*




*CYER estimates for Southern U.S. unmarked Attachement I Chinook stocks based on the September 2024 (black) and preliminary December 2024 (green) Exploitation Rate Analysis.*




*CYER estimates for Southern U.S. unmarked Attachement I Chinook stocks based on the September 2024 (black) and preliminary December 2024 (green) Exploitation Rate Analysis.*




*CYER estimates for Southern U.S. unmarked Attachement I Chinook stocks based on the September 2024 (black) and preliminary December 2024 (green) Exploitation Rate Analysis.*

## CYER Limit Changes for Canadian Fisheries (Task 4)

| Stock Name | Feb. 2024 (marked)-CA | Sept. 2024 (marked)-CA | Prelim. Dec. 2024 (marked)-CA | Sept. 2024 (unmarked)-CA | Prelim. Dec. 2024 (unmarked)-CA |
|---|---|---|---|---|---|
| Skeena (KLM) | 0.143 | 0.148 | 0.155 | 0.147 | 0.154 |
| Atnarko Wild (ATN) | 0.272 | 0.277 | 0.321 | 0.276 | 0.319 |
| NWVI (RBT adj) | 0.083 | 0.092 | 0.12 | 0.091 | 0.119 |
| SWVI (RBT adj) | 0.083 | 0.092 | 0.12 | 0.091 | 0.119 |
| Cowichan (COW) | 0.382 | 0.418 | 0.569 | 0.419 | 0.569 |
| EVIN (QUI adj) | 0.147 | 0.161 | 0.245 | 0.158 | 0.241 |
| Harrison (HAR) | 0.101 | 0.109 | 0.171 | 0.109 | 0.173 |
| Nicola (NIC) | 0.165 | 0.167 | 0.182 | 0.167 | 0.182 |
| Lower Shuswap (SHU) | 0.196 | 0.2 | 0.262 | 0.2 | 0.262 |
| Hoko (HOK) | - | - | - | - | - |
| Grays Harbor Fall (QUE adj) | - | - | - | - | - |
| Queets Fall (QUE) | - | - | - | - | - |
| Quillayute Fall (QUE adj) | - | - | - | - | - |
| Hoh Fall (QUE adj) | - | - | - | - | - |
| Nooksack Spring (NSF adj) | 0.131 | 0.149 | 0.209 | 0.149 | 0.208 |
| Skagit Spring (SKF) | 0.07 | 0.08 | 0.12 | 0.079 | 0.119 |
| Skagit Summer/Fall (SSF) | 0.082 | 0.088 | 0.111 | 0.088 | 0.111 |
| Stillaguamish (STL) | 0.105 | 0.122 | 0.183 | 0.128 | 0.195 |
| Snohomish (SKY) | 0.078 | 0.092 | 0.15 | 0.092 | 0.148 |
| Coweeman (CWF) | - | - | - | - | - |
| Upriver Brights (HAN) | - | - | - | - | - |
| Upriver Brights (URB) | - | - | - | - | - |
| Lewis (LRW) | - | - | - | - | - |
| Mid Columbia Summers (SUM) | - | - | - | - | - |
| Coquille (ELK adj) | - | - | - | - | - |
| Nehalem (SRH adj) | - | - | - | - | - |
| Siletz (SRH adj) | - | - | - | - | - |
| Siuslaw (SRH adj) | - | - | - | - | - |
| South Umpqua (ELK adj) | - | - | - | - | - |

## CYER Limit Changes for Southern U.S. Fisheries (Task 4)

| Stock Name | Feb. 2024 (marked)-US | Sept. 2024 (marked)-US | Prelim. Dec. 2024 (marked)-US | Sept. 2024 (unmarked)-US | Prelim. Dec. 2024 (unmarked)-US |
|---|---|---|---|---|---|
| Skeena (KLM) | - | - | - | - | - |
| Atnarko Wild (ATN) | - | - | - | - | - |
| NWVI (RBT adj) | - | - | - | - | - |
| SWVI (RBT adj) | - | - | - | - | - |
| Cowichan (COW) | 0.097 | 0.09 | 0.062 | 0.08 | 0.055 |
| EVIN (QUI adj) | - | - | - | - | - |
| Harrison (HAR) | 0.07 | 0.069 | 0.064 | 0.059 | 0.055 |
| Nicola (NIC) | 0.038 | 0.038 | 0.038 | 0.036 | 0.036 |
| Lower Shuswap (SHU) | - | - | - | - | - |
| Hoko (HOK) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Grays Harbor Fall (QUE adj) | 0.155 | 0.154 | 0.153 | 0.154 | 0.153 |
| Queets Fall (QUE) | 0.138 | 0.137 | 0.137 | 0.137 | 0.136 |
| Quillayute Fall (QUE adj) | 0.208 | 0.207 | 0.206 | 0.207 | 0.206 |
| Hoh Fall (QUE adj) | 0.149 | 0.148 | 0.148 | 0.148 | 0.148 |
| Nooksack Spring (NSF adj) | 0.099 | 0.096 | 0.084 | 0.081 | 0.071 |
| Skagit Spring (SKF) | 0.251 | 0.288 | 0.268 | 0.252 | 0.235 |
| Skagit Summer/Fall (SSF) | 0.163 | 0.161 | 0.15 | 0.147 | 0.137 |
| Stillaguamish (STL) | 0.155 | 0.146 | 0.126 | 0.105 | 0.09 |
| Snohomish (SKY) | 0.177 | 0.173 | 0.155 | 0.108 | 0.097 |
| Coweeman (CWF) | 0.205 | 0.207 | 0.205 | 0.195 | 0.194 |
| Upriver Brights (HAN) | 0.286 | 0.285 | 0.284 | 0.281 | 0.28 |
| Upriver Brights (URB) | 0.263 | 0.262 | 0.26 | 0.256 | 0.254 |
| Lewis (LRW) | 0.194 | 0.195 | 0.192 | 0.19 | 0.188 |
| Mid Columbia Summers (SUM) | 0.34 | 0.339 | 0.335 | 0.29 | 0.287 |
| Coquille (ELK adj) | 0.224 | 0.224 | 0.222 | 0.223 | 0.222 |
| Nehalem (SRH adj) | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 |
| Siletz (SRH adj) | 0.172 | 0.171 | 0.171 | 0.171 | 0.171 |
| Siuslaw (SRH adj) | 0.202 | 0.201 | 0.201 | 0.201 | 0.201 |
| South Umpqua (ELK adj) | 0.267 | 0.267 | 0.266 | 0.266 | 0.265 |

## Attached Data Sets

As part of the request, several requested data sets were identified. This included the data used to generate the CYERs and the resulting CYER estimates. For the sake of brevity, these data sets are provided separately as downloadable files and are described in the table below. All these files are provided through the PSC CTC SharePoint website.

| File Name | Description |
|---|---|
| cyer_estimates.xlsx | CYER Estimates for marked and unmarked Attachment I stocks |
| Prelim Dec 2024 ERA.zip | Microsoft Access file used to produce the Preliminary December 2024 ERA |
| rec_report_data.xlsx | Canadian Recreational catch estimates produced by the updated estimation framework |
| prelim_dec_2024_hrj.zip | HRJ files from the marked and unmarked Preliminary December 2024 ERA |

## Progress Update on PSC Technical Report #51 Recommendations

Over the last year members of the Okanagan Working Group (OWG) have worked to implement or support progress on the 58 recommendations coming out of the PSC Technical Report #51. Significant progress has been made since the report was published. This progress is summarized below in Table 1, grouped into six broad categories as many of the actions address multiple recommendations.

*Table 1 - A description of the progress on various recommendations summarized by broad categories that the recommendations relate to.*

| Category | Number of Recommendations Addressed | Progress Description |
|---|---|---|
| **Hatcheries** | **5**<br><br>(Recommendations 1, 47, 50, 51, 53) | The following progress was made on recommended actions related to hatcheries:<br><br>• Ongoing work to develop a bilateral supplementation program is a key part of the OWG work plan for 2024/25<br>• Letters requesting Chinook eggs for the kłcp̓əlk̓stim̓ hatchery in Canada were sent by both DFO and ONA to CCT Chief Joseph hatchery (summer 2024). No response or eggs were received. This is currently being discussed as part of the supplementation planning process.<br>• A subset of the OWG met virtually with management entity staff regarding the feasibility, permitting, and option to collect eggs and live adults in the U.S. and transport them to Canada for the supplementation program. A brief concept document was developed and distributed to participants. The permitting was initiated for cross-border transfer of fish, and plans are to tentatively implement one of the options in 2025<br>• In July, the OWG sent letters to U.S. hatcheries requesting they scan broodstock and surplus collections for Canadian PIT tagged Chinook. Wells hatchery implemented a new system to avoid Canadian-released Chinook. One Canadian-released Chinook was collected for broodstock by Wells Hatchery. It will be necessary to supply updated tag lists annually to include all returning ages. Further efforts are required to improve sharing of biological and PIT data between monitoring programs.<br>• Colville Tribes hired a consultant to do an alternatives analysis for improvements to Chief Joseph Hatchery water systems, which has been completed. Colville is working through the process with BPA and ACOE to get to a solution. |

| | | |
|---|---|---|
| **Habitat** | **12**<br><br>(Recommendations 2, 9, 10, 11, 15, 16, 20, 22, 23, 24, 25, 49) | The following progress was made on recommended actions related to habitat:<br><br>• In Canada, several habitat restoration projects have been initiated or implemented, including:<br>o Naturalization of and spawning and rearing habitat creation in Vernon Creek; restoration of riparian vegetation in the project area<br>o Re-connection of portions of Okanagan River floodplain on the north end of Vaseux Lake are in progress. Construction is planned to proceed in winter 2024/25 pending permitting<br>o Riffle installation in the mainstem Okanagan River upstream of Vaseux Lake has backwatered one Vertical Drop Structure, created spawning habitat through gravel placement, and has re-meandered the river flow between the existing dikes to improve flow velocities and heterogeneity in the channel. Additional riffle installations are scheduled for winter 2024/25 at two Vertical Drop Structures in the same reach.<br>o Funding proposals were submitted to initiate re-connection of oxbows/side channels to the mainstem Okanagan River upstream of Osoyoos Lake<br>o Osoyoos Lake experiences bottom hypoxia and high surface water temperatures. In-lake habitat conditions (temperature - DO profiles) were monitored intensely in summer 2024 to determine migration and holding habitat availability in the lake. A funding proposal was submitted to investigate the engineering feasibility of (1) aerating Osoyoos Lake to mitigate hypoxic conditions, and (2) hypolimnetic siphon/cold water release to mitigate high water temperatures.<br>o BC Institute of Technology is conducting a project to map cool water refugia in Okanagan using drones. A study is underway on surface water-groundwater interactions in tributaries to the Okanagan River |

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| **Monitoring** | **11**<br><br>(Recommendations 4, 13, 14, 17, 21, 34, 35, 36, 37, 40, 58) | The following progress was made on recommended actions related to monitoring:<br><br>• PIT infrastructure: several PIT arrays received additions, repairs or upgrades, including arrays at the outlet of Okanagan Lake, in the Penticton Channel, in the Okanagan River upstream of Osoyoos Lake, and at Zosel Dam at the outlet of Osoyoos Lake. Repairs and upgrades were made to the power supply, housing, and arrays themselves. This resulted in better coverage, less downtime and higher detection probabilities. Operating Zosel Dam with stop logs during smolt migration in spring 2024 created overhead spill instead of the usual undershot spill, which forced smolts closer to the surface and the floating PIT antennas, resulting in improved juvenile PIT detection probabilities (approx. 3% average in prior years to approx. 16% in 2024). Over the winter of 2024/25, the floating PIT arrays will be modified to permit easier adjustments. Long-term funding for operating Okanagan tributary PIT arrays in Canada was lost.<br>• Juvenile monitoring: ONA released 11,900 PIT tagged Chinook in 2023 and 5,537 PIT tagged Chinook in 2024. Predation and habitat use studies using acoustic tags were conducted by DFO, ONA and Thompson Rivers University in 2024. The predation study indicated significant bass predation below vertical drop structures in the channelized reaches of the Okanagan River. CRITFC put forward a proposal to study Okanagan Sockeye avian predation in the Columbia River.<br>• Ongoing work to improve Inter-Dam-Loss (IDL) estimates and have them incorporated into the new REAM process for the CWT ERA analysis. Possible improvements to the IDL estimates will be discussed in the OWG March meeting.<br>• Continued adult monitoring in Canada and the U.S. includes biological length and age samples and origin (hatchery vs natural) which allows tracking of body size at age trends to determine productivity implications.<br>• A summary of exploitation rates and smolt-to-adult survival rates for Upper Columbia summer Chinook was compiled to support comparisons of the productivity of Okanagan summer Chinook relative to other summer / fall Chinook populations with similar life-history characteristics.<br>• WDFW Avian Predation position (new but not currently filled) was to fill a role on the WA legislatively mandated Avian Salmon Predation Work Group to write a report; any actions would be in concert with other managers of fish/birds. |

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| **Fisheries Monitoring** | **4**<br><br>(Recommendations 38, 39, 41, 46) | The following progress was made on recommended actions related to fisheries monitoring:<br><br>• Fisheries monitoring: Improvement of CWT sampling rates for Columbia River net and sport fisheries was included in the research themes for the Southern Endowment Fund request for proposals for 2025 projects; Washington received MSF funds for 2022 and 2023 to support increased sampling however there was a delay in recruitment; enhanced sampling occurred in both Buoy 10 (MSF) and Area 1 (non-MSF) near the mouth of the Columbia River during the fall season (Aug 1 onward); 2022 resulted in 12 sample days with 223 Chinook sampled and 2023 resulted in 103 sample days and 354 Chinook sampled. CWT tagging efforts for the Similkameen are ongoing.<br>• Exploitation Rate Analysis: The CTC has applied the methods recommended by the PSC Calendar Year Exploitation Rate work group to generate CWT-based exploitation rates that represent the impacts of mark-selective fisheries on unclipped Okanagan Chinook. A new item was added to the OWG workplan to examine the effects on the Similkameen (SMK) indicator stock.<br>• Fisheries management: In 2024 due to concerns for the Okanagan Chinook return, WDFW did not open a portion of the Brewster/Wells Pool for Chinook (Sockeye remained open); WDFW/CCT did not open any areas within the Okanagan River. |

