Meeting Summary Record
Pacific Salmon Commission Post Season Meeting
January 2013

The Pacific Salmon Commission met January 14-18, 2013 in Vancouver, British Columbia at the Sheraton Wall Centre. The Commission met five times in bilateral session, and there were 30 participants including one member of the public (see attached attendance list).

The Commission AGREED:

1. The Performance Review Implementation Group (PRIG) will submit its final report prior to the February 2013 Annual Meeting. The Commission will develop an action plan in response to the PRIG report with appropriate input from the national sections.

2. The Commission accepted the Parties' post-season reports as submitted.

3. At the February 2013 Annual Meeting, the U.S. Section will provide a response to the draft terms of reference for a Strategic Review Committee on In-River Assessment of Fraser River Sockeye and Pink Salmon (Hydroacoustics) submitted by Canada with a view toward completing the terms and specifying timelines for future work.

4. The Commission accepted the minutes from the February 2012 and October 2012 Commission meetings as edited by each national section.

5. The Commission agreed to discuss the Habitat and Restoration Technical Committee workplan at the February 2013 Annual Meeting.

ATTENDANCE
PACIFIC SALMON COMMISSION
POST SEASON MEETING
JANUARY 14-18, 2013
SHERATON WALL CENTRE, VANCOUVER, B.C.

COMMISSIONERS

CANADA	UNITED STATES
S. Farlinger (Chair)	D. Bedford (Vice-Chair)
R. Jones	R. Allen
P. Macgillivray	P. Anderson
R. Rezansoff	W. Auger
B. Riddell	R. Elicker
P. Sprout	M. Oatman
	L. Rutter

ADVISORS

L. Neilson	B. Bohn
M. Saunders	C. Bowhay
A. Webb	P. Dygert
H. Wood	C. Kern
	M. Matylewich
	P. Pattillo
	C. Ryder
	C. Starger
	G. Williams

STAFF

J. Field
K. Forrest
T. Tarita

PACIFIC SALMON COMMISSION MEETING
JANUARY 14-18, 2013
SHERATON WALL CENTRE, VANCOUVER, B.C.

RELATED DOCUMENTS

1. Draft agenda

2. Post-Season Report for 2012 Canadian Treaty Limit Fisheries

3. 2012 Post-Season Report United States Salmon Fisheries of Relevance to the Pacific Salmon Treaty

4. Letter of introduction to the Salish Sea Marine Survival Project

5. Salish Sea Marine Survival Project Presentation

6. The Results and Recommendations of the Salish Sea Marine Survival Research Planning and Ecosystem Indicators Development Workshops; Draft Summary Report, January 11, 2013

7. Terms of Reference for the Strategic Review Committee in In-River Assessment of Fraser River Sockeye and Pinks (Hydroacoustics), Draft prepared by the Canadian Section, January 16, 2013

8. Next Steps for Fraser River Acoustics

9. Fraser River Panel Renegotiation of Annex IV, Chapter 4: List of Procedures or Provisions that may need Amendment or Inclusion

10. Bilateral CWTIT Report January 2013

Draft Agenda

Pacific Salmon Commission
Post-Season Meeting

January 14-18, 2013
Sheraton Wall Centre
Vancouver, B.C.

1. **Adoption of Agenda**
2. **Executive Secretary's report**
3. **Approval of Minutes**
    a. February 13-17, 2012 (with edits from October 2012)
    b. October 16-17, 2012
4. **Action Items Pending**
    a. Update on Annex IV, Chapter 4 Renewal
    b. Hydroacoustics Issues
        i. Draft report from Secretariat
        ii. Draft Terms of Reference for liaison group
    c. Update from Performance Review Implementation Group
    d. Post-Season Reports
    e. Update from Salish Sea Marine Survival Research Planning Workshop (Nov. 2012)
    f. Southern Resident Killer Whale workshops – update on expert panel report
    g. Cohen Commission results relevant to the PSC
5. **Reports from Panels and Committees**
    a. F & A Committee Report
    b. Sentinel Stock Committee – progress report
    c. Chinook Interface Group – update (as needed)
    d. Coded Wire Tag program report
    e. Habitat Restoration Technical Committee – next steps
    f. Progress Reports on Work Plans – Panels and Technical Committees – as needed

6. **Other Business**
    a. Recognition of recent outgoing Canadian Commissioners

POST-SEASON REPORT FOR
2012 CANADIAN TREATY LIMIT FISHERIES

By Fisheries and Oceans Canada

January 7, 2012

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1 INTRODUCTION

The chapters in Annex IV of the Pacific Salmon Treaty outline the joint conservation and harvest sharing arrangements between Canada and the U.S. for key stocks and fisheries subject to the Treaty. On December 23, 2008, Canada and the U.S. ratified new provisions for five chapters under Annex IV of the Pacific Salmon Treaty. These new chapters came into effect on January 1, 2009. Chapter 4, which covers Fraser River sockeye and pink salmon, was set to expire on December 31, 2010. However an Order in Council, and the corresponding exchange of diplomatic notes, allowed for the extension of the chapter until December 31, 2013. All management regimes under Annex IV continue to be implemented by Fisheries and Oceans Canada (DFO) and U.S. agencies for the 2012 season.

The catches reported below provide the best information available to December 1, 2012, and may change once all catch information for 2012 has been reviewed. The catches are based on in-season estimates (hailed statistics), on-grounds counts by Fisheries and Oceans Canada management staff and independent observers, logbooks, dockside tallies, landing slips (First Nation fisheries), fish slip data (commercial troll and net), creel surveys, logbooks and observers (sport and commercial).

Annex fisheries are reported in the order of the Chapters of Annex IV. Comments begin with expectations and management objectives, followed by catch results by species, and where available and appropriate, escapements. The expectations, management objectives, catches and escapements are only for those stocks and fisheries covered by the Pacific Salmon Treaty; domestic catch allocations have been excluded. Appendix 1 summarizes 1995-2012 catches in Canadian fisheries that have at some time been under limits imposed by the Pacific Salmon Treaty.

2 TRANSBOUNDARY RIVERS

2.1 STIKINE RIVER

Canada developed a fishing plan for Stikine River salmon fisheries based on the catch sharing and management arrangements outlined in Annex IV, Chapter 1, Paragraph 3 of the Pacific Salmon Treaty, including the new arrangements agreed to on January 17, 2008 for the 2009 to 2018 period. Accordingly, the 2012 management plan was designed to meet agreed escapement targets and the following harvest objectives: to harvest 50% of the total allowable catch (TAC) of Stikine River sockeye salmon in existing fisheries; to allow additional harvesting opportunities in terminal areas for enhanced sockeye that were surplus to spawning requirements; to harvest up to 5,000 coho salmon in a directed coho fishery; and, to harvest approximately 1,400 large chinook salmon in a test fishery, conducted by the commercial fleet. Because the preseason run size estimate of 40,800 chinook exceeded the PST agreed upon preseason threshold run size of 28,100 large chinook, both countries were permitted to engage in a directed net fishery. The allowable catch for the US and Canada was 5,890 and 6,810 chinook salmon respectively. The allowable catch does not include a base level catch of 3,400 and 2,300 chinook salmon for the US and Canada respectively.

The 2012 season opened on May 6, 2012, statistical week 19 (SW19), and ended September 6, (SW36). In week 23 (SW20) the commercial fishery was closed. However, the commercial fleet continued to fish under the auspices of a test fishery with a catch quota of approximately 228 large chinook. This action was taken as a result of the in-season chinook run size estimate of less than 24,500 fish (threshold number used to trigger a directed chinook fishery). The commercial fishery reengaged in week 24 (SW24) as a result of an increase in the inseason run size estimate that exceeded the 24,500 fish threshold. Commercial gear consisted of one 135-metre (443 ft) gill net per licence holder. The maximum mesh size allowed was 204 mm (8”) through June 24th after which time the maximum mesh size was restricted to 140 mm (5.5”). Only one gill net was permitted throughout the course of the commercial fishery.

The lower Stikine commercial fishing grounds covered the area from the international border upstream to near the confluence of the Porcupine and Stikine rivers and also included the lower 10 km (6 mi.) of the Iskut River.

In the upper Stikine commercial fishery, which is located upstream from the Chutine River, fishing periods generally mirrored those in the lower Stikine commercial fishery, but lagged by one week. Fishers were permitted one net. Effort was low throughout the season. Again in 2012, the commercial fishing area was extended upstream to the mouth of the Tuya River. This action was taken in order to provide for a terminal fishing opportunity on Tuya River bound sockeye, specifically at sites located upstream of the Tahltan River. For the fifth consecutive year no commercial fishing activity occurred at this site. The Tuya run, which consists entirely of sockeye produced from the Canada-U.S. Stikine enhancement program, has no spawning escapement requirement since these fish cannot return to Tuya Lake due to several velocity barriers located in the lower reaches of the

Tuya River. Tuya sockeye are released into Tuya Lake as young of the year juveniles.

The First Nation fishery located near the community of Telegraph Creek, B.C. was active from late May to mid August. There were no time or gear restrictions imposed on this fishery.

Most of the chinook sport fishing activity in the Stikine River watershed occurs in the lower reaches and at the mouth of the Tahltan River. Additional activity occurs less intensively in the Iskut River and other areas within the Stikine River drainage. Sport fishing activity commenced in late June and peaked in mid July. Fishing effort and catch was relatively low.

Chinook Salmon

The pre-season forecast of Stikine chinook salmon, as provided by the Canada/U.S. Technical Committee for the Transboundary Rivers (TCTR), was for a below average terminal run size of 40,800 large chinook salmon, i.e. fish with a mid-eye to fork length >659mm (~26") or a fork length of >734mm (~29"). For comparison, the previous 10-year (2002-2011) average terminal run size was approximately 45,400 large chinook salmon.

The total combined gill net catch of chinook salmon in the First Nation and commercial fisheries included 4,573 large chinook and 1,213 jacks compared to 2002-2011 averages of 6,792 large chinook and 1,356 jacks. The 2012 sport fishery yielded a total catch of 64 large chinook.

In-season management was influenced significantly by run size projections derived from the Stikine Chinook Management Model (SCMM), a joint Canada-U.S. mark-recapture program, and other stock assessment tools such as the relationship between the commercial fishery CPUE and run size from 2005-2011. Harvest rate assessments by week were also used concurrently with the above-mentioned in-season run size estimation techniques. In-season estimates based on the average of the mark-capture and model estimates were calculated post SW23. In-season terminal run size projections ranged from 20,900 fish in SW23 to 33,600 fish in SW26. According to the in-season projections, the TAC for Canada varied from 6,600 to 2,300 large chinook. The TAC included the allowable catch based on current run size estimates and PST catch shares, the base level catch of 2,300 fish, plus 228 fish allocated under a test fishing regime. The final post season run size was 31,600 large chinook salmon.

Although a directed commercial chinook fishery was prosecuted throughout most of the season, the low in-season run size estimate of 20,900 chinook generated after three weeks of fishing resulted in the fleet converting to a test fishing regime commencing in SW23. A test fishery was required to provide stock assessment personnel with the tools to determine weekly run sizes by both test fish CPUE and the ratio of spaghetti tags recovered in the fishery (m-r project). Canada endeavoured to honour Annex IV, Chapter 1, Paragraph 3(a)(3)(vi) which identifies the will of both Parties to partition the chinook harvest (Canada's base level catch of 2,300 and 1,400 large chinook provided by a test fishery) over the season through weekly fishery openings based on weekly guideline harvests. As result the guideline test fish harvest for SW23 was only 228 large chinook. The commercial

fishery was reinstated after SW23 due to the inseason run size estimate increasing to 31,100 chinook, above the 24,500 fish threshold. The SW23 test fishery guideline was exceeded by 100%; however, commercial catches were close to the established weekly guidelines. The first week of the targeted sockeye fishery, which commenced in SW26, had a mesh size restriction of 140 mm (~5.5”); this action was aimed at minimizing the catch of large chinook salmon while providing a fishing opportunity on the early component of the sockeye return.