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| **Passage** | **5**<br><br>(Recommendations 16, 18, 42, 44, 45) | The following progress was made on recommended actions related to fisheries passage:<br><br>• Okanagan Lake Dam: A funding commitment was received to create a side channel passage route around Okanagan Lake Dam in Penticton. Construction is planned for winter 2025. This will improve passage for adults migrating up stream and allow for better estimation of the number of Chinook migrating past the dam.<br>• Zosel Dam: Washington Department of Ecology (WDOE) is replacing and upgrading several gates at Zosel Dam this winter. A meeting was held between CRITFC, ONA, WDOE, Colville Confederated Tribes (CCT), and DFO to discuss the gate upgrades and issues related to adult and juvenile salmon passage at the dam. In spring 2024, CRITFC, CCT and ONA worked with WDOE and OTID to implement gate operations at Zosel Dam that improve juvenile outmigration passage past the dam, by installing stop logs and creating overhead spill as opposed to the undershot spill created by the existing gates. In addition, the group implemented gate operations changes in August 2024 to improve adult salmon passage upstream to the spawning grounds. A written memo report of 2024 activities, results and recommendations will be prepared over winter 2025.<br>• Enloe Dam: DFO Science has proposed to (PSC SEF 2024) to fund a 3-day workshop focused on information sharing, identifying key science gaps, and preliminary development of a watershed monitoring strategy. The workshop will include diverse groups who are planning for the return of salmon and steelhead to the Similkameen River; this includes NOAA Fisheries, WA Dept. of Fish and Wildlife, Upper Columbia River Tribes and First Nations, Fisheries and Oceans Canada, and the Province of British Columbia among others. NOAA and DFO have applied to the Southern Fund for the resources to convene a workshop to discuss an ecological monitoring program related to the Enloe Dam removal. This is from a research perspective in anticipation of salmon access to the upper Similkameen River. Colville Tribes habitat program and Trout Unlimited received NOAA funding to continue with feasibility assessment of dam removal.<br>• All Okanagan River dams: A subcommittee of the Canadian Okanagan Basin Technical Working Group (COBTWG) focuses on improving fish passage at all dams. The group has drafted a monitoring plan for the fish ladders at Okanagan and Skaha dams to check for passage issues (debris buildup, damage or adjustments needed to the stop logs) at key times of the year.<br>• Vertical Drop Structures: ONA has backwatered one of the Vertical Drop Structures (#17) with a riffle and added spawning gravel to ease fish passage and increase spawning habitat. Further work is planned over winter 2025 to backwater two additional drop structures.<br>• Thermal barrier: ONA and DFO are initiating study on cold water release to improve migration conditions. |

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| **Invasive Species** | **5**<br><br>(Recommendations 3, 26, 27, 30, 32) | The following progress was made on recommended actions related to invasive species:<br><br>• A predation and habitat use studies for juvenile Chinook were conducted in spring and summer 2024, using acoustic tagged hatchery Chinook from the ONA hatchery. Data analysis and reporting are currently in progress. ONA is preparing a scope of work for a predator suppression program (e.g., bass).<br>• Upper Columbia United Tribes (UCUT) has formed a "Northwest Regional Northern Pike Coordination Forum". CCT's Northern Pike Rapid Response Plan is finalized and included as part of the Washington State Plan which was completed in March 2024.<br>• Throughout 2024, WDFW assisted the U.S. Army Corps of Engineers as it developed environmental compliance and program authorization necessary for a future northern pike cost-share program focused on preventing spread downstream to the Okanogan River mouth and other areas downstream of Lake Roosevelt.<br>• WDFW updated their State Wildlife Action Plan, adding reference to Northern pike as a threat to Chinook throughout the Columbia basin and Okanogan Chinook specifically. The Plan will be published in 2025. |
| **No Progress** | **15**<br><br>(Recommendations 7, 8, 12, 19, 28, 29, 31, 33, 43, 48, 52, 54, 55, 56, 57) | On 15 of the recommendations no progress can be reported. These are due to varying causing, including lack of funding, heavy workloads and in some cases these recommendations rely on outcomes from other recommendations where progress is being made. As other recommendations get completed there will be more time to make progress on these items. |

Despite the significant progress that was made in the last year there is still continued work required to develop the bilateral supplementation program, coordinate data sharing, improve escapement and harvest rate estimates as well as work to address habitat and temperature issues in the Okanagan. In particular, action is required to develop the process for egg or brood stock transfer from the U.S. to Canada which will form the basis for the supplementation program. Without a defined process in place, it is difficult to progress on drafting the supplementation program. Overall, members of the OWG group have undertaken substantial actions aiming to address the majority of the recommendations from the PSC Technical Report #51 with continued work expected in the 2024/25 work plan year.

# 2025 PACIFIC SALMON COMMISSION
# ANNUAL MEETING

Coded Wire Tagging and Recovery/Catch and Escapement Improvement Indicator Work Group (C2)

<u>2024-25 WORK PLAN PROGRESS UPDATE</u>

**Work Plan Tasks:**

*(i) Create opportunities for the exchange of project results and conclusions, advancements in knowledge, discussion of the direction of these programs between the Parties, management entities, and knowledgeable individuals;*

<u>Status Summary</u>: The workgroup has not convened to specifically advance progress on this task. It is anticipated that exchange of project results will occur in September at a meeting identified in the C2 workplan. Additional meetings before September may be scheduled as needed to make progress on this task.

*(ii) Review project results and conclusions from these programs and provide these reviews to the project proponents and the Commission; and*

<u>Status Summary</u>: Although the C2 workgroup has received presentations on relevant projects in the past (this last occurred in September 2024), no formal reviews have been provided to the project proponents or the Commission to date.

*(iii) Identify, for the Commission, changes to projects or suggest new projects to fill gaps in knowledge.*

<u>Status Summary</u>: The workgroup has met twice during this meeting cycle to advance progress on this task. The work group met on November 25th to discuss and conceptualize an approach to identify gaps in knowledge. The outcomes of this C2 meeting were discussed at the CIG meeting on January 13th and described in the CIG meeting notes. The C2 workgroup met again on January 27th to make further progress on this task. At this meeting, several gaps were identified by each a party and a plan for reporting on these gaps was discussed. The workgroup plans to meet again on April 16th to further solidify identified gaps and reporting plans.

**Comments:**

None.

**DRAFT Commission responses and corrections to Annex IV, Chapter 3**

**Since Entry into Force in 2019**

**February 5, 2025**

This document, prepared by the Secretariat, was approved by the Commission on [insert date] to summarize notable PSC responses and typographical corrections to various provisions in Annex IV, Chapter 3 of the Pacific Salmon Treaty. This summary is based on an exhaustive review of Commission records since the current version of Chapter 3 entered into force in 2019 and does not reflect substantive changes to Chapter 3 or its legal force in either Party.

1. **(Page 49) Subparagraph 2(a)(ix), Footnote 9**
    a. At the February 2022 meeting, the Commission agreed to revisit the language in footnote 9 of Chapter 3, Paragraph 2(a)(ix) to reflect the current Phase 2 PSC Chinook Model. Significant management changes will be compared to BPCV1-28 AC1 rather than CLB1804 (which was referenced in the original footnote 9.)
    b. The correct reference is now: *The model configuration BPCVI-28 shall be used to establish a baseline run. The Parties shall document specific concerns or inconsistencies between that configuration and the management regime in 2018*.

2. **(Page 51) Subparagraph 2(c), Footnote 11**
    a. In February 2023, the Secretariat updated the correct reference in the footnote to TCCHINOOK (13)-1, which had previously referenced TCCHINOOK (13)-2.
    b. The revised footnote now reads: *Guidelines in TCCHINOOK (13)-1 and PSC Technical Report 25 (Correct reference to TCCHINOOK (13-1) updated in February 2023.*

3. **(Page 52) Subparagraph 2(e)** *create and maintain a work group to discuss the programs initiated in sub-paragraphs (c) and (d) by 2020.*
    a. During the February 2021 meeting, the Commission agreed to the chosen membership in the CWTR/CEII committee (which eventually became referred to as the "C2 Work Group".)
    b. The CWTR/CEII had their initial meeting on January 2022.

4. **(Page 54) Subparagraph 4(c)** *The CTC shall recommend standards for the desired level of precision and accuracy of data required to estimate incidental fishing mortality by February 2020.*
    a. At the January 2020 meeting, the Commission agreed that the January 14, 2020, memo from the CTC to the CIG regarding incidental mortality precision and accuracy is adopted, and the February 2020 deadline to develop standards will need to be delayed.
    b. During the February 2020 meeting the CTC anticipated that it could provide recommendations on data collection standards and desired levels of precision and accuracy of encounter estimates at or before the February 2021 PSC Annual Meeting.
    c. During the February 2022 meeting the CIG reviewed the Incidental Mortality Report TCCHINOOK (22)-01 published by the CTC. The CIG recommended and the Commission agreed to "reviewing the report and adding the incidental mortality report on the forward CIG agenda".

5. **(Page 56) Subparagraph 5(b)** *The Commission shall establish a work group to explore issues related to Okanagan Chinook, including the establishment of management objectives, enhancement and the possible use of Okanagan Chinook as an indicator stock[14]. The work group shall report to the Commission by October 2019.*
    a. During the January 2019 meeting the Commission agreed that a small workgroup on Okanagan Chinook is authorized. This group would include one Commissioner and two experts from each Party and would develop its draft terms of reference consistent with the scope of Chapter 3, paragraph 5(b).

6. **(Page 56) Subparagraph 5(e)** *the Commission shall use the Calendar Year Exploitation Rate (CYER) metric to monitor the total mortality in ISBM fisheries and shall review the CYER metric during the year 2022 to make a decision on its continued application or the use of an alternative metric. In the absence of a Commission decision to use an alternative metric, the use of the CYER metric continues. Before the review, the CTC shall complete the development of the Data Generation Model, complete the evaluation of alternative metrics for the evaluation of ISBM fisheries and develop data standards for the application of CYER as a metric.*

a. During the February 2022 meeting the Commissioners agreed to remove the 2022 timeline associated with the review of alternatives to the CYER metric. Should an alternative metric be proposed, the CTC will be responsible for carrying out a timely review of the proposed metric consistent with their approved work plan. This decision is noted for the record but will not affect Treaty text.

7. **(Page 57) Subparagraph 6(b)(ii)** *the US shall provide to the Commission by February 1 of each year a proposed annual catch limit based on the estimated CPUE from the winter power troll fishery in District 113 during statistical weeks 41-48 (using method and base period data in Appendix B to this Chapter) and Table 2*
   a. At the January 2023 meeting, the Commission confirmed with the relevant management entity that the CPUE method would not be used for setting catch limits in the SEAK AABM fishery for 2023.
   b. The Commission therefore waived the U.S. obligation to propose a catch limit using the CPUE methodology by February 1, 2023 (Chapter 3, subparagraph 6(b)(ii)) as allowed by Chapter 3, paragraph 7(g): *that unusual circumstances may arise in the management of ISBM and AABM fisheries. Either party may ask the Commission for some flexibility in the implementation of this Chapter to avoid undue disruption of fisheries while maintaining the conservation and allocation principles embodied in this Treaty.*

8. **(Page 60) Subparagraph 7(c)** *that for ISBM fisheries, the CTC shall annually compute and report the metrics described in paragraphs 5(a), and, using the best available post-season data and analysis, report performance to the Commission of those metrics and the obligations set out in this Chapter. If a Party anticipates that there is a risk that it may exceed its CYER limit in a given year, that Party shall advise the Commission before the fishing season, provide supporting rationale and explain how the CYER limit shall be achieved on average over a three-year period. Beginning with the 2019-2021 catch years[17], the CTC shall compute a running three-year average of CYERs for all stocks*
   a. At the October 2022 meeting, the Commission agreed that Option B (Option B: Require three years of CYER data to be included in the average – note: this option would result in reporting 3-year averages

less frequently than in Option A but more frequently than in Option C) is adopted for the 2023 calculation of the 3-year running average CYER under Chapter 3, paragraph 7c. Approaches for this calculation in future years will be revisited by the CIG.

**9. (Page 61) Paragraph 7**

*[…]*

*(d) to conduct up to two reviews of the CPUE-based approach to decide whether to continue to use this method to determine the catch limit for the SEAK AABM fishery, to return back to use of the Commission Chinook model, or to adopt an alternative method as determined by the Parties, to determine pre-season estimates of the aggregate AI of Chinook stocks available to the SEAK troll fishery and the relationship between the catch and AIs specified in Table 1. The first review shall occur as soon as practical after the 2022 first post-season AI is calculated, and the second review shall occur as soon as practical after the 2025 first post-season AI is calculated.*

*(e) to consider the results of reviews described in subparagraph (d), immediately, and decide whether to continue to use the CPUE method for the SEAK AABM fishery. Unless the Commission decides to continue to use the CPUE-based approach or adopt an alternative method, the Commission Chinook model estimate of the AI and table 1 shall be used to determine the annual pre-season and post-season catch limits.*

a. At the February 2023 meeting, the Commission agreed to:
    i. Suspending use of the CPUE-based approach to determine the catch limit for the SEAK AABM fishery.
    ii. Utilizing the CTC-proposed Method 4.3 which is the same as the ADF&G proposed multivariate model, in conjunction with the 17 tiers proposed by the CTC, to set the catch limit for the SEAK AABM fishery in 2023.
    iii. Having the CTC conduct further analyses to inform how a trigger point for subparagraph 7(b) for the SEAK AABM fishery could be set in the future if Method 4.3 and the CTC-proposed 17-tier approach continue to be utilized to set the SEAK AABM catch limit. The CTC would report back to the Commission with these analyses prior to the 2023 October Executive Meeting.

iv. Having the CTC review the CPUE-based approach outlined in Chapter 3, subparagraph 7(d), and submit its findings before the October 2023 meeting. This review would include the information specified in subparagraph 7(d), along with any additional data that could help inform the Commission's decision on the continued use of Method 4.3 and the CTC-proposed 17 tiers to set the SEAK AABM fishery catch limit for 2024 and beyond.

b. At the October 2023 meeting, the Commission agreed that the CTC was no longer required to conduct a second review of the CPUE method outlined in Chapter 3 subparagraph 7(d) since this method would not be used going forward. It was agreed that unless the Commission decides to adopt an alternative model at the January 2024 meeting, per paragraph 7(e), the Commission Chinook model estimate of the AI and Table 1 shall be used to determine the annual SEAK pre-season and post-season catch limits.

c. At the October 2023 meeting the Commission also agreed to the adoption and publication of the CTC report: "2023 Review of the Catch per unit effort-based approach and response to Chapter 3 subparagraph 7(b) tasks for the Southeast Alaska Aggregate Abundance-Based Management Fishery" in fulfillment of the obligations in Chapter 3, subparagraph 7(d) of the 2019 PST Agreement.

d. At the January 2024 meeting, pursuant to paragraph 7(d) and 7(e), the Commission returned to the use of the Commission Chinook Model and Table 1 for SEAK AABM fisheries and approved the application of the 10% exceedance rule that defines the triggers for 7(b)(i) and (ii).