The preliminary post-season estimate of the terminal run was 31,600 large chinook salmon, including an in river run size based on mark-recapture data of 27,900 large Chinook and a total U.S. catch estimate of 3,700 large chinook. Accounting for the total Canadian catch of 6,500 large chinook salmon (includes commercial, First Nation, sport and test catches), the total system-wide spawning escapement is estimated to be approximately 21,500 large chinook salmon. This escapement estimate is 27% below the 2002-2011 average of 27,800 large chinook and 23% above the target S_{MSY} escapement goal of 17,400 large chinook salmon. The escapement was within the escapement goal range of 14,000 to 28,000 large chinook salmon. A run size of 31,600 large chinook translates into an Allowable Harvest in directed commercial fisheries of 7,100 large chinook, shared by Canada and the US. Both Canada and the US were also entitled to harvest their base level of catch of 2,300 and 3,400 large chinook respectively. In addition, Canada was entitled to harvest its test fish allocation.

The 2012 chinook escapement enumerated at the Little Tahltan weir was 720 large fish and 51 jack chinook salmon (Appendix A.22). The escapement of large chinook salmon in the Little Tahltan River was 86% below the average of 4,989 fish and 78% below the MSY escapement goal for this stock of 3,300 large chinook salmon. The weir count was also well below the low end of the escapement goal range of 2,700 to 5,300 large fish, and represented only 3% of the Stikine wide escapement. This proportion of the escapement is well below the average Little Tahltan contribution of 15%. This is the sixth consecutive year that the lower end of the escapement was not reached. This year’s return, however, is a product of a very weak escapement in 2007 (this year’s five year old fish) when only 562 large chinook were enumerated. The failure from the 2006 escapement of 3,860 (this year’s six year old fish) cannot be fully explained. The jack chinook count was 77% below the average count of 219 fish.

Escapement counts in Verrett Creek (a tributary to the Iskut River) were reliable in 2012 due to high turbid flow conditions as reported by the carcass pitch crew stationed at the creek from August 5-10. A relatively strong return of chinook salmon to Shakes Creek (near Telegraph Creek) was reported by residents living at the creek mouth. Anecdotal observation of spawners in the mainstem Tahltan River indicated a strong return. Incidental chinook catches taken in the Tuya/Stikine test fishery were the highest on record. The sampling crew in the Tuya River reported an unusually high incident catch of chinook salmon as well.

Stikine River chinook run timing to the lower Stikine commercial fishing and timing to the spawning grounds appeared to be normal.

In addition to the mark-recapture study, the Little Tahltan weir project, and aerial surveys; genetic samples were collected on a weekly basis from Chinook caught in the U.S. District 108 fishery and from weekly catches taken in the Canadian commercial fishery. This data will be used to assess run timing of Stikine stocks in District 108 and the lower Stikine commercial fishery.

Sockeye Salmon

The pre-season forecast for Stikine sockeye salmon, as provided by the TCTR, was for a terminal run size[1] of 134,000 fish including: 51,700 Tahltan Lake origin sockeye salmon (35,500 wild and 16,200 planted); 32,600 planted Tuya Lake sockeye; and 49,700 non-Tahltan wild sockeye salmon. This outlook constituted a below average run; for comparison, the previous 10-year average (2002-2011) terminal run size was approximately 203,500 fish.

Preliminary combined catches from the Canadian commercial and First Nation (food, social, ceremonial (FSC)) gill net fisheries in the Stikine River totalled 30,426 sockeye in 2012, which was below the 2002-2011 average of 59,525 fish. The lower Stikine commercial fishery harvested 25,958 sockeye, while the upper Stikine commercial and First Nation fisheries harvested a total of 468 and 4,000 sockeye, respectively. The preliminary estimate of the total contribution of sockeye salmon from the Canada/U.S. Stikine sockeye enhancement (i.e. the fry-planting program) to the combined Canadian First Nation and commercial catches was 11,900 fish, or 39% of the catch.

In addition to these catches, 1,777 sockeye salmon were taken in the traditional stock assessment test fishery located near the international border. For the fifth consecutive year, a test fishery designed to target Tuya-bound sockeye operated in the mainstem Stikine River upstream of the mouth of the Tahltan River and succeeded in harvesting 2,306 sockeye salmon.

A total of 13,687 sockeye salmon was counted through the Tahltan Lake weir in 2012, 61% below the 2002-2011 average of 35,206 fish. The 2012 count was below the escapement goal range of 18,000 to 30,000 fish. An estimated 5,612 fish (41%) originated from the fry-planting program, which was above the 35% contribution observed in smolts leaving the lake in 2009, the principal smolt year contributing to the 2011 return. A total of 244 sockeye salmon was sacrificed at the weir for stock composition analysis. In addition, 3,949 sockeye salmon were collected for broodstock, resulting in a spawning escapement of 9,514 sockeye salmon in Tahltan Lake.

The total estimated run size of 33,660 Tahltan Lake sockeye was approximately 35% below the preseason expectation of 51,700 fish.

The spawning escapements for the non-Tahltan and the Tuya stock groups are calculated using stock ID, test fishery and in-river commercial catch and effort data. The average of the test fishery and the commercial fishery catch-per-unit of effort (CPUE), which operated

[1] Terminal run excludes U.S. interceptions that occur outside Districts 108 and 106.

over the full duration of the run, were used as the principal tool in assessing the spawning ground escapements of non-Tahltan Lake and the Tuya sockeye stock groupings. Based on the run reconstructions generated from the test and commercial fishery CPUE, the preliminary escapement estimates for 2012 were 33,612 non-Tahltan and 10,507 Tuya sockeye salmon. The non-Tahltan spawning escapement estimate was within the escapement goal range of 20,000 to 40,000 and was 12% above the mid-point escapement goal of 30,000 sockeye. The 2012 escapement was 5% above the recent 10 year average of 31,275 fish. No mainstem sockeye aerial surveys were conducted in 2012 due to high, turbid water conditions. The estimated escapement of 10,507 Tuya Lake sockeye was close to the recent 10 year average of 10,452 fish. These fish do not contribute to the natural production of Stikine River sockeye salmon due to migration barriers that obstruct entry to their nursery lake and potential spawning gravels.

Based on the in-river run reconstruction of the Tahltan Lake run expanded by run timing and stock ID data in the lower river and estimated harvests of Stikine sockeye in U.S. terminal gill net fisheries, the preliminary post-season estimate of the terminal sockeye run size is approximately 123,665 fish. This estimate includes 33,961 Tahltan Lake sockeye, 29,521 Tuya Lake sockeye, and 60,184 sockeye of the non-Tahltan stock aggregate. A Stikine run size of this magnitude is below the 2002-2012 average terminal run size of 199,000 sockeye salmon and is approximately 7% below the preseason forecast of 134,000 fish.

Similar to 2008-2011, Canada relied more heavily on other in-season abundance estimates than those derived from the Stikine sockeye management model (SMM), which was updated and refined by the TCTR prior to the season. The SMM was used exclusively in SW27 by Canada and was used in concert with other in-river assessment estimates from SW28 through SW33. It was felt that the model was over-estimating both the Tahltan Lake and mainstem sockeye run sizes. As a result, most of the in-season run projections used in management of the Canadian fisheries were based on the average of the SMM and run reconstruction analyses or the average of the SMM model and an in-river regression model as the season progressed. The run size projections ranged from 111,600 fish in SW34 to 166,700 fish in SW27. The final in-season run size estimate was 111,600 fish, based on the run reconstruction approach, while the final estimate based solely on the SMM was 121,600 fish. The preliminary post-season estimate was 123,665 with a Canadian allowable harvest of 23,500 fish. The actual catch was 33,300 fish, 141% above the allowable harvest.

Coho Salmon

For the fourth consecutive year, several boats remained in the fishery to harvest coho salmon resulting in a total catch of 6,188 coho salmon. A total catch of 5,748 coho salmon was taken during the targeted coho fishery from SW35-36, slightly above Canada's 5,000 piece allocation under the PST, and well above the recent 10 year average catch of 2,034 fish.

The cumulative weekly CPUE index of 5.7 observed in the coho test fishery was 5% below the recent 10 year average cumulative CPUE of 6.0. Aerial surveys of six index spawning sites was aborted midway through the survey due to ice, snow and wind conditions.

Joint Sockeye Enhancement

Joint Canada/U.S. enhancement activities continued with approximately 5.66 million sockeye eggs collected at Tahltan Lake in the fall of 2012, meeting the target of 5.5 million. The 5.5 million egg target was agreed upon bilaterally prior to the project beginning in August 2012 due to realising lower than expected returns and associated Treaty guidance to handle such situations specific to Tahltan Lake. The ability to reach the egg take goal in 2012 was largely due to the changes in methodology and additional resources that were utilized. An additional brood stock collection crew was employed to acquire brood stock by means of angling from secondary sites where seining is not effective. Brood stock collected through both historical beach seine practices and angling were held in large net pens to ripen. Through the additional efforts in 2012, 76% of the total females spawned were from short term holding and 25% of the total females collected were collected from the secondary sites. Without the additional efforts undertaken in 2012, it is clear that the target would not have been achieved. The last day of brood stock collection occurred on September 25 as per the agreed plan and the final egg take was completed on September 28.

Approximately 2.12 million fry were out-planted into Tahltan Lake in late May and early June of 2012. The fry originated from the 2011 egg-take and were mass-marked at the Snettisham hatchery with thermally induced otolith marks. The balance of 1.59 million fry originating from the 2011 Tahltan Lake egg take was released into Tuya Lake in mid June of 2012. This group also had a unique, thermally induced otolith mark. Green egg to released fry survival was 51.5% for the eggs designated for Tuya Lake and 62.8% for those designated for Tahltan Lake. A total of 0.88 million fry destined for Tuya Lake and 0.54 million fry destined for Tahltan Lake held at the Snettisham hatchery were destroyed due to an outbreak of Infectious Hematopoietic Necrosis Virus (IHNV). The U.S./Canada sockeye enhancement program has been subject to IHNV outbreaks in its history and while unfortunate the losses were within normal occurrence levels.

Although the Stikine enhancement program has been successful in producing significant numbers of sockeye salmon, the inability to harvest these fish in terminal areas continues to be a challenge. Returning adults from the Tuya Lake out-plants unsuccessfully attempt to ascend the impassable barriers in the lower reaches of the Tuya River until they either perish or back out of the system. Some of these drop outs end up in nets fished in the Telegraph Creek area raising concerns over poor quality, injured and battered up fish. Others stray[2] into Stikine River tributaries raising concerns over potential impacts on wild salmon stocks.

Various attempts have been made to date to address these concerns many of which were made possible by support from the Northern Fund. Fishing with gill nets and dip nets has occurred at various sites in the Tuya River with mixed results. To improve fish capture in

[2] Straying of Tuya sockeye has been confirmed using radio telemetry and sampling for thermal marks. In a report completed in February 2006, funded by the Northern Fund, which investigated potential impacts and risks of the straying of enhanced Tuya sockeye salmon, the authors concluded that …*"given the results of the literature review and the data collected to date in the Stikine River, the probability of genetic risk of Tuya River blocked fish appears to be extremely low. However, it is prudent to suppose, that given a long enough period of time and a large enough number of fish, that some successful straying and interaction of Tuya River fall back fish could take place"*.