**10. (Page 63-64, 65-67, 77-79, 80-82)** Tables

a. At the <u>October 2019</u>, meeting, the Commission agreed on the recalibration of the Chinook Model, its adoption, and implementation and translation of Tables 1 and 2 and Appendix C in Chapter 3 of Annex IV. This resulted in updates to the original versions of these tables as shown on the respective pages.

11. **(Page 69) Subparagraph 2** *The CTC shall recommend standards for the level of precision and accuracy of data required to estimate incidental fishing mortality by February 2020.*
    a. At the January 2020 meeting, the Commission agreed that the January 14, 2020, memo from the CTC to the CIG regarding incidental mortality precision and accuracy is adopted, and the February 2020 deadline to develop standards will need to be delayed.
    b. During the February 2020 meeting the CTC anticipated that it could provide recommendations on data collection standards and desired levels of precision and accuracy of encounter estimates at or before the February 2021 PSC Annual Meeting.
    c. During the February 2022 meeting the CIG reviewed the Incidental Mortality Report TCCHINOOK (22)-01 published by the CTC. The CIG recommended and the Commission agreed to "reviewing the report and adding the incidental mortality report on the forward CIG agenda".

*12.* **(Pages 59 and 71) Footnotes 16 and 21:** *For stocks with an exploitation rate management objective, the trigger shall be a CYER that exceeded the management objective by more than 15 percent (i.e., estimated CYER is 1.15 of the CYER management objective) on average in three consecutive years.*
    a. During the February 2022 meeting the Commission agreed that:
        i. the trigger for applying a CYER limit is the management objective and not 85% of the objective for each stock (the latter is a standalone prevision in Paragraph 7(a).)
        ii. CYER limits apply each year as specified in the Treaty, while noting the three-year running average is designed to assess compliance with the Treaty.

13. **(Page 72) Subparagraph 13** *By January 2023, the CTC shall develop a draft outline for a five-year review to evaluate the effectiveness of harvest reduction measures that are taken for AABM and ISBM fisheries. The draft outline shall include stock status (including spawners, productivity, and abundance indices) and fishery performance (including catches, incidental mortality, and fishery indices such as fishery harvest rates) and seek Commission direction to proceed with preparing a report. In January 2025, the Commission shall review the report*

*to identify any appropriate modifications to this Chapter to improve its implementation.*

a. At the October 2023 meeting the Commissioners agreed that the MREER metric will be included in the Chapter 3 five-year review to provide additional and complementary information alongside the CYER metric. It was also noted that the CYER metric will continue to be used to evaluate ISBM fishery performance, as outlined in the 2019 PST Agreement.
b. During the October 2024 meeting the Commission agreed to grant the CTC an extension of the five-year review from January 2025 to October 2025.

14. **(Page 72-73) Subparagraph 14** *The CTC shall work to complete by February 2019 improvements to the Commission Chinook model in order to add and refine the stocks and fisheries (referred to as Phase 2 in CTC 2018 work plan). The Commission shall receive the model improvements from Phase 2 and make a decision about their implementation. The CTC shall complete its Phase 3 work (e.g., improved capabilities for pre-season abundance forecasts, representation of MSF and other types of fisheries regulations, inclusion of release data to estimate incidental mortalities in Chinook fisheries, incorporation of stock-specific growth functions, etc.) in time to support the five-year review. The Commission shall receive the model improvements from Phase 3 and make a decision about their implementation.*
    a. During the February 2022 meeting the Commission agreed to remove the requirement to provide a completed Phase 3 PSC Chinook Model by January 2023 from the CTC's Treaty tasks. The completion of Phase 3 work continues to be a high priority item but will be delayed as a result of other higher priority tasks.

**15. (Page 84 and 85) Attachment I**
a. During the January 2022 meeting, the Commissioner's agreed to discontinue use of the Phillips stock as a CWT indicator stock as originally contemplated in Attachment I to Chapter 3.
    **i.** During the February 2022 meeting, Commissioners agreed that the Phillips River stock would be used as an escapement indicator stock only.

ii. Specifically, the Commission agreed: *The CTC will be reporting on CWT recoveries for the Phillips River Stock until 2024, when all age classes from the last tagged brood (2019) recruit to fisheries, however as the criteria for calculations of mortality distributions (which are the basis for CYERs) are: (1) recoveries available for three ages at least, and (2) minimum of 35 estimated recoveries per age, the CYER for Phillips cannot be calculated past 2022. The Phillips River will continue as an escapement indicator and Canada is continuing to assess options for a potential CWT indicator stock that is representative of mainland Inlet Chinook stocks.*

b. During the October 2024 meeting, the Commission approved updated escapement goals for the Skagit River Chinook stocks listed in Attachment I to Chapter 3. The CTC had earlier reached consensus that the new escapement goals are biologically sound and represent an improvement over those originally listed in Attachment I. Specifically, the Commission agreed to <u>update the management objectives for Skagit Spring Chinook from 690 to 1,024, and for Skagit Summer/Fall Chinook from 9,202 to 8,201 adult spawners</u>.

Distribution: Bilateral
US Section Approved: Yes
Document: US Preliminary Proposed Chapter 3 Renewal Issues Draft 2-10-25.doc
Date: February 10, 2025
Source: U.S. Section

## Preliminary U.S. Proposed Issues for Consideration in the Renewal of Chapter 3
## Draft February 10, 2025

The October 9, 2024, negotiation instructions from the Pacific Salmon Commission (PSC) requested a list of issues relating to renewal of Chapter 3. The U.S has had a preliminary discussion of potential issues and provides the following ideas for discussion within the CIG.

a) Predicting Abundance for PST Fisheries. The CTC has been working to develop improved methods to predict the abundance of Chinook salmon in PST fisheries. However, introducing new tools after January 2026 will make it exceedingly difficult to bring the discussion of the Chinook Chapter to a conclusion by the end of 2027. We suggest that the Commission encourage completion of substantive changes in modelling tools by no later than January 2026.

b) Alignment of Fishery Impacts and Stock Productivity. Reviewing the status and productivity of the escapement indicator stocks relative to fishery exploitation rates under the existing regime will be an important step in the renewal of Chapter 3. We anticipate that the completion of the five-year review by the CTC in 2025 will help inform those discussions.

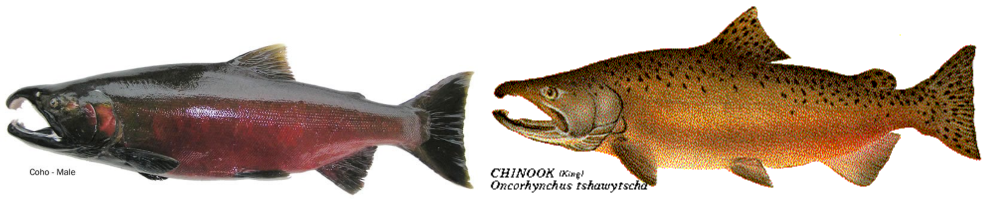
c) Performance Monitoring. The 2019 update of Chapter 3 includes improvement in performance metrics for the management of AABM and ISBM fisheries. Additional discussion of this topic could result in further management improvements and improved stock status.

d) Accountability. The 2019 update of Chapter 3 includes more comprehensive accountability measures for all fisheries with the provisions outlined in Paragraph 7 (a-c). Discussion of more specific and timely accountability measures for AABM and ISBM fisheries could result in further management improvements and improved stock status.

e) Adaptive Processes. The 2019 update of Chapter 3 includes several provisions (e.g., paragraphs 7a, 7f, 7g, and 7h) intended to provide for the implementation of additional management actions or modifications of the Chapter. Additional discussion may identify improved provisions to address adaptive conservation and fishery management actions during the 2029-2038 implementation period, without necessitating the exchange of diplomatic notes or other formal processes.

f) Fishery and Stock Assessments. One focal point of the current Chinook Chapter is improvements in fishery and stock assessment. Substantive improvements have occurred and discussions are warranted regarding how to best incorporate this new information and to promote further improvements in the collection of data and the estimation and reporting of exploitation rates, fishery catches, and incidental mortality, while recognizing fiscal constraints.

g) Attachment 1 Indicator Stocks. Attachment I identifies a set of escapement and CWT indicator stocks for monitoring the performance of Chapter 3 provisions. A review and discussion of the Attachment I stocks may identify beneficial modifications to the list.




# PSC Selective Fishery Evaluation Comitte

## SELECTIVE FISHERY EVALUATION COMMITTEE
## PROGRESS REPORT TO COMMISSION
## February 2025

The SFEC met in Victoria, BC in November 2024 to review 2025 Mass Marking (MM) and Mark Selective Fishery (MSF) proposals.

The planned Mass Marking for 2025 included:

- Coho proposals included a region-wide total of approximately 36.4 million MM fish, a decrease of 0.8 million fish from 2024.
- Chinook proposals included approximately 141.8 million MM fish, an increase of approximately 7.1 million from 2024, mostly due to production increases of Columbia River fall Chinook program.

| Agency | Coho (in millions) | | Chinook (in millions) | |
|---|---|---|---|---|
| | 2024 | 2025 | 2024 | 2025 |
| ADF&G | | | 3.3 | 2.8 |
| CDFO | 3.5 | 3.7 | 11.6 | 11.5 |
| USFWS | 1.6 | 1.5 | 27.1 | 27.8 |
| WDFW/Tribes | 25.9 | 23.7 | 67.9 | 72.1 |
| ODFW/Tribes | 6.2 | 7.5 | 24.8 | 26.7 |
| **Total** | **37.2** | **36.4** | **134.7** | **141.8** |

- 2024 and 2025 estimates include U.S. hatchery production to increase Southern Resident Killer Whale prey.
- Canada is continuing to explore the potential for new MM and MSF opportunities.
- In the U.S., Chinook and Coho DIT groups are limited to Puget Sound, the Washington Coast, and the Columbia River. WDFW, USFWS, and NWIFC are the agencies tagging DIT groups. In Canada, the only DIT program which began tagging in 2024, is on Big Qualicum Chinook in the Strait of Georgia.
- AutoFish trailers continue to be added in Canada and the U.S. to allow increased and more efficient marking and tagging with lower tag-loss rates.

Planned MSFs for 2025 include 33 proposals for Coho fisheries and 48 for Chinook fisheries:

- The 33 Coho MSF proposals for 2025 is two less than proposed for 2024. There are no new Coho MSF proposals.
- 48 Chinook MSF proposals were received, two more than for 2024. The additional WDFW proposal is a sport MSF within the Humptulips River that has previously been proposed and has occurred since 2017. There is one new proposal from ODFW/WDFW for a commercial MSF in the lower Columbia River targeting summer Chinook.

| Agency | Coho | | Chinook | |
|---|---|---|---|---|
| | **2024** | **2025** | **2024** | **2025** |
| ADF&G | 0 | 0 | 0 | 0 |
| CDFO | 9 | 9 | 5 | 5 |
| WDFW | 16 | 14 | 29 | 30 |
| ODFW | 7 | 7 | 5 | 5 |
| ODFW/WDFW | 3 | 3 | 5 | 6 |
| IDFG | 0 | 0 | 0 | 0 |
| Lummi Nation | 0 | 0 | 1 | 1 |
| Nisqually Indian Tribe | 0 | 0 | 1 | 1 |
| **Total** | **35** | **33** | **46** | **48** |

Key points for the Commissioners and obstacles for completing bilateral tasks:

*New and Emerging*

- Given recent Chinook CYER workgroup recommendations, requirements for tagging and fishery sampling have changed for Chinook. Different requirements for Chinook versus Coho may lead to confusion from management entities regarding requirements under the PST.
- Given the result of the CYER WG evaluation indicating strong performance of single index tags (SIT) methods for Chinook, and the state of CWT recoveries for Coho in mixed stock fisheries, a joint SFEC-CoTC workgroup has been formed to review the value of double index tagging DIT and recoveries for Coho.
- New U.S. travel administration issues prevented SFEC members from participating in-person, required those U.S. members who did attend to provide their own travel funding, and impeded completion of workplan tasks.
- The 2004 SFEC MOU is being considered for amendment given adopted CYER working group recommendations regarding reporting protocols for MSF regulations and data.
- SFEC proposes streamlining data requests by limiting them to data necessary for SFEC's review and analysis, recognizing that additional data should be transferred directly from the management agencies to CTC and CoTC, as needed. SFEC steering committee (CTC, CoTC, Data Sharing, and SFEC co-chairs) will be engaged in this process.
- Given the emerging information on release mortality rates, SFEC recommends the technical committees update release mortality rates used for Chinook and Coho. These rates are part of the evaluation of mark rates and assessment of MSF impacts.
- There are times and areas where Chinook and Coho MSFs are being prosecuted but the mark-rates submitted to SFEC are low. This raises concerns around incidental mortality and the benefit of MSF over non-MSF, as well as impacts to non-retention or non-target species. We recommend agencies ensure mark rates are considered when deciding to implement MSFs in these situations.