the lower Tuya River, a fishway/trapping apparatus was designed and constructed in Vancouver during the spring of 2006 and transported to Whitehorse. However, full operation of the apparatus was cancelled because of a major rock slide at the Tuya River fishing site that occurred sometime in June 2006. The rockslide rendered the fishing site, which the fish trap was designed for, unusable due to changes in river hydrology and unsafe working conditions. In 2007, additional rock slide activity occurred in the lower reaches of the Tuya River. A steering committee, consisting of Canadian and U.S. engineers and other technical advisors, visited the site in August 2007 to re-assess the conditions and to consider other options. The committee decided to proceed the following year with plans to strategically blast the rock obstruction at the location of the 2006 rock slide to provide fish passage to a potentially favourable harvest site located approximately 800 metres (1/2 mi.) further upstream. In the late fall of 2008, a blasting crew succeeded in removing approximately 100 m^3 (~130 cubic yards) of rock from the blockage. A visual and test fish assessment conducted in late July 2009 and 2010 at locations below and above the blast site indicated that the majority of the fish, including Chinook salmon, succeeded in ascending the river to points above the rock slide site. The committee plans to contract an engineering firm to design a fish harvest structure for the new site. The firm will provide both design detail and cost estimates for the structure as well as the routing and costs of an access trail to the site. The plans would then be available for consideration by all interests. The initial road survey was conducted in May 2009, followed by a detailed professional survey in August 2010. Work continues on the design and cost estimates of both an access road and a fish trap in 2012.

For the fifth consecutive year, an experimental test fishery designed to target Tuya River sockeye at fishing sites located in the lower Grand Canyon of the Stikine River upstream from the mouth of the Tahltan River was conducted. The project design followed the design adopted in 2009 in that the majority of nets were fished further upstream in the Stikine River and closer to the mouth of the Tuya River than what occurred in 2008. This change was prompted by the stock identification results from 2008 which indicated that less than 50% of the catch was Tuya River origin sockeye in 2008. The 2012 Tuya test fishery yielded a total catch of 2,309 sockeye in late July. There were also 44 Chinook caught and released. The majority of the catch was distributed to elders of the Tahltan/Iskut First Nations, most of whom were residents of communities located within the Stikine River drainage.

2.2 TAKU RIVER

As with the Stikine River, the fishing plan developed by Canada for the Taku River was based on the new arrangements in Annex IV, Chapter 1, Paragraph 3 of the PST in effect for 2009 through 2018. Accordingly, the plan addressed conservation requirements and contained the following harvest objectives: until in-season data was available, to harvest only 30% of the Allowable Catch (AC); thereafter, to harvest chinook salmon in a directed chinook salmon fishery with the catch share adjusted as per weekly run projections; to harvest 21% of the TAC of Taku River sockeye salmon (adjusted as necessary according to projections of the number of enhanced sockeye), plus the projected wild sockeye run in excess of 1.6 times the spawning escapement goal; to harvest enhanced Taku River sockeye incidentally to wild sockeye salmon; and, to harvest 3,000 to 10,000 coho salmon in a

directed coho fishery, depending on in-river run size projections, plus projected escapement in excess of the spawning escapement goal.

The 2012 commercial fishing season on the Taku River opened on Sunday, April 2 (SW18) and closed on Sunday, October 6 (SW40). However, virtually all commercial fishing activity ceased in early September 30 (SW36) due to market and transport conditions. Fishing area and gear restrictions were as per recent years and incorporated the maximum gill net length of 36.6 metres which was established in 2008 for drift gill nets and in 2009 for set gill nets.

The Taku River commercial fishing grounds in Canada consist of the mainstem of the river from the international border upstream approximately 18 km (11 mi.), to a geological feature known locally as Yellow Bluff. Almost all fishing activity takes place in the lower half of this area, downstream of the Tulsequah River.

The First Nation fishery is primarily located in the lower Taku River in the same area as the commercial fishery as described above. However, small numbers of fish are also harvested on the lower Nakina River and at the outlet of Kuthai Lake. There were no time or gear restrictions imposed on this fishery in 2012.

Most of the Chinook sport fishing activity in the Taku watershed occurs on the lower Nakina River. Additional sport fishing sites used less intensively exist on the Tatsatua River, the Sheslay River and other areas within the Taku River drainage. Effort and catches are poorly documented but are believed to be negligible for all species except Chinook salmon and steelhead. This is due to the remote nature of the watershed and somewhat difficult access.

Chinook Salmon

The bilateral pre-season forecast was for a terminal run of 48,036 large Chinook, approximately 5% above the previous 10-year average of 45,800 fish. At a run size of this magnitude and factoring in the new interim SMSY escapement point goal of 25,500 large fish, the allowable catch (AC) was 14,136 large Chinook, with 7,436 fish (53% of total) allocated to Canada and 6,700 fish (47% of total) allocated to the U.S.. Adding the base level catches (BLCs) of 1,500 fish for Canada and 3,500 fish for the U.S. meant that the total allowable catch (TAC) was 19,136 fish.

Based on deliberations pursuant to Chapter 1, Paragraph 4 which occurred in February 2012, it was determined that adjustment to management procedures were once again required in order to ensure that Chinook TACs were not exceeded. The accuracy of both preseason and in-season forecasting was still having an impact on the achievement of management objectives. Pre-season forecasting methodology was reviewed in November 2011, resulting in only minor adjustments which did not produce a significantly different forecast for 2012. As such, it was determined that, as in 2011, a cautionary approach would be adopted for the early part of the season, specifically, reduction of the Canadian AC by 30% until reliable in-season projections could be made (typically after mid-May and/or three weeks of fishing). Once reliable joint Canada/U.S. in-season projections were available, the fishery was to be managed to either full directed fishery guidelines with the

objective of meeting escapement and agreed harvest sharing objectives, or to strictly test fishery guidelines. The test fishery would be conducted as per Chapter 1, Paragraph 3(b)(3)(xii) and would involve commercial licensing as occurred in 2008, 2010 and 2011.

Table 2-1. identifies weekly fishery guidelines / targets based on either the AC reduced by 30% or the test fishery target of 1,400 large chinook, versus actual catches.

Table 2-1. Weekly large chinook guideline harvests or test fishery targets versus actual catches for the Canadian commercial fishery in 2012.

Week	Start Date (Sunday)	Test Catch*	AC x 0.7	Actual
17	April 22	-	104	-
18	April 29	129	471	184
19	May 6	273	993	494
20	May 13	246	897	483
21	May 20	220	-	235
22	May 27	207	-	239
23	June 3	191	-	240
24	June 10	153	-	151

* Test catch targets apply only in the absence of an allowable catch (AC), and are apportioned by average run timing.

In order to honour Annex IV, Chapter 1, Paragraph 3(b)(3)(v) which identifies the need for both Parties to spread the chinook harvest over the season, the duration of weekly fishery openings were based on weekly guideline harvests apportioned by historical run timing data developed using the arrangement noted above. In-season projections of the terminal run size of large chinook salmon were not possible until May 17, SW20, i.e. after the third set of weekly openings. The estimates were based on the bilateral mark-recapture program, the estimated catch of Taku River chinook in the U.S. gillnet and sport fisheries, the catch in the Canadian fishery, and historical run timing information. Run size projections ranged from 14,100 fish in SW20 (May 13-19) to 10,800 fish in SW24 (June 10-16), the latter of which was the final projection made during the chinook season i.e. prior to the directed sockeye fishery. All in-season forecasts indicated a terminal run size significantly below the preseason forecast of 48,036 large chinook. As a result, the fishery was constrained to test fishery targets for SW 21 through SW 24 (May 20–June 17). Catches were about 50% below weekly guidelines in all of the openings during the reduced directed fishery part of the season (weeks 18-20); consequently, the cumulative catch for this period, 1,161 fish, was about 50% below the cumulative target of 2,361 fish (i.e. the AC reduced by 30%). For the test fishing period (weeks 21-24) weekly catches were close to target; the cumulative catch for this period was 865 fish, versus the cumulative target of 752 fish.

Management emphasis switched to sockeye salmon in SW25 (June 17–23); at this point, the maximum permissible mesh size was reduced from 204 mm (8.0”) to 140 mm (5.5”) in order to reduce bycatch of chinook salmon. The additional catches of chinook which occurred in what constitutes the Canadian chinook base level fisheries were: 748 large

chinook in the directed commercial sockeye gill net fishery; 67 large chinook in the First Nation fishery; and an estimated 105 large chinook in the recreational fishery. The total harvest in the base level fisheries amounted to 920 fish, which was 580 fish less than the base level allowance of 1,500 fish.

The preliminary post-season estimate of terminal run size is 24,270 large chinook, 59% below the pre-season forecast, but well above in-season projections. This estimate is considered to be provisional and may be revised upon further review of both the data and methodology used to determine in-river abundance. A terminal run size of this magnitude is not associated with an AC; however, there was a base level catch (BLC) allocation of 5,000 fish (1,500 Canada; 3,500 U.S). Actual directed fishery / BL catches were 2,081 fish (Canada) and 1,786 fish (U.S.).

The Canadian catch of 2,081 large Chinook, comprised of 1,909 commercial, 67 First Nation and 105 recreational fish, was 47% below the 2002-2011 average of approximately 3,900 fish (excluding test fisheries). The 2012 harvest of small Chinook was 492 fish (478 commercial and 14 First Nation), 14% below the 2002-2011 average of 575 fish.

The preliminary estimate of the spawning escapement of large Chinook is 19,538 fish. This is below the new interim point target of 25,500 large Chinook and just within the overall escapement range of 19,000 to 36,000 fish. The 2012 estimate is 47% below the 2002-2011 average spawning escapement of 36,700 large Chinook (which was associated with a higher target until 2009). During aerial surveys of five index areas, a total of 3,214 large Chinook were observed; this was 36% below the 2002-2011 average.

Sockeye Salmon

The Canadian pre-season run outlook for wild sockeye was 197,313 fish, approximately 9% below the previous 10-year average total run size of 218,000 fish. In addition, approximately 6,000 adult sockeye (5,300 of Tatsamenie Lake origin and 700 of Trapper Lake origin) were expected to return from fry outplants associated with the Canada/U.S. joint Taku sockeye enhancement program. The forecast return of enhanced Tatsamenie Lake origin sockeye was 13% above the average return of 4,700 fish.

The Canadian sockeye catch was 30,378 fish, of which 30,209 were taken in the commercial fishery and 169 in the First Nation fishery. This was 38% above the 2002-2011 average total of 21,950 fish. An additional six sockeye were taken in the chinook test fishery. The contribution of sockeye salmon from the bilateral enhancement program is estimated at 3,149 fish, comprising 10% of the total Canadian catch.

Projections of the total wild sockeye run size, TAC, and total escapement were made frequently throughout the fishing season. Similar to chinook, the estimates were based on the bilateral mark-recapture program, the estimated catch of Taku River sockeye in U.S. fisheries, the catch in the Canadian fishery, and historical run timing information. These estimates ranged from 118,000 in SW27 (July 1-7) to 204,000 in SW 31(July 22-28). The preliminary post-season estimate of run size is 209,721 fish, comprising 196,613 wild sockeye and 13,108 enhanced sockeye. The wild component was within 1% of the preseason forecast, while the enhanced component exceeded the forecast by 118%.

Subtracting the escapement target of 75,000 from the run of 196,613 fish results in a TAC of 121,613 wild fish. The Canadian allowable catch, based on a 21% harvest share (which in turn is associated with an enhanced return of 5,000 – 15,000 fish), was 25,539 fish plus in-river escapement in excess of 1.6 times the escapement goal (i.e. 25,411 fish), totaling 50,950 fish; the actual catch was 27,229 wild fish, representing 21% of the TAC of wild fish, plus 1,690 fish from the in-river escapement in excess of 120,000 fish. Likewise, the U.S. allowable catch of wild fish, based on a 79% harvest share, was 96,075 fish; the actual catch was 51,202 fish, representing 42% of the TAC of wild fish.