*Ongoing*

- Complexity of MSF regulations, particularly mark-and-size mixed bag regulations, will challenge evaluation of MSF impacts. We recognize that the mixed fishery adjustment developed by CYER WG addresses the mixed bag complexity for Chinook MSFs but does not address mark-and-size regulations.
- Lack of electronic CWT sampling for Coho in some areas (i.e., Canada, and Alaska fisheries) where DIT groups are expected to be encountered results in lack of sampling of unmarked fish.
- Some Canadian CWT recoveries include inaccurate information regarding the regulation type that the catch occurred in.
- There are continuing concerns with monitoring programs for certain MSFs.
- Increased scrutiny of U.S. hatchery programs has resulted in litigation that is affecting hatchery production, including marking and tagging.
- Potential expansion of pre-terminal Chinook MSFs in BC (potentially changing mark rates in subsequent fisheries).
- Hiring and retention of staff, particularly for marking, tagging, and sampling activities, continues to be a challenge for all management entities.
- Hatcheries continue to face challenges from climate change including elevated water temperatures, water supplies, and impacts from wildfires.

Progress on 2024/25 Annual Work Plan

- The SFEC annual report Review of Mass Marking and Mark-Selective Fishery Activities Proposed to Occur in 2024 is anticipated to be completed February 2025.
- The 2025 SFEC meeting will be held in Victoria, BC from 17 to 20 November 2025.
- SFEC is coordinating with CoTC with regards to the Coho DIT program.
- The 2004 SFEC MOU will be considered for amendment given adopted CYER working group recommendations regarding reporting protocols for MSF regulations and data.

# Pacific Salmon Commission

## Northern Panel and Northern Boundary Technical Committee Report to Bilateral Commissioners

## 2025 Post Season Meeting, February 10 to 13, 2025

**Annual Workplan**

The Northern Panel met domestically and bilaterally at the Vancouver Post Season meeting from January 13 to 16, 2025. The bilateral Panel did not meet at the Portland Annual Meeting in February.

The Northern Panel had several notable outcomes from the January session:

**Reviewed and accepted the**

- Northern Boundary Technical Committee's (NBTC) 2023 Final Boundary Area sockeye salmon run reconstruction.
- Final 2023 pink salmon run reconstruction.
- Preliminary 2024 Boundary Area sockeye salmon run reconstruction.
- Preliminary 2024 pink salmon run reconstruction.
- Cumulative Annual Allowable Harvest sharing agreements.

**Received updates and status on**

- Fishery reports from both parties for the 2024 season.

**CSC Discussion**

At the Post Season meeting, most members of the bilateral panel and NBTC attended the presentation provided by the CSC.

**Review of Implementation Workplan Tasks and Timelines**

Chapter 2 was ratified for implementation in 2019, which led to a Joint Implementation Workplan for the chapter that outlined all required activities and due dates. The implementation plan was updated in December of 2024. To date, all activities have been completed except the upcoming chapter review that begins in January 2026.

The NBTC provided an update at the January meeting on the three remaining technical tasks from the Chapter 2 review that was completed in 2023: potential for increased genetic resolution of mixed stocks in Northern Boundary fisheries; Skeena River run timing; and quantifying uncertainty in the run reconstruction model. A major outcome of these discussions is an effort to convert the sockeye run reconstruction model to R, which will make the model more accessible to member of the technical committee and will allow for improved assessment of model uncertainty. A Northern Fund proposal has been submitted to fund this work moving forward.

**Canadian Presentation on Skeena River Habitat**

As part of the follow up to the joint analysis of Chapter 2, Canada provided a presentation the status of salmon habitat on the Skeena River drainage, which led to a good discussion of habitat issues on the river. Habitat issues were of concern to the U.S. in trying to understand changing production dynamics for Skeena River salmon stocks.

**Domestic Policy Presentations**

As part of the follow up to the joint analysis of Chapter 2, we also exchanged policy documents and presentations on key domestic policy and legislation for the protection and rebuilding of wild populations. Canada provided a summary document of key legislation, policies, and legal precedents that drive salmon management, and answered questions that helped clarify salmon management processes and objectives in British Columbia. The U.S. provided a published paper outlining the development of salmon fishery policy in Alaska and gave a presentation on the *Policy for the Management of Sustainable Salmon Fisheries* and the *Policy for Statewide Salmon Escapement Goals*. The policy discussions were very helpful in providing better understanding of the issues facing both countries and the similarities and differences behind the policies guiding salmon management on both sides of the border.

**Identification of Issues Related to Negotiating the Chapter 2 Agreement**

Following instructions from the commission in October 2024, the Northern Panel developed a joint memo on issues related to renewal of Chapter 2. The memo demonstrated that similar issues to the 2019 negotiation will factor for the upcoming negotiation, with the U.S. generally satisfied with the current agreement and Canada seeking updated language that better aligns with their positions and management objectives. We anticipate we will be able to conclude negotiations by February 2027 by meeting at both the January and February meetings in 2026 and 2027. Typically, the Northern Panel only meets in January, so for our panel this would allow for 2 additional meetings devoted entirely to negotiations. Any additional meetings beyond January and February 2026 and 2027 will be done virtually if needed.

**PACIFIC SALMON COMMISSION**
**JOINT TECHNICAL COMMITTEE ON DATA SHARING**

**WORK PLAN 2024-2025 PROGRESS UPDATE**
**TO THE PSC COMMISSIONERS**

The bilateral Technical Committee on Data Sharing (TCDS or Committee) supports the Pacific Salmon Commission by coordinating the content of the Coded-Wire-Tagging and reporting system to be exchanged (see Pacific Salmon Treaty's Memorandum of Understanding, January 28, 1985). The Technical Committee on Data Sharing (TCDS) reports directly to the Pacific Salmon Commissioners.

This committee is responsible for:

- Maintaining and revising the Specifications and Definitions for the Exchange of Coded Wire Tag Data for the North American Pacific Coast (hereafter Specifications).
- Facilitating access and timely exchange of CWT data between the two parties.
- Advising Commissioners as appropriate on: (i) computing hardware, software (including development), and data transmission requirements of the Commission; (ii) compilation and maintenance of databases established by or for the Commission; (iii) policies and procedures for data compilation and dissemination of fishery-related statistics and environmental information; and, (iv) data governance and software development guidelines (e.g. handling external data requests), documenting, and version management)) used to create automated reports and analytical data products.

The Committee's draft Terms of Reference (TOR) was approved by the Commissioners during their October 2024 meeting, effectively merging the Data Standards Working Group within the TCDS, thereby streamlining the committee's process and reducing the number of meetings. The 2024 TOR also refined the responsibility of providing advice to the Commissioners to clarify the role that the TCDS has in providing advice on data/software related PSC guidelines and sharing lessons across committees. During the Commissioner's October 2024 meeting, the Commissioners also approved the TCDS suggestion to add to the PSC workplan a section that would facilitate communication of issues and request to the TCDS.

As part of this workplan the TCDS continues to review requests for modifications to the Specifications, and other requests received from PSC technical committees, including the Chinook, Coho and Selective Fishery Evaluation Technical Committees. To support information exchange with the PSC committees, the TCDS co-chairs continue to provide updates to the relevant PSC technical committees and to receive input on proposed modifications and on implementation timeline. The TCDS continues to assist with preparation and review of draft PSC guidelines. For its workplan implementation, the TCDS primarily liaises with the Chinook Technical Committee (CTC), Selective Fishery Evaluation Committee (SFEC), and Coho Technical Committee (CoTC).

A key goal of the 2024-2025 workplan is to finalize and begin modifications to the USA and Canada data systems to prepare for implementation of the 5.0 version of the *Specifications and Definitions for the Exchange of Coded Wire Tag Data for the North American Pacific Coast* by t early 2026. The TCDS is also continuing to advance the development of a controlled vocabulary document to define all data fields and terms in the data specifications to ensure the accessibility of these data over-time and to maintain quality data in the bilateral systems. Once ready, engage in collaborative scoping and document approaches and methods with other technical committees to refine terms, definitions, and metadata that support proper CWT and related data use. The TCDS continues to assess processes to improve CWT data quality, including incorporating new metadata fields, use of automated validation processes and automated quality checks on data submitted to the bilateral systems.

A summary of 2024 and 2025 tasks and their status are provided below:

| Task | When | Status |
|---|---|---|
| Present draft TOR and recommendations to improve information exchange with other committees (i.e., section added to annual workplan, PSC guidance documents, and 2025 Data Den) to Commissioners during their October for approval | October 2024 | Done |
| Update members on outcome of presentation to Commissioners' during their Oct 13, 2024 meeting and advance progress on developing the Controlled Vocabulary document. | November 2024 | Done |
| TCDS Co-chair discuss with CTC and CoTC during 2025 Post Season Meeting January 13, to January 17, 2025, proposed modification and implementation impacts, and timelines. Obtain input on other needed modifications and improvements that would inform 5.1 or 6.0 version of the Specifications document. Communicate information on guidelines. | January 2025 | Done |
| Internal draft report of the 5.0 Data Specification version is produced | January 2025 | Done |
| Host PSC wide Data Den to facilitate discussion around common data management concerns within all PSC committees and how TCDS may provide support. | January 2025 | Done |
| TCDS Co-Chairs present 2024-2025 work plan progress update to PSC Commissioners during the 40th Annual Meeting 10- 14, February 2025 in Portland, OR. Meet with other technical committees as possible to conduct outreach and coordination. | February 2025 | Planned |
| Full TCDS virtual meeting to review current status of proposed finalized 5.0 version, discussing input received from TCs. Check in on (and continue to work on) all planned tasks as listed above this table. | April 2025 | Planned |
| Full TCDS in-person/hybrid meeting in Nanaimo, BC at DFO office to revisit as needed timeline for 5.0 implementation process (migration /translation) and outreach to all data providers. Confirm month for database version 5.0 to enter production stage that best minimizes impact on TCs analytical work. Check in on (and continue to work on) all planned tasks as listed above this table. | May 12-15, 2025 | Planned |
| Full TCDS in-person/hybrid meeting 2-5 September 2025 to develop 2025/2026 Work plan. Check in on 5.0 implementation progress and timeline. Check in on (and continue to work on) all planned tasks as listed above this table. | September 2-5, 2025 | Planned |

| | | |
|---|---|---|
| Full TCDS virtual meeting (1-day) to confirm outreach with committees and content being discussed; and continue progress on the controlled vocabulary | October 2025 | Planned |
| TCDS co-chairs to meet virtually or in-person with technical committees on finalizing 5.0 implementation, discuss active/new proposals to inform *Specifications* version 5.1 or 6.0, and new tasks from scoping exercised planned for 2026 (revised from previously estimated 2025/2026 timeframe). | Revised to be January 2026. (previously estimated as Late Oct/Nov 2025) | Planned |
| *The final version of the 5.0 Specification document version will* be finalized after the 5.0 version is implemented into production. In the original work plan submitted we estimated this to be submitted at the end of 2025 but based on discussions with technical committees this will be shifted to 2026. This timeline should minimize impact on CWT data users, such as the Chinook Technical Committee. The updated version of PSC Technical Report No. 52. | Revised to be 2026.<br><br>(previously estimated as end of 2025) early 2026 | Planned |

# Transboundary Panel Report to Pacific Salmon Commission

*February 13, 2025*

The Transboundary Panel (Panel), supported by Transboundary Technical Committee (TTC) and Enhancement Sub-Committee (TESC) representatives met bilaterally during the 2024 Post-Season (January 14–16) and 40th Annual (February 11–13) 2025 Pre-Season meetings of the Pacific Salmon Commission.

<u>2024 Post-Season Meeting:</u> The Panel received post-season reports on 2024 Transboundary Stikine, Taku, and Alsek Rivers salmon runs including: catch from terminal marine and inriver fisheries, escapements, and results from stock assessment projects. As required in Chapter 1 (Paragraph 4), 2024 U.S. and Canadian fishery management measures and associated catch were evaluated to confirm if escapement goals were achieved, and harvest shares not exceeded. Escapements were not achieved for Stikine River Chinook salmon for the ninth consecutive year, and although Taku River Chinook salmon escapement was achieved, managed actions will continue to be required management for both stocks in 2025. The U.S. harvest of Taku River coho salmon in 2024 was above PST allocation for third time in the previous 5 years, resulting in the requirement to implement corrective management actions during the 2025 season in accordance to Paragraph 4. All other fishery catches were maintained within PST harvest share allocations; no corrective management actions are required. The Panel received presentations from the TESC on the 2024 Stikine Enhancement Production Plan (SEPP) and Taku Enhancement Production Plan (TEPP) sockeye enhancement program results (fry outplants from 2023 and egg takes in 2024). The final 2022 SEPP was approved by Panel. The TESC also presented results from the 2023 SEPP and the proposed 2025 SEPP and TEPP. The TESC final presentation reviewed Tatsamenie Lake sockeye enhancement and specifically the extended rearing program. The Panel received a presentation from the U.S. Forest Service (USFS) on the 2024 Taku River subsistence fishery, noting that no permits to participate in the fishery were issued. The Panel received a U.S. proposal for a 2025 Taku River subsistence fishery for consideration. Bilateral agreement on recommendations regarding the proposed fishery was not achieved, with further discussion scheduled for the February 2025 Transboundary Panel meeting session. The Panel received updates on the Stikine River Chinook salmon escapement goal review, development of a Stikine River coho salmon assessment program, and the ongoing work of the Alsek River Chinook and sockeye salmon assessment project. Finally, the Panel compiled a list of U.S. and Canadian Chapter 1 renewal priorities which was presented to Commissioners.

<u>2025 Pre-Season Meeting:</u> The Panel received 2025 bilateral forecasts for Stikine and Taku Chinook and sockeye salmon and Taku River coho salmon, in addition to Canadian forecasts for Alsek River Chinook and sockeye salmon. In conjunction with the forecasts, the Panel received proposed management actions for each party's fisheries which included continuation of extraordinary measures to conserve Stikine Rivers Chinook salmon and continued attention on Taku River Chinook salmon in 2025. In addition, the Panel received proposed U.S. management measures to align U.S. harvest of Taku River coho salmon with Treaty allocations (response to Chapter 1 Paragraph 4 trigger identified following the 2024 season). The Panel also accepted the TTC's recommendation to not proceed with any lethal assessment fisheries in 2025. The Panel received Canada's response and associate recommendations on the U.S. proposal for a 2025 Taku River subsistence fishery and following deliberation and receiving updated information on participant eligibility, the Panel reached bilateral agreement on measures associated with the administration of the fishery. The Panel Chairs presented the bilateral recommendation to Commissioners for decision on February 13. The Panel received final recommendations from the TESC on the 2025 SEPP and TEPP, which were bilaterally approved by the Panel for implementation. The TTC presented proposed plans and timelines to complete analysis that will enable development of an updated recommendation for a Taku River coho salmon escapement goal. The Panel accepted the TTC recommendation, tasking the TTC to provide a presentation on the results of analysis at the Panel's January 2026 bilateral meeting session. The Panel received a presentation on adult sockeye salmon passage restoration projects in the Taku River watersheds as well as a presentation on initial considerations pertaining to a Stikine River Chinook salmon restoration strategy. The TTC also presented the results of the Alsek River sockeye salmon radio tagging project for 2024 in addition to a presentation on U.S. fishery management measures implemented in the Dry Bay area to achieve Chapter 1 Section 3.(c)(ii)(D) sockeye salmon passage in the Alsek River prior to statistical week 27. The Panel Chairs reported on submission of Chapter 1 renegotiation priorities and process and the TTC provided an update on the status of annual catch and escapement reports. Finally, the Panel received an overview of Northern Fund projects relative to the Transboundary Rivers. The Transboundary Panel's next bilateral meeting is scheduled for January 2026.

# PSC ANNUAL MEETING
# January and February 2025

## SOUTHERN PANEL MEETING REPORT

### Session Activities:

- The US and Canadian Sections of the Southern Panel developed an agenda that enabled bilateral and section time to focus on activities associated with our annual work plans and other related assignments:
  - *Polishing and formatting the 5 year review report for Chapter 5 Paragraph 12*
  - *Receiving and discussing reports from Coho and Chum Technical Committees*
  - *Review and discussion on Coho TC draft electronic 'Periodic Report'. Southern Panel approved the Periodic Report format and requested that the CoTC use the Skagit MU template for all Mus and finish the report*
  - *Reviewing 2023 Coho Exploitation Rate (ER) Annual Report*
  - *Developing priorities for Endowment Fund proposals for 2026*
  - *Conducting tasks from workplans for 2025*
- The Bilateral Panel met and received presentations on:
  - *2024 Post-season Report Presentations from each Country*
  - *Ocean Indicators Report*
  - *Coho and Chum Technical Committee SEF 2025 project updates and 2026 priorities*

- Chapter Implementation Plans
  - Both section and bilateral time was spent to review implementation plans for Chapters 5 and 6, including assigning tasks to sub-committees, Technical Committees as appropriate, and assigning short-term and longer-term tasks.
    - *Discussed and revised the draft 5 year review report*
    - *The Southern Panel and Coho TC will schedule the Coho Working Group (CWG) meeting and develop the agenda.*

- Update from the Coho Technical Committee
  - *The Coho TC presented their updates to the electronic "Periodic Report" for Panel consideration and feedback*
  - *2023 Coho Annual Summary ER Report was presented. The ER report is preliminary, final numbers for grays harbour to be added*

  - *Southern Endowment Fund (SEF) 2026 priorities and 2025 project updates (at time of this report out there was no section or bilateral discussion)*
  - *Planning for CoWG meeting agenda items and preparing technical information to support the meeting*

- Update from Chum Technical Committee
  - *Review and discussion on preliminary post-season 2024 fisheries information*
  - *Update on progress for the SEF funded ChumGEM project to finalize run reconstruction model for Southern BC and Washington State Chum*
  - *Provided updated 2025 and 2026 SEF priorities to the Southern Panel*
  - *Provided chum 101 presentation to Southern Panel which included information on forecasting*

Preparation for Future Meetings

- Finally, the bilateral Panel worked on a schedule for upcoming meetings, including the timing of the manager-to-manager information exchange for a virtual meeting in mid March and the Coho Working Group and Coho Technical Committee.

- Meeting plan to meet negotiation schedule.  The panel will be extending their regular meetings to include Fridays. The Panel will also require one additional week of meetings per year, with the potential to augment that with virtual meetings. We will also, if needed, use and repurpose some time from our annual coho working group meetings.

# Fraser River Panel Work Plan progress

Pacific Salmon Commission 2025 Annual Meeting

*Fraser River Panel Chair, Adam Keizer (Canada)*
*Fraser River Panel Vice-Chair, Jason Gobin (United States of America)*

The Fraser River Panel submits to the Pacific Salmon Commission (PSC) our report on Work Plan progress. Highlights of the Work Plan (Appendix A) include:

- Implementation of Chapter 4 of the Pacific Salmon Treaty as documented in the Fraser River Panel Management Plan (Appendix B);
- Proposed meeting dates of the Fraser River Panel; and
- Special issues the Panel will address

## Implementation of Chapter 4

The Fraser River Panel adopted the 2024 Fraser River Panel Management Plan (Management Plan) as per the Pacific Salmon Treaty (PST), Annex IV, Chapter 4, paragraph 5, and has commenced drafting the 2025 Management Plan.

Refer to Appendix B for a description of 2024 bilateral management objectives and key pre-season information regarding run size forecasts and escapement plans. The Management Plan also documents the Panel's bilateral pre-season decisions about test fishing plans, fishing plans, and in-season decision rules, and serves as a post-season record of fishery outcomes.

*2024 Post Season*

Preliminary post-season catch and exploitation rates, relative to the established limits, are described in the 2024 Management Plan and summarized below.

- Fisheries impacts were less than the Allowable Exploitation Rate for Early Stuart Sockeye.
- Fisheries impacts were less than the Allowable Exploitation Rate for Early Summer Sockeye.
- Fisheries impacts were less than the Allowable Exploitation Rate for Summer Sockeye.
- Fisheries impacts were less than the Allowable Exploitation Rate for Late Sockeye.

Escapement estimates, relative to the established targets, are described in the 2024 Management Plan and summarized below. Early Summer escapement was near the long-term average, whereas Early Stuart, Summer, and Late escapement was below the long-term average.

- Early Stuart Sockeye escapement was above the in-season target.
- Early Summer Sockeye escapement was above the in-season target.
- Summer Sockeye escapement was below the in-season target.
- Late Sockeye escapement was below the in-season target.

The 2025 Management Plan will begin to be drafted at the April meeting of the Fraser River Panel. The first pre-season input, the run size forecast for Fraser Sockeye and Pink, was delivered at the February meeting.

*2025 Forecast*

The median forecast for the total Fraser Sockeye run size is 2,947,000 fish, which is 36 per cent of the 30-year cycle line average run size. There is a one in ten chance that the actual number of returning Sockeye will be at or below 736,000 fish, and there is a one in ten chance that the actual number of returning Sockeye will be at or larger than 13,140,000 fish. The forecasts for the four different Stock Management Groups are described in Table 1.

*Table 1. Fraser River Sockeye Salmon forecast. The first column reports median (50% probability) forecasted run size by Stock Management Group. The forecasted run size for the 10$^{th}$ and 90$^{th}$ percentiles is also reported.*

| Stock Management Group | Median (p50) | 10$^{th}$ percentile (p10) | 90$^{th}$ percentile (p90) |
|---|---|---|---|
| **Early Stuart** | 116,000 | 42,000 | 319,000 |
| **Early Summer** | 220,000 | 54,000 | 820,000 |
| **Summer** | 2,137,000 | 522,000 | 10,004,000 |
| **Late Run** | 474,000 | 118,000 | 1,997,000 |

The median forecast for Fraser Pink return is 26,965,000 fish, which is 218 per cent of the 50-year average run size. There is a one in ten chance that the actual number of returning Pink will be at or below 12,585,000 fish, and there is a one in ten chance that the actual number of returning Pink will be at or larger than 57,854,000 fish.

Key forecast parameters of note that will inform management include:

- Chilko and Late Stuart Sockeye represent 52% of the total Fraser Sockeye return and 72% of the Summer Management Group return at the median forecast. The Chilko forecast is highly variable among the top preforming forecast models
- The Pink salmon forecast is highly uncertain. If the realized run size equates to the forecast, it will be the high Pink salmon run size on record.

## Proposed meeting dates of the Fraser River Panel

No changes are proposed to the meeting schedule as presented to the Commission in October and outlined in the Work Plan. The next meeting of the Fraser River Panel will occur in April to discuss pre-season planning.

## Special issues the Panel will address

1. *The Panel will continue discussions on methods for determining allowable impacts on non-target stocks and species, and necessary conservation actions, in Panel Area fisheries. This will include discussions of small but acceptable harvest during Pink directed fisheries.*

Ongoing.
Pursuant to Chapter 4, paragraph 11, the Fraser River Panel shall manage its fisheries *to ensure that the conservation needs and management requirements for other salmon species and other sockeye and pink salmon stocks are taken into account*. Prior to each season commencing the National Sections have identified stocks and species where a conservation concern exists that is relevant to Fraser River Sockeye and Pink salmon management.

With respect to Fraser Sockeye and Pink stocks of concern, the National Sections documented a revised pre-season planning process that identifies fishery planning scenarios where parties agree on scenario-specific "small but acceptable" Sockeye mortality by Stock Management Group. The Management Plan serves this purpose. The 2024 Management Plan notes:

> Given the primary objective of obtaining spawning escapement goals by stock or Stock Management Group, the Fraser River Panel, to the extent practical, shall strive to concentrate harvest on the management group (or groups) that have the most harvestable surplus. It is understood that a small but acceptable (SBA) rate of incidental harvest on one or more overlapping management groups, with little or no TAC, may occur. Should harvestable surplus materialize in season, both National Sections of the Fraser River Panel agree to have discussions around SBA parameters and associated PST-guided notification process in-season. (2024 Management Plan, paragraph 14)

This pre-season process is being further developed through the newly-formed US-Canada First Peoples Salmon Caucus (FPSC). In January 2025 the FPSC issued a joint statement outline their understanding of "small but acceptable" and an approach to management during the upcoming season.

2. *The Panel will advance bilateral Indigenous relationships to help with fisheries planning and negotiations.*

Ongoing.
The Panel has been supportive of formalizing bilateral Indigenous relationships, most recently in the form of the First Peoples Salmon Caucus (FPSC). A Memorandum of Understanding was signed by FPSC in February 2025.

3. *The Panel will review the 2018 test fishing report "Summary of a Review of Fraser River Test Fisheries" and the 2022 report "Overview of pre-season and in-season assessment methods for Fraser River sockeye salmon" to identify if test fishing objectives need to be refined following increased conservation concerns in recent years.*

Ongoing.
The Secretariat shared the reports with Panel for discussion during the Post-Season and Annual Meeting.

The current test fisheries cover three key geographic areas: the northern and southern marine approaches to the Fraser River and the lower Fraser River. The core marine test fisheries are located toward the seaward end of each approach route to provide reliable and representative information as early as possible in advance of potential marine fisheries. In the lower Fraser River, test fisheries coupled with acoustics provide estimates of the abundance of fish that remain following any marine harvest (i.e., the abundance of fish available for spawning escapement and that would be available for potential harvest by fisheries within the Fraser River and its tributaries).

Test fisheries provide data related to catch (by stock and species), as well as effort, and other biological information. These data are then used as inputs to the PSC models to assess abundance, timing, diversion rate, stock and species composition, vulnerability, and catchability.

The Panel sought to understand from the Secretariat the level of precision that the current design is intended to achieve, and how expanded or contracted test fisheries will change this value. It is important to understand the target data quality that the Secretariat seeks, so that when the Panel considers the tradeoffs against operating costs the Panel knows what the value of the information is, and at which points the test fishery is either non-functional or excessive.

The Secretariat confirmed at the 2025 Annual Meeting that current Test Fisheries have not been designed with a target level of precision. In the absence of a target, further quantitative evaluation is not possible. The Panel should define quantified test fishing objectives to further advance this Work Plan item.

4. *The Panel and Technical Committee will review the effectiveness of the alternative test fishing location at Brownsville Bar, near New Westminster, for in-season assessment of Fraser River sockeye and pink salmon.*

Ongoing.
In-river test fishing is anticipated to occur at Brownsville Bar and not Cottonwood following successful operation at Brownsville Bar. A final report evaluating the relative performance of two test fisheries will be presented by the Secretariat to the Fraser River Panel in April 2025.

5. *The Panel and Technical Committee will continue to review the work to improve species composition methods, both at Mission and at Qualark. Thus far, year 1 of a four-year project has been completed.*

Ongoing.
Commencing year two of a four year project.

6. *The Panel will review recommendations to improve the Run Size Adjustment (RSA) process following the scientific peer review process conducted through the Canadian Science Advisory Secretariat (CSAS).*

Complete.
A CSAS peer view meeting of *Stock-specific Fraser River Sockeye Salmon Run Size Determination* occurred in May 2024. Following revisions, submission for publication is anticipated in February 2025.

*7. The Panel will identify and track issues for Chapter 4 renegotiations.*

Ongoing. In-camera submission to Commissioners in January 2025 completed as requested.

## Recommendations to Commissioners

The Panel requests that, when the Secretariat provides advice pursuant to Chapter 4, paragraph 13, the advice is provided in writing.

The Panel requests that, pursuant to Chapter 4, paragraph 6, the scheduled in-season management meetings shall be held in Richmond, British Columbia unless the Panel mutually decides otherwise.

Appendix A

PACIFIC SALMON COMMISSION

ESTABLISHED BY TREATY BETWEEN CANADA
AND THE UNITED STATES OF AMERICA
MARCH 18, 1985

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**PACIFIC SALMON COMMISSION WORK PLAN 2024-2025**

# Fraser River Panel and Fraser River Technical Committee

Provided at PSC Executive Session via Teams on October 7-10, 2024.

**Update on Bi-lateral Tasks Assigned Under Current PSC Agreement:**

The Panel continued implementation of Chapter 4 of the Pacific Salmon Treaty for the 2024 Sockeye salmon season.

**Obstacles to Completing above Bi-lateral Tasks:**

There were no major obstacles to Panel implementation of the Fraser River Sockeye and Pink Salmon chapter (Chapter 4 of the Pacific Salmon Treaty) in 2024.

As per the *Fraser River Panel Bilateral Response to "PSC Secretariat Report – Review of August 18 and 25, 2023 Fraser River Panel fisheries proposals, decisions and subsequent consequences"* from February 2024 bilateral work continues at the Fraser River Panel.