The estimated spawning escapement of sockeye salmon in the Canadian section of the Taku River was 124,125 fish which was well above the target range of 71,000 to 80,000 fish. The 2012 escapement is 17% above the 2002-2011 average of 105,800 fish. Based on weir counts, escapements to the Kuthai, Little Trapper, Tatsamenie and King Salmon lakes were 181, 10,231, 15,605, and 5,413 sockeye, respectively. The Kuthai Lake escapement was even lower than the record low count of 204 fish obtained in the primary brood year, and was 94% below the 2002-2011 average. The Little Trapper escapement was 43% above the primary brood year count and 9% below average. The Tatsamenie count was 39% above the primary brood year escapement, and 119% above average. The escapement to King Salmon Lake was 152% above average – no count was obtained in the primary brood year.

Coho Salmon

The total commercial catch of 11,581 coho salmon was about double the 2002-2011 average of 5,900 fish; the First Nation catch of 324 coho salmon was 31% above the average of 248 fish. The catch during the directed coho salmon fishery, i.e. after SW33, was 8,689 fish; this excludes the catch from the test fishery which took place from SW38-40 (September 16–October 6) and landed 2,200 fish. Based on bilateral mark-recapture data, the preliminary estimate of the run into the Canadian section of the drainage is 65,706 fish, 34% below the preseason forecast of 100,100 fish, which was predicated upon average exploitation rates in U.S. fisheries. According to the PST harvest arrangements for Taku coho salmon, at a run size of this magnitude, Canadian fishers were entitled to harvest up to 7,500 coho salmon in a directed fishery starting in SW34, plus projected surplus escapement. The preliminary post-season spawning escapement estimate is 51,601 fish; this is 16,601 fish above the top end of the interim escapement goal range of 27,500 to 35,000 fish. The 2012 spawning escapement was 49% below the previous 10-year average of 124,509 coho salmon.

Joint Sockeye Enhancement

Joint Canada/U.S. enhancement activities continued in 2012. Approximately 86% of the eggs collected in 2011 from Tatsamenie Lake survived to the fry stage at the Snettisham Hatchery in Alaska. There were no IHNV losses in the Tatsamenie Lake hatchery raised sockeye fry. Between May 29th and June 21th approximately 1.40 million sockeye fry were out-planted into Tatsamenie Lake. In addition, as part of an onshore extended rearing project, 243,000 fry which had been reared to 0.72 grams in the hatchery were released into four onshore rearing tanks located near the northeast end of the lake (on June 12th). These fish were released in two groups, one on August 1 and the other on August 12, at an average size of 2.2 and 3.2 grams, respectively. As was observed in 2011, a portion of these fish appeared to out-migrate almost immediately, rather than remaining in the lake to rear.

Low tag recapture results during the 2012 smolt assessment resulted in poor confidence in the smolt emigration estimate and the composition of the smolt population. These results are preliminary. It is estimated that approximately 129,000 sockeye smolts out-migrated from Tatsamenie Lake in the spring and summer of 2012 of which 9,030 were extended-rearing pre-smolts. The contribution of enhanced smolt to this out-migration was estimated to be 52% based on preliminary thermal mark analysis.

As part of the feasibility study associated with removal of a migration barrier near the outlet of Trapper Lake (detailed in the 2010 Taku Enhancement Plan) information is being compiled to possibly be used in a Canadian Environmental Assessment Act application to provide for fish passage to Trapper Lake.

Brood stock was collected and held near the assessment weir beginning August 17 and continuing to September 6. Females were 70% of the escapement through the weir at Tatsamenie Lake and approximately 5% of the females were used for brood stock. In 2012 four egg takes were conducted on September 17th and 23rd and October 1st and 6th. An estimated 2.0 million sockeye eggs were delivered from Tatsamenie Lake to the Snettisham Hatchery for incubation and thermal marking. This met the target of 2.0 million as per the agreed bilateral production plan.

2.3 ALSEK RIVER

Although catch sharing of Alsek River salmon stocks between Canada and the U.S. has not yet been specified, Annex IV of the Pacific Salmon Treaty does call for the development and implementation of cooperative abundance-based management plans and programs for Alsek River Chinook and sockeye salmon. Interim escapement goal ranges for Alsek River sockeye and coho salmon were initially set by the TTC at 33,000 to 58,000 sockeye, and 5,400 to 25,000 coho salmon. The principal escapement-monitoring tool for Chinook, sockeye, and coho salmon stocks on the Alsek River is the Klukshu weir, in operation since 1976 by DFO in cooperation with the Champagne-Aishihik First Nation (CAFN).

To make the management objectives of Chinook and sockeye salmon better defined in terms of Klukshu stocks, revised goals, expressed in terms of Klukshu escapements only, were established in 1999 and used again in 2012. Mark-recapture programs to estimate the total in river abundance and the fraction of the escapement contributed by the Klukshu stocks were in operation since 1997 for Chinook salmon and since 2000 for sockeye salmon. These however were discontinued in 2005.

Previously, a joint escapement goal for Klukshu Chinook was developed by both DFO and ADF&G, which recommended an escapement goal range of 1,100 to 2,300 Chinook spawners in the Klukshu drainage (McPherson, Etherton and Clark 1998). A review of the recent escapement goal analysis completed by Bernard and Jones in 2010 was conducted by the Canadian Science Advisory Pacific (CSAP). The CSAP review has been finalized. The 2010 analysis suggested a revised escapement goal of 800-1,200 fish. Adoption of the revised goal is pending acceptance by the TTC.

The current biologically-based escapement goal for Klukshu sockeye is 7,500 to 15,000 fish (Clark and Etherton, 2000). Similar to the Chinook goal review, an updated escapement goal analysis for sockeye was completed in 2010 by Eggers and Bernard, and was reviewed by CSAP. The CSAP review has been completed. The 2010 analysis suggested a revised escapement goal of 7,500-11,000. Adoption of the revised goal is pending acceptance by the TTC.

Total drainage abundance programs are being investigated as part of the development of abundance-based management regimes and to accurately assess whether the escapement goals for Alsek River Chinook and sockeye salmon stocks are appropriate and if so, are being achieved. At this time, there are no programs in place to estimate the drainage-wide coho salmon escapement. A large and variable proportion of the escapement of each species is enumerated at the weir on the Klukshu River. Current escapement monitoring programs including the Klukshu weir, Village Creek electronic counter, and aerial surveys allow annual comparisons of escapement indices. The most reliable long-term comparative escapement index for Alsek River drainage salmon stocks is the Klukshu River weir count.

The harvest estimate for the 2012 First Nation fishery was comprised of the fish taken from the Klukshu River weir (elders only) and an estimate of catches above/below the weir (based on the past relationship with the weir count and harvest). It is assumed that a near zero harvest of Chinook occurred due to the poor return to the Klukshu River. An estimated 1,734 sockeye and no coho salmon were harvested in the food fishery. The average catches are 83 Chinook, 1,451 sockeye, and 7 coho salmon. Preliminary catch estimates for the Tatshenshini recreational fishery were above average for Chinook salmon, with an estimated 85 fish retained (315 released), and near average for sockeye salmon with 52 retained (157 released), and an unknown number of coho salmon were retained (2 released). These were 28% above average for Chinook salmon and 29% above average for sockeye salmon. Due to the poor Chinook return to the Klukshu River, non-retention of Chinook salmon was implemented on July 25th in the Yukon portion of the Tatshenshini River. Retention of sockeye salmon was permitted on August 15th.

The preliminary weir count and escapement estimates of Klukshu River sockeye salmon were 17,694 (count expanded due to high water delaying weir installation until July 13th) and 17,176 fish, respectively, in 2012. The count of 5,969 early run fish (count through August 15) was nearly twice of average while the count of 11,725 late run fish was near average. The total escapement of 17,176 fish was above the upper end of the recommended escapement goal range of 7,500 to 15,000 fish. The sockeye escapement to Village Creek was 1,372 in 2012 (average is 2,632).

The most reliable comparative Chinook escapement index for the Alsek River drainage is the Klukshu River weir count. The preliminary Chinook salmon weir and escapement estimate in 2012 was 693 (count expanded due to high water delaying weir installation until July 13th). A minimal harvest above the Klukshu River weir was thought to have occurred due to the poor return so no adjustement to the weir count was made to estimate spawning escapement. The 2012 count was well below the escapement goal range of 1,100 to 2,300 Klukshu Chinook salmon.

The Klukshu River coho salmon weir count was 1,272 below the 10 year average of 2,495 fish. As in past years, the weir count cannot serve as a reliable run strength indicator as the weir is normally removed well before the end of the coho salmon run to the Klukshu River.

3 NORTHERN BRITISH COLUMBIA

3.1 PINK SALMON

In the Canadian northern boundary area, pink salmon returns were anticipated to be below average for both Area 3 and Area 4, based on brood year return strength. Actual returns to Area 3 streams were average and returns to Area 4 streams were well below average.

Areas 3-1 to 3-4 Pink Net Catch

For the year 2012, Canada was to manage the Area 3-1 to 3-4 net fishery to achieve an annual catch share of 2.49 % of the annual allowable harvest (AAH) of Alaskan Districts 101, 102 and 103 pink salmon. With a Total Return of approximately 31.10 million pinks, the Alaskan Districts 101, 102 and 103 AAH was 20.35 million pinks. The resulting Area 3-1 to 3-4 Canadian commercial net total allowable catch of this AAH was approximately 0.51 million pinks of Alaskan Districts 101, 102 and 103 origin.

The 2012 preliminary Canadian pink salmon catch in Sub-areas 3-1 to 3-4 was 118,164 and the Alaska stock component of this catch is estimated to be 96,658, or 0.47 % of the AAH, well below the annex agreement of 2.49 %.

Area 1 Pink Troll Catch

For the year 2012, Canada was to manage the Area 1 troll fishery to achieve an annual catch share of 2.57 % of the annual allowable harvest (AAH) of Alaskan Districts 101, 102 and 103 pink salmon. The resulting Area 1 Canadian commercial troll total allowable catch of this AAH was approximately 523,056 pinks of Alaskan Districts 101, 102 and 103 origin.

The Canadian commercial troll fishery targeting pink salmon was open in the northern portion of Area 1 (Dixon Entrance AB Line) from July 1st to September 30th. Pink retention was also permitted during the chinook directed fishery in parts of Area 1 which was open from June 21st to September 30th with closed periods from July 16th to July 19th and August 12th to September 3rd. Area 1 pink salmon directed effort was very minimal and the fishery harvested a total of 57,013 pink salmon, with an estimated 52,143 being of Alaskan origin. This equates to 0.26 % of the Alaskan District 101, 102 and 103 pink AAH, well below the annex agreement of 2.57%.

3.2 CHINOOK AGGREGATE ABBUNDANCE BASED MANAGEMENT (AABM) FISHERIES

Objectives and Overview

The pre-season abundance index for North Coast B.C. troll and Haida Gwaii sport fisheries in 2012 was 1.32, which allowed a total catch of 173,600 chinook salmon in these fisheries.
Preliminary estimates indicate a total catch of 120,305 chinook salmon; 80,256 caught in commercial troll fisheries and 40,050 caught in sport fisheries. Details of opportunities for commercial and recreational fisheries are below.

Commercial
The North Coast B.C. troll fishery was opened for chinook fishing from June 21 to July 15, July 20 to August 11 and September 4 to 30. The entire 2012 Northern B.C. troll fishery was conducted under a system of individual transferable quotas. The size limit was 67 cm. Barbless hooks and revival boxes were mandatory in the troll fishery. No troll test fisheries were conducted in the North Coast of B.C. in 2012.

Recreational
Sport fishing was open with a daily limit of two (2)chinook and a possession limit of four (4) chinook. An estimated 40,050 chinook were caught in the Haida Gwaii (Queen Charlotte Islands) sport fishery. A minimum size limit of 45 cm was in effect and barbless hooks were mandatory in the sport fishery.

3.3 CHINOOK INDIVIDUAL STOCK-BASED MANAGEMENT (ISBM) FISHERIES

Objectives and Overview
Fisheries included in this category are commercial net fisheries throughout north and central B.C., marine sport fisheries along the mainland coast, freshwater sport, and Native fisheries in both marine