**Outline of Other Panel / Committee Tasks or Emerging Issues:**

The Panel is preparing for Chapter 4 renegotiations and would like to have direction on intermediary outcomes and timelines.

**Potential Issues for Commissioners:**

None.

**Potential Issues for Committee on Scientific Cooperation:**

None.

**Proposed Meeting Dates and Draft Agendas:**

**October 7-10, 2024 PSC Executive Session**

Present the 2024-2025 Fraser Panel/Fraser River Panel Technical Committee Work Plan to the Commission.

**January, 2025 PSC Post-Season Meeting**

The Panel will review in detail the 2024 Fraser River Sockeye management season: the in-season assessment estimates as well as the in-season decision rules, catch reports (including unauthorized catches and District 104 catches), the TAC and the Allocation Status calculations. The Panel will review the financial update of the 2024 test fishing program and the Test Fishing Revolving Fund. The Panel will also discuss any special issues arising from the 2024 management season, to be included in the workplan if needed.

**February, 2025 PSC Annual Meeting**

The Panel will initiate the 2025 Pre-Season Planning process consistent with the provisions of the renewed Annex IV, Chapter 4 of the Pacific Salmon Treaty, and any guidance provided by the Commission. More specifically, the Panel will review the Fraser River Sockeye and Pink Salmon forecast, the forecast of Washington Sockeye and Pink Salmon returns, the conservation needs for other stock and species, and will review the expected management considerations for 2025. The Panel also reviews and approves the draft sampling plan request letters for 2025. The Panel will commence drafting the annual Fraser River Panel Management Plan.

The Panel will also review the 2024 near final spawning ground estimates of Fraser River Sockeye, the resulting Differences Between Estimates that provide a first indication of the en-route losses experienced and the achievement of management objectives. The Panel shall continue discussions of any unresolved issues from the 2024 season.

At the February meeting, the Panel will update the Commission on work plan progress.

**April and June 2025 FRP pre-season meetings**

The Panel will meet in April and in June to share the information regarding bilateral planning for both Fraser River Sockeye as well as Pink Salmon. This information will include the run size, timing and diversion rate forecasts, the escapement plan including any updates to the harvest control rule parameters, and the predictions of environmental conditions. These estimates are used to populate the pre-season fishing plan. The Panel will also review the 2025 test fishing schedule, including associated costs and Sockeye and Pink Salmon mortalities.

At the June meeting, the Panel will review and agree on preseason Management Adjustments and a fishing plan based on the median (p50) run size forecast. In addition, the Panel will seek agreement on the in-season decision rules for 2025, which include an agreement on the in-season rules to adjust the Management Adjustment and the calculation of the harvestable surplus and international TAC. Prior to the 2025 management season, the Panel will develop a framework for reaching agreement on “small but acceptable” (pursuant to Chapter 4, paragraphs 3(c) and 3(g)) levels of incidental catch in Panel fisheries targeting harvestable surpluses of Fraser River Sockeye and Pink. This is consistent with the Fraser River Panel Bilateral Response to *“PSC Secretariat Report – Review of August 18 and 25, 2023 Fraser River Panel fisheries proposals, decisions and subsequent consequences*” tabled by the Fraser Panel in February 2024. This information will be summarized in the “2025 Fraser River Panel Management Plan.”

At the conclusion of June pre-season meeting the FRP shall finalize the Fraser River Panel Management Plan which contains:

- Information shared bilaterally pre-season
    - Run size forecast
    - Escapement Plans
- Pre-season agreements
    - Test fishing plan
    - Pre-season fishing plan, including Management Adjustments
- In-season decision rules

At these four meetings, the Panel shall continue discussions of any unresolved special issues (see 2024-25 list below), receive updates of the resolution of technical issues by the Technical Committee (e.g. RSA meeting updates, SEF project updates, Technical Report publications), and kept up to date on annual reoccurring tasks (e.g. Annual Reports, minutes, review of SEF proposals).

**Special issues the Panel will address:**

1. The Panel will continue discussions on methods for determining allowable impacts on non-target stocks and species, and necessary conservation actions, in Panel Area fisheries. This will include discussions of small but acceptable harvest during Pink directed fisheries.
2. The Panel will advance bilateral Indigenous relationships to help with fisheries planning and negotiations.
3. The Panel will review the 2018 test fishing report "Summary of a Review of Fraser River Test Fisheries" and the 2022 report "Overview of pre-season and in-season assessment methods for Fraser River sockeye salmon" to identify if test fishing objectives need to be refined following increased conservation concerns in recent years.
4. The Panel and Technical Committee will review the effectiveness of the alternative test fishing location at Brownsville Bar, near New Westminster, for in-season assessment of Fraser River sockeye and pink salmon.
5. The Panel and Technical Committee will continue to review the work to improve species composition methods, both at Mission and at Qualark. Thus far, year 1 of a four-year project has been completed.
6. The Panel will review recommendations to improve the Run Size Adjustment (RSA) process following the scientific peer review process conducted through the Canadian Science Advisory Secretariat (CSAS).
7. The Panel will identify and track issues for Chapter 4 renegotiations.

**Status of Annual or Technical Reports:**

Fraser River Annual Reports up to and including 2022 are complete and have been posted to the PSC website. The 2023 report has not yet been sent for review to the Parties; however, it is anticipated this will happen before the end of the year. The 2024 Annual Report will be sent to the Parties for review spring 2025.

PSC staff will provide a PSC Technical Report on Pink Salmon prior to the 2025 season and an updated PSC Technical Report on Sockeye Salmon prior to the 2026 season.

**Fraser River Panel Meeting Schedule[1,2]**

| Date | Meeting | Location |
|---|---|---|
| 2024 | | |
| November ? (1 day) | Review CSAS-RSA Report Recommendations | Virtual |
| December 2-3 | Forecast Meeting | Vancouver/Virtual |
| 2025 | | |
| January 13-16 | PSC Post-Season Meeting | Vancouver/Virtual |
| February 10-14 | PSC Annual Meeting | Portland/Virtual |
| March | FRTC Model Inputs | Email |
| April 28-29 | Fraser River Panel Technical Committee | Victoria/Virtual |
| April 30-May 2 | Fraser River Panel Pre-Season Planning | Victoria/Virtual |
| May ?? (2 days) | Technical Modeling Meeting (RSA) | Vancouver/Virtual |
| June 16-17 | Fraser River Panel Technical Committee | Tulalip/Virtual |
| June 18-20 | Fraser River Panel Pre-Season Planning | Tulalip/Virtual |
| July 11, 15, 18, 22, 25, 29 | Fraser River Panel – In-Season Meeting | Virtual |
| August 1, 8, 15, 22, 29 | Fraser River Panel – In-Season Meeting | Virtual |
| August 5 | Fraser River Panel – In-Season Meeting | Richmond/Virtual |
| August 12 | Fraser River Panel – In-Season Meeting | Richmond/Virtual |
| August 19 | Fraser River Panel – In-Season Meeting | Richmond/Virtual |
| August 26 | Fraser River Panel – In-Season Meeting | Richmond/Virtual |
| September 2, 5, 9, 12 | Fraser River Panel – In-Season Meeting | Virtual |
| September 23-25 | Fraser River Panel – Post-Season Meeting | TBD |

1 – This schedule will be reviewed for opportunities to improve upon efficiency and reduce Panel costs.

2 – Both parties may choose to schedule pre-meeting caucuses virtually or in-person before Panel meetings

# 2024 Fraser River Panel Management Plan

Agreed July 12, 2024[1]

The Fraser River Panel has adopted the 2024 Fraser River Panel Management Plan (Management Plan) as per the Pacific Salmon Treaty (PST), Annex IV, Chapter 4, paragraph 5.

> *"To support Fraser River Panel decisions including those related to fishery management, the Panel shall develop test fishing plans, fishing plans, and in-season decision rules as may be necessary to implement this Chapter. …"*

The Management Plan documents the Fraser River Panel's bilateral management objectives and key pre-season information regarding run size forecasts and escapement plans. The Management Plan also documents the Panel's bilateral pre-season decisions about test fishing plans, fishing plans, and in-season decision rules.

## Objective

1. The Fraser River Panel recalls our bilateral management objectives in Chapter 4, paragraph 10:
   > *"The Parties agree that Panel management actions should meet the following objectives, listed in order of priority:*
   > *(a) obtain spawning escapement goals by stock or stock grouping;*
   > *(b) meet Treaty defined international allocation; and*
   > *(c) achieve domestic objectives."*

## Information shared bilaterally pre-season

### Run Size Forecast

2. Canada has provided the Fraser River Panel with run-size forecasts for Fraser River Sockeye salmon (Fisheries and Oceans Canada, 2024. *Pre-Season Run Size Forecast for Fraser River Sockeye Salmon in 2024.* 5a_KD_2024Forecast_FRP Presentation Feb 13.pdf).
3. The median forecast for the total Fraser Sockeye return is 567,000 fish, which is less than 18 per cent of the 30-year average run size. There is a one in ten chance that the actual number of returning Sockeye will be at or below 167,000 fish, and there is a one in ten chance that the actual number of returning Sockeye will be at or larger than 2,173,000 fish. The 2024 total run size forecast is the lowest forecast on record.
4. The median forecasts for the four different Stock Management Groups are described in Table 1.

*Table 1. Fraser River Sockeye Salmon forecast. The first column reports median (50% probability) forecasted run size by Stock Management Group. The forecasted run size for the 10$^{th}$ and 90$^{th}$ percentiles is also reported.*

| Stock Management Group | Median (p50) | 10$^{th}$ percentile (p10) | 90$^{th}$ percentile (p90) |
|---|---|---|---|
| **Early Stuart** | 200 | 80 | 400 |
| **Early Summer** | 159,000 | 58,000 | 465,000 |

[1] Panel Chair, Mickey Agha, and Vice-Chair, Adam Keizer agreed to the 2024 Fraser River Panel Management Plan for 2024 season.

| Stock Management Group | Median (p50) | 10th percentile (p10) | 90th percentile (p90) |
|---|---|---|---|
| **Summer** | 379,000 | 101,000 | 1,554,000 |
| **Late Run** | 29,000 | 8,000 | 154,000 |

5. Forecast parameters of note that informed management scenarios include:
    - Chilko and Harrison sockeye represent 50% of the total Fraser sockeye return and 74% of the Summer-run return at the median forecast.
    - 10 of the 28 forecasted stocks have a median forecast equal to or less than 1,000 sockeye.

### Escapement Plan

6. Pursuant to Chapter 4, paragraph 4, Canada established the annual Fraser River Sockeye and Pink salmon spawning escapement targets for the purpose of calculating the annual Total Allowable Catch (TAC). The harvest rule parameters of the escapement plan are described in the Integrated Fishery Management Plan for Southern B.C. Salmon published by Fisheries and Oceans Canada (Fisheries and Oceans Canada. 2024. Southern Salmon Integrated Fisheries Management Plan 2024/2025. 23-2367: 628p.) and Table 2.

*Table 2. Fraser River Sockeye Salmon Escapement Plan Parameters.*

| Stock Management Group | Low Abundance Exploitation Rate (LAER) | Total Allowable Mortality (TAM) Cap | Lower Fishery Reference Point | Upper Fishery Reference Point |
|---|---|---|---|---|
| **Early Stuart** | 5% | 20% | 108,000 | 135,000 |
| **Early Summer (without misc)** | 7% | 50% | 100,000 | 200,000 |
| **Summer (without misc)** | 10% | 50% | 640,000 | 1,280,000 |
| **Late Run (without misc)** | 10% | 50% | 300,000 | 600,000 |

7. Low Abundance Exploitation Rates (LAER) are not intended to create directed harvest opportunities in mixed-stock areas, do not contribute to international TACs, and represent maximum allowable fishing-related impacts (including test fisheries and release mortalities).

## Pre-season Agreement

### Test Fishing Plan

8. The Fraser River Panel adopted a test fishing plan that considers information needs, run size and timing forecasts, and program operating costs. Further details are noted in Appendix B.
9. The Fraser River Panel agrees to the test fishing plan in Table 3.

*Table 3. Fraser River Panel Test Fishing Plan noting test fishery commencement and conclusion.*

| Test Fishery | Start Date | End Date | Realized Dates |
|---|---|---|---|
| **Area 20 gillnet** | Not operated in 2024 | | |
| **Area 20 purse seine** | July 15 | August 5 | July 15 – August 3 |

| Test Fishery | Start Date | End Date | Realized Dates |
|---|---|---|---|
| **Area 4b, 5 gillnet** | Not operated in 2024 | | |
| **Brownsville Bar** | July 8 | August 25 | July 8 – August 25 |
| **Whonnock gillnet** | June 28 | September 10 | June 28 – September 8 |
| **Area 7 reefnet** | 10 observation days | - | Not operated in 2024 |
| **Area 12 Round Island gillnet** | Not operated in 2024 | | |
| **Area 12 Blinkhorn purse seine** | July 14 | August 4 | July 14 – August 4 |
| **Area 13 purse seine** | Not operated in 2024 | | |
| **Qualark gillnet** | July 18 | September 6 | July 18 – September 6 |

## Pre-season Fishing Plan

10. The Fraser River Panel recalls the methodology for calculating the TAC, pursuant to Chapter 4, paragraph 3, where the TAC is the remaining portion of the "…*aggregate Fraser sockeye run after the spawning escapement targets established, … by applying Canada's pre-season escapement plan (subject to any adjustments made pursuant to paragraph 3(b)), the agreed Fraser River Aboriginal Exemption (AFE), and the retained catch in Panel-authorized test fisheries are deducted."*
11. The Fraser River Panel agrees to use the proportional Management Adjustments (pMA), by Stock Management Group, for Sockeye Salmon in Table 4. The pMAs are based on pre-season assumptions about Sockeye marine migration timing, recent late run delay behavior, and an anticipated en-route mortality due to predicted warm water temperatures which will be exacerbated by low discharge.

*Table 4. Fraser River Panel Adopted Pre-season pMAs for Fraser River Sockeye.*

| Stock Management Group | Adopted pre-season pMA |
|---|---|
| **Early Stuart** | 1.17 |
| **Early Summer** | 0.56 |
| **Summer** | 0.28 |
| **Late Run** | 0.49 |

12. Pursuant to Chapter 4, paragraph 13(a), the Fraser River Panel agrees to adopted median run size (i.e., p50) forecast provided by Canada for management purposes until in-season updates of run size become available.
13. At the median run size forecast, no TAC is available and no directed harvest of Sockeye is planned. In the event that international TAC becomes available, fisheries plans will be discussed by the Fraser River Panel. Fisheries will be based on in-season information and will be conducted respecting the conservation concerns for both Parties on co-migrating stocks and species.

## In-season Decision Rules

14. The Fraser River Panel agrees on the following in-season decision rules:
    a. Proportional Management Adjustments may be adjusted in season, as necessary, using the process described by Secretariat staff and noted in Table 5 (PSC, 2024. *2024*

*Management Adjustments*. 3f_2024 Management Adjustments.pdf). A Threshold Approach will be utilized for Early Stuart and Summer run, should extreme in-season environmental conditions occur.

*Table 5. Methodology to change pMAs In-season for Fraser River Sockeye salmon.*

| **Stock Management Group** | **In-season adjustment methodology** |
|---|---|
| **Early Stuart** | Threshold Approach |
| **Early Summer** | All-years Median (1977-2023) |
| **Summer** | Threshold Approach |
| **Late Run** | Non-Dominant Years Median (1996-2023) |

b. The Secretariat will make recommendations for in-season run size to the Panel.

c. Harvestable surplus and international TAC will be calculated pursuant to Chapter 4, paragraph 3.

d. Given the primary objective of obtaining spawning escapement goals by stock or Stock Management Group, the Fraser River Panel, to the extent practical, shall strive to concentrate harvest on the management group (or groups) that have the most harvestable surplus.

    i. It is understood that a small but acceptable (SBA) rate of incidental harvest on one or more overlapping management groups, with little or no TAC, may occur.

        1. Should harvestable surplus materialize in season, both National Sections of the Fraser River Panel agree to have discussions around SBA parameters and associated PST-guided notification process in-season.

e. During the 2024 season and into the 2025 pre-season, the National Sections of the Fraser River Panel each agree to develop a framework for reaching agreement on annual "small but acceptable" (pursuant to Chapter 4, paragraphs 3(e) and 3(g)) levels of incidental catch in Fraser River Panel fisheries targeting harvestable surpluses of Fraser River Sockeye and Pink salmon.

    i. For clarity, paragraph (e) is consistent with the *Fraser River Panel Bilateral Response to "PSC Secretariat Report – Review of August 18 and 25, 2023 Fraser River Panel fisheries proposals, decisions and subsequent consequences"* tabled by the Fraser River Panel in February 2024 (Appendix B)

f. National Sections of the Fraser River Panel each agreed to adopt the *p50 (base case) modeling scenario* (PSC, 2024. *p50_June.* Model Summary Handout_p50_June.pdf) to begin the 2024 season. This scenario includes: the median run size forecasts, by Stock Management Group; the 2024 escapement objectives by Stock Management Group and adjusted for the agreed-to pre-season pMAs; the agreed-to test fishery deductions; and does not include any planned fisheries by either National Section.

## Post-season Data

### Post-season Run Size and Run Time Estimates

15. Pursuant to Chapter 4, paragraph 13, the Secretariat provided the Fraser River Panel with in-season run size recommendations. The Secretariat provided a post-season estimated run size by Stock Management Group and deviation from the forecast, effective 24 September 2024, as described in Table 6. (PSC, 2024. In-season Distribution. 2024 09 25 Distribution.pdf).

*Table 6. Estimated run size by Stock Management Group and deviation from the forecast, effective 24 September 2024.*

| Stock Management Group | Pre-season forecast | Post-season estimate | Difference |
|---|---|---|---|
| **Early Stuart Sockeye** | 181 | N/A | N/A |
| **Early Summer Sockeye** | 159,000 | 142,000 | -11% |
| **Summer Sockeye** | 379,000 | 307,000 | -19% |
| **Late Sockeye** | 29,000 | 25,000 | -14% |
| **Total Fraser Sockeye** | 567,000 | 474,000 | -16% |
| **Fraser Pink** | N/A | N/A | N/A |

16. Total Sockeye run size is estimated at 20% above the brood year (0.4 million) and 85% below the historical cycle-line average (3.1 million).
17. The post-season estimate of Area 20 run timing by Stock Management Group and deviation from the forecast, effective 24 September 2024, are described in Table 7. (PSC, 2024. In-season Distribution. 2024 09 25 Distribution.pdf).

*Table 7. Estimated run timing by Stock Management Group and deviation from the forecast, effective 24 September 2024.*

| Stock Management Group | Pre-season forecast | Post-season estimate | Difference |
|---|---|---|---|
| **Early Stuart Sockeye** | July 7 | N/A | N/A |
| **Early Summer Sockeye** | July 19 | July 14 | -5 |
| **Summer Sockeye** | July 30 | August 1 | +2 |
| **Late Sockeye** | August 7 | August 12 | +5 |
| **Fraser Pink** | N/A | N/A | N/A |

### Total Allowable Catch, Allocations, and Catch

18. The Fraser River Sockeye and Fraser River Pink TAC is described in Table 8. (PSC, 2025. 2024 Summary TAC and Allocations status. 4c. Summary TAC and Allocations status Calculations_updated Jan 23 2025.pptx).

*Table 8. Total Allowable Catch of Fraser River Sockeye and Pink as adopted by the Fraser River Panel. Effective 23 August 2024.*

| | Fraser River Sockeye | Fraser River Pink |
|---|---|---|
| **Total Allowable Catch** | 0 | N/A |

| | Fraser River Sockeye | Fraser River Pink |
|---|---|---|
| **United States of America – Washington** | 0 | N/A |
| **Canada** | 0 | N/A |

19. The Fraser River Panel affirms the TAC calculations and Parties' allocations, including overages and underages, pursuant to Chapter 4, paragraphs 3, 2, and 8, respectively. The detailed TAC calculations and allocations are described in Appendix C. (PSC, 2025. 2024 Summary TAC and Allocations status. 4c. Summary TAC and Allocations status Calculations_updated Jan 23 2025.pptx).
20. Pursuant to Article VI, paragraph 6, and Chapter 4, paragraph 12, no fisheries were authorized by the Fraser River Panel this season. Regulatory announcements describing these authorizations are published at: Fraser River Panel Regulatory Announcements - Pacific Salmon Commission.
21. The in-season catch estimate of Fraser River Sockeye and Fraser River Pink, effective 20 December 2024 are described in Table 9. (PSC, 2025. Review of the 2024 Management Season. 4a. Management Overview 2024.pptx).

*Table 9. In-season catch estimate of Fraser River Sockeye and Fraser River Pink, by Party, effective 20 December 2024. Catches in this Table may differ from those presented in the Annual Report due to late catch reporting.*

| | Fraser River Sockeye Retained Catch | Fraser River Pink Retained Catch |
|---|---|---|
| **Total Retained Catch** | 23,900 | N/A |
| **United States – Washington** | 0 | N/A |
| **Canada** | 18,100 | N/A |
| **Test Fisheries** | 5,800 | N/A |

### Management Regime Performance and Escapement

22. Preliminary post-season catch and exploitation rates, relative to the established limits, are described in Table 10 for Fraser River Sockeye Stock Management Groups, and Fraser River Pink. (PSC, 2025. Review of the 2024 Management Season. 4a. Management Overview 2024.pptx; PSC, 2025. District 104 Next Steps. 7_Next steps for PIPWOG Feb 2025 (FRP).pptx).
    - Fisheries impacts were less than the Allowable Exploitation Rate for Early Stuart Sockeye.
    - Fisheries impacts were less than the Allowable Exploitation Rate for Early Summer Sockeye.
    - Fisheries impacts were less than the Allowable Exploitation Rate for Summer Sockeye.
    - Fisheries impacts were less than the Allowable Exploitation Rate for Late Sockeye.

*Table 10. Preliminary post-season estimates by Stock Management Group, relative to exploitation limits, effective 20 December 2024. Note the exploitation rate includes fishing-related incidental mortality (FIM), which in not recorded as catch throughout the table.*

| Fishery Type | Early Stuart Sockeye | Early Summer Sockeye | Summer Sockeye | Late Sockeye | Total Sockeye | Pink |
|---|---|---|---|---|---|---|
| **United States Catch** | 0 | 0 | 0 | 0 | 0 | N/A |
| **Commercial** | 0 | 0 | 0 | 0 | 0 | N/A |
| **Non-Commercial** [1] | 0 | 0 | 0 | 0 | 0 | N/A |
| **Alaska** | N/A | N/A | N/A | N/A | 4,200 | N/A |
| **Canadian Catch** | 0 | 0 | 0 | 0 | 0 | N/A |
| **Commercial** | 0 | 0 | 0 | 0 | 0 | N/A |
| **First Nations** | 0 | 50 | 70 | 420 | 540 | N/A |
| **Non-Commercial** [1] | 0 | 40 | 180 | 120 | 240 | N/A |
| **Other** [2] | 0 | 1,000 | 16,300 | 80 | 18,100 | |
| **Test Fishing Catch** | 0 | 1,600 | 4,000 | 210 | 5,800 | N/A |
| **Total Catch** | 0 | 2,700 | 20,500 | 720 | 23,900 | N/A |
| **Panel-adopted run size** | N/A | 143,000 | 275,000 | 38,000 | 456,000 | N/A |
| **Preliminary Exploitation Rate (incl. FIM)** | N/A | 1.9% | 7.5% | 1.9% | 5.2% | N/A |
| **Allowable Exploitation Rate** | 5% | 7% | 10% | 10% | N/A | N/A |

[1] Non-commercial catch includes recreational, charter, and ESSR in Canada, and sport and C&S in the U.S.

[2] May include unauthorized directed retention or unauthorized bycatch retention in fisheries directed at other species.

23. Fraser River Sockeye escapement by Stock Management Group, effective 11 February 2025, relative to the escapement target, is described in Table 12 (PSC, 2025. 2024 Summary TAC and Allocations status. 4c. Summary TAC and Allocations status Calculations_updated Jan 23 2025.pptx; PSC, 2025. Review of the 2024 Management Season. 4a. Management Overview 2024.pptx; Fisheries and Oceans Canada, 2025. 4a_Prelim Fraser Sockeye Spawning Escapements.pdf).
    - Early Stuart Sockeye escapement was above the in-season target.
    - Early Summer Sockeye escapement was above the in-season target.
    - Summer Sockeye escapement was below the in-season target.
    - Late Sockeye escapement was below the in-season target.

*Table 11. Fraser River Sockeye spawning escapement by Stock Management Group, relative to their spawning escapement targets (SET) effective 12 February 2025.*

| Stock Management Group | Pre-season Target[1] | In-season Target[2] | In-season Predicted Spawning Escapement[3] | Preliminary Post-season Spawning Escapement[4] |
|---|---|---|---|---|
| **Early Stuart Sockeye** | 108,000 | 200 | N/A | 356 |
| **Early Summer Sockeye** | 131,200 | 131,400 | 89,000 | 172,161 |

| Stock Management Group | Pre-season Target[1] | In-season Target[2] | In-season Predicted Spawning Escapement[3] | Preliminary Post-season Spawning Escapement[4] |
|---|---|---|---|---|
| **Summer Sockeye** | 891,400 | 275,000 | 183,300 | 260,924 |
| **Late Sockeye** | 302,000 | 38,000 | 16,900 | 34,029 |
| **Total Sockeye** | 1,432,600 | 444,600 | 289,000 | 467,470 |

[1]Pre-season spawning escapement target is the Lower Fishery Reference Point (Table 2) scaled to account to miscellaneous stocks.
[2]When the run size is below the pre-season target, the run size becomes the target. PSC, 2025. 2024 Summary TAC and Allocations status. 4c. Summary TAC and Allocations status Calculations_updated Jan 23 2025.pptx
[3]PSC, 2025. Review of the 2024 Management Season. 4a. Management Overview 2024.pptx
[4] Fisheries and Oceans Canada, 2025. 4a_Prelim Fraser Sockeye Spawning Escapements.pdf

**Appendix A**

# Summary of April FRP meeting test fishing decisions for the 2024 season

May 9, 2024

## Test fishing schedule:

Panel approved test fishing schedule for 2024:

| | Agreed Schedule | |
|---|---|---|
| **Test Fishery** | **Start** | **End** |
| Area 20 gillnet | Not operated for 2024 | |
| Area 20 purse seine | July 15 | August 5 |
| Brownsville Bar | July 8 | August 25 |
| Whonnock gillnet | June 28 | September 10 |
| Area 7 reefnet | 10 observation days | |
| Area 12 round island gillnet | Not operated for 2024 | |
| Area 12 Blinkhorn purse seine | July 14 | August 4 |
| Qualark gillnet | July 18 | September 6 |

## Live Sampling

### Schedule

- PSC Staff are planning to run an experimental trial of live-sampling and releasing sockeye in the Area 20 purse seine test fishery. The schedule is subject to change, but the most likely scenario is:
  - July 15-16: Sample and land sockeye (targeting 120 sockeye per day) in Port Renfrew.
  - July 17-20: Live sample (targeting 120 sockeye per day) and release all sockeye caught.
  - July 21 onward: Return to sampling and landing 120 sockeye per day in Port Renfrew.
  - Assess the success of the live-sampling trial and determine whether a second, 4-day live-sampling period can occur prior to the end of the test fishery. PSC Staff cannot guarantee that a second live-sampling period will occur as it will depend on the success of the initial trial and the availability of personnel required.
- There will be no live sampling in Area 12 or in any of the in-river test fisheries.

### Associated Costs

- Live sampling will require a one-time startup cost (purchase of sampling and fish care equipment) of up to $5,000.
- Each day of live sampling will increase daily program costs by up to $1,500, and $1,000 in program revenue per day will be foregone as sampled sockeye will be released[1].

### Reduction to Sockeye Mortality

- Each day of live sampling will result in an expectation of approximately 96 additional Fraser sockeye reaching the lower Fraser River, assuming a test fishing catch of 120 sockeye[1]. This

[1] Estimates of foregone revenue and reduction in fishing related mortality are dependant on the Area 20 purse seine's ability to reach its sample target of 120 sockeye per day. Daily sockeye catch and release estimates of 120 pieces (due to higher abundances or catchability) would result in a increase to the lost revenue estimate. Estimates assume an average of $3.00 per pound for sockeye and a 5.3 pound average per fish.

assumes a mortality of 20% associated with the live sampling, but does not take into account additional en route mortality that is expected to occur.

### Loss of Information

- Lengths, weights, and sex ratio cannot be obtained during the live-sampling periods in Area 20. Sex ratio and length information will still be obtained in Area 12 during the live sampling period. Loss of this data in Area 20 will reduce the quality of the PSC's biological data time-series but is not expected to impact the ability of the Panel to make in-season fisheries management decisions.

## Summary

- For the 2024 season, the PSC will not operate the marine gill nets. A four-day live sampling program will be conducted during the Area 20 purse seine program. The 4-day live sampling trial results in an increase to the expected test fishing program financial deficit by $15,000. A second 4-day live-sampling period would increase the deficit by an additional $14,000. In addition, the number of Fraser sockeye, live sampled, expected to reach the lower Fraser River will be increased by up to 384 individuals assuming 120 sockeye are caught daily during the 4-day live sampling.

## Appendix B

# Fraser River Panel Bilateral Response to "PSC Secretariat Report – Review of August 18 and 25, 2023 Fraser River Panel fisheries proposals, decisions and subsequent consequences"

## Introduction

In response to fishery decisions made at the August 18 and August 25 meetings of the Fraser River Panel (the Panel), the Canadian National Section requested that the Pacific Salmon Commission (PSC) Secretariat prepare a report on the circumstances of the decisions and their consequences. This report, pursuant to Chapter 4, section 13(e) of the Pacific Salmon Treaty (PST), was submitted to the Panel on December 21, 2023. PSC staff presented the report at a January 9, 2023 PSC meeting in Seattle. The Canadian and United States (U.S.) National Sections offer the following comments about the report "Review of August 18 and 25, 2023 Fraser River Panel fisheries proposal, decisions, and subsequent consequences."

Both the Canadian and U.S. Sections appreciate the work of the PSC Secretariat to provide a detailed review to the August 2023 fishery decisions. The Report provides some helpful context and makes some useful recommendations to move forward.

Both National Sections of the Panel recognize the complexities of Fraser River sockeye management and rely on the PST to guide decision-making processes and resolve disagreements between the two National Sections.

## Disagreement

In 2023, Canada and the U.S. disagreed on the interpretation of the PST, Chapter 4, section 3(g), in particular reference to "small but acceptable" and "to the extent practical." This resulted in the Panel approving two U.S. pink salmon fishery proposal on August 18 and 25, with the Canadian National Section dissenting.

The U.S. interpretation of Chapter 4 language is that incidental harvest of sockeye, in instances where there is no international sockeye Total Allowable Catch (TAC), is contemplated in section 3 (g). That the use of the term "harvest" is a purposeful acknowledgment of the expectation that bycatch of sockeye, when small enough, is allowed. The U.S. stated in their August 18 rationale letter, supporting retention of incidental sockeye salmon for tribal Ceremonial and Subsistence use, that U.S. tribes have cultural beliefs, enshrined in their traditional laws and fishing regulations that require their fishers to retain all catch, including bycatch, for sampling and to prevent wastage of the resource. Further, the U.S. considered the incidental harvest rate of sockeye small but acceptable in accordance with the PST. Following the August 25 Panel meeting, the US provided a rationale letter and prosecuted a pink-directed fishery Treaty Tribal and All Citizen fishery with no sockeye retention. The U.S. stated that U.S. fisheries would result in a low level of sockeye encounters and fishing-induced mortalities (FIMs) given the sockeye marine run timing and low U.S. fishery effort. The U.S. considered the incidental harvest rate (catch and release) of sockeye small but acceptable in accordance with the PST. Ultimately, the total sockeye mortality from decisions on August 18 and 25 resulted in 3,243 fish (including 872 FIMs), representing a sockeye exploitation rate of 0.19%. The U.S. also interprets the term "to the extent practical", in reference to planning fisheries to minimize incidental harvest of sockeye, to mean the proposal, as evaluated by the PSC staff, results in very low incidental impacts (for consideration of acceptability) while remaining within available TAC on the target species or management group.

As discussed in our 2023 pre-season meetings, both Parties agree that the definitions depend on the context of a fishery proposal. Two key contextual considerations for the Canadian National Section are (1) stock abundance relative to escapement goals, and (2) that fishery proposals, to the extent practical, are designed to minimize incidental harvest. The Canadian National Section's view of the 2023 fishery decision is summarized:

- Canada's view of "small but acceptable" incidental harvest in the events referenced is that a small amount of Fraser sockeye mortality will occur in U.S. Fraser pink-directed fisheries in the absence of sockeye TAC, and that the parties must negotiate what is considered 'small'.
- When fisheries are designed, that they be designed to the extent practical, to minimize mortality to align with what is deemed acceptable.
- Choices of fishery area, gear, effort, and bycatch release could be considered to minimize impacts to Fraser River sockeye by reducing encounters and/or minimizing mortalities during the development of U.S. Fraser River pink directed fishery proposals These measures should prioritize meeting escapement targets for sockeye salmon, and not incur unnecessary sockeye mortalities.
- On August 18, the U.S. fishery proposal was three days earlier than pre-season planning process identified, there was significant uncertainty in the run size, and the return was experiencing unprecedent migration conditions. Given this Canada felt more conservative approach was necessary.
- In Canada's view, insufficient efforts, to the extent practical, were made to minimize impacts of U.S. pink-directed fisheries on sockeye salmon.
- As a result, the incidental harvest of sockeye salmon, caught and retained in the proposed August 18 fisheries as well as the FIMs in the proposed August 25 fisheries, were not acceptable to Canada.

The Report describes a number of other factors relevant to sound fisheries management decisions (e.g., catchability, effort, release mortality, stock composition), but suggests that the "bottom line" for the recent Panel disagreements is incidental Sockeye mortality, suggesting that this metric integrates across a number of important factors. However this approach presumes an equal weighting across factors and may not fully consider management tradeoffs. This conclusion underpins the Report's subsequent recommendations. However this approach presumes an equal weighting across factors and may not fully consider management tradeoffs.

## Moving Forward

The National Sections recognize and appreciate the Staff's development of recommendations that the Panel should consider implementing to reduce the likelihood that Chapter 4, paragraph 13(d)(iii) needs to be initiated by a Party in future fishing seasons.

The National Sections recognize that each annual circumstance is unique and implementing any sort of framework would need to allow for flexibility in management. There is also recognition that the Panel coming to agreement about "small but acceptable" and "to the extent practical" during the pre-season planning process would lessen the likelihood of in-season disputes.

The recommendations may be broadly categorized as (1) means to quantify and evaluate "small but acceptable" [Recommendations 1, 2, 4, 7, 8]; (2) fishery objective refinement and prioritization [3, 5, 6]; and (3) improved monitoring and reporting [10, 11, 12].

The National Sections agree that the annual pre-season planning process should seek agreement about “small but acceptable” and “to the extent practical”, noting that an annual process will be required given that the management context may change significantly from fishing season to season. The Secretariat identified candidate metrics to consider during a pre-season planning process: fixed rates of harvest mortality, variable rates of harvest mortality based on sockeye run size, fixed total mortality rate (including fishing induce mortalities).

In general, the National Sections are in agreement about the benefits of refining fishery objectives and priorities. In general, the National Sections agree with the recommendations regarding improved monitoring and reporting.

The National Sections are committed to documenting a revised pre-season planning process that comprehensively identifies fishery planning scenarios where parties agree on scenario-specific “small but acceptable” sockeye mortality by management unit. The parties will also develop an approach to address in-season fishery proposals that deviate from a pre-season agreement. The Panel will complete this workplan by June 2024.

The National Sections acknowledge that the current chapter language in the PST was drafted at a time when Sockeye scarcity was the exception, not the rule. The differing interpretation of PST language is not a new schism among the parties, but rather a pre-existing divergence that has been exposed by an absence of fish and an uncertain future. Frequent scarcity has left the Panel negotiating fisheries using an agreement where the Parties’ interpretation differs. Given that both Parties' fundamental principles have not changed (namely our priority objective of achieving escapement targets), and given that both Canada and the U.S. have clearly articulated their commitment to work together collaboratively, resolution over the coming year is possible.

## Appendix C

| | Note | Sockeye | |
|---|---|---|---|
| **TOTAL ALLOWABLE CATCH** | | | |
| **In-season Total Run Size (adopted)** | *1* | **456,200** | |
| **Deductions** | | **695,200** | |
| In-season Spawning Escapement Target | *1* | 444,600 | |
| In-season Management Adjustment | *1* | 244,300 | |
| Aboriginal Fishery Exemption (AFE) | *2* | 540 | |
| Post-season Test Fishing Catch | | 5,800 | |
| **Total Allowable Catch** | *3, 4* | **0** | |
| **UNITED STATES** | | | |
| **Washington Share** | | **0** | |
| Washington Share of TAC | *3* | 0 | 16.5% |
| Payback | | 0 | |
| **Washington Catch** | | **0** | |
| Other Catch | *5* | **0** | |
| **Deviation** | | **0** | |
| **CANADA** | | | |
| **Balance to Canada + U.S. Payback + AFE** | | **540** | |
| **Canadian Catch (includes Charter, SSFSC)** | *6* | **780** | |
| Other Catch | *5* | **17,360** | |
| **Deviation** | | **-17,600** | |

*1* Estimates in effect on August 23, 2024, the last date the Panel adopted an in-season run size as per paragraph 3(a) Annex IV, Chapter 4 of Pacific Salmon Treaty.

*2* Actual Catch as per paragraph 3c, Annex IV, Chapter 4, of the Pacific Salmon Treaty

*3* TAC and Washington sockeye share according to Annex IV, Chapter 4, of the Pacific Salmon Treaty.

*4* TAC may not equal the total run minus total deductions shown due to adjustments required when the run size of individual management groups is less than the nominal deductions. For more detail refer to TAC calculations by individual management groups.

*5* May include unauthorized directed retention or unauthorized bycatch retention in fisheries directed at other species

*6* Fraser Sockeye Single Stock FSC Fisheries (SSFSC), formerly known as ESSR fisheries

| 2024 TAC Calculations | Fraser Sockeye | | | | |
|---|---|---|---|---|---|
| | Early Stuart | Early Summer | Summer | Late | Total |
| **RUN STATUS, ESCAPEMENT NEEDS & AVAILABLE SURPLUS** | | | | | |
| In-season Abundance Estimate | 180 | 143,000 | 275,000 | 38,000 | 456,180 |
| Adjusted Spawning Escapement Target * | 180 | 143,000 | 275,000 | 38,000 | 456,180 |
| Spawning Escapement Target (SET) | 200 | 131,400 | 275,000 | 38,000 | 444,600 |
| Management Adjustment (MA) | 390 | 73,580 | 154,000 | 16,340 | 244,310 |
| Test Fishing Catch (TF, post-seas. est.) | 1 | 1,590 | 3,989 | 205 | 5,800 |
| Surplus above Adjusted SET & TF | 0 | 0 | 0 | 0 | 0 |
| **DEDUCTIONS & TAC FOR INTERNATIONAL SHARING** | | | | | |
| Aboriginal Fishery Exemption (AFE) | 0 | 50 | 70 | 420 | 540 |
| Total Deductions (Adj.SET + TF + AFE) | 181 | 144,640 | 279,059 | 38,625 | 462,505 |
| Available TAC (Abundance - Deductions) | 0 | 0 | 0 | 0 | 0 |
| **UNITED STATES (Washington) TAC** | | | | | |
| Propor. distrib. TAC - Payback ** | 0 | 0 | 0 | 0 | 0 |
| Washington Catch | 0 | 0 | 0 | 0 | 0 |
| Other Catch*** | 0 | 0 | 0 | 0 | 0 |
| Deviation from TAC - Payback | 0 | 0 | 0 | 0 | 0 |
| **CANADIAN TAC** | | | | | |
| Propor. distrib. TAC + Payback + available AFE | 0 | 50 | 70 | 420 | 540 |
| Canadian Catch (includes Charter, excludes SSFSC ) | 0 | 93 | 253 | 438 | 783 |
| Other Catch*** | 0 | 1,008 | 16,271 | 78 | 17,357 |
| Deviation from TAC + Payback + AFE | 0 | -1,050 | -16,454 | -95 | -17,599 |

* The adjusted spawning escapement target cannot exceed the estimated abundance.

** TAC and Washington sockeye share according to Annex IV, Chapter 4, of the Pacific Salmon Treaty.

*** May include unauthorized directed retention or unauthorized bycatch retention in fishereis directed at other species

## Fraser Sockeye

| | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|
| **TOTAL ALLOWABLE CATCH** | | | | |
| Total Run Size | 2,553,000 | 7,274,000 | 1,652,000 | 456,180 |
| Escapement and other deductions | 2,377,260 | 4,940,480 | 1,652,000 | 456,180 |
| Total Allowable Catch: | 175,740 | 2,333,520 | 0 | 0 |
| **UNITED STATES** | | | | |
| Washington Catch | 20 | 352,310 | 2,390 | 0 |
| Washington Share (exclds payback) * | 29,000 | 385,030 | 0 | 0 |
| Deviation: | -28,980 | -32,720 | 2,390 | 0 |
| **Cumulative Allocation Status:** | **470** | **0** | **2,390** | **2,390** |

* Washington share of the TAC according to Annex IV of the Pacific Salmon Treaty:

2020: No payback w as generated in 2020, but by Panel agreement 470 sockeye w ere carried forw ard from the 2019 season.

2021: Shall not exceed 16.5% for Fraser sockeye and 25.7% for Fraser pinks. Allocation status based on TAC w hen Panel met for last in-season meeting (Sep 23). As there w as no TAC for sockeye salmon, the payback of 470 sockeye w as carried forw ard from the 2019 season.

2022: Shall not exceed 16.5% for Fraser sockeye and 25.7% for Fraser pinks. Allocation status based on TAC w hen Panel made the last decision about U.S. fisheries in 2022 (Aug. 18).

2023: Panel met for last in-season meeting (Sep 27). As there w as no TAC for sockeye salmon any sockeye catch is considered an overage.

2024: Shall not exceed 16.5% for Fraser sockeye and 25.7% for Fraser pinks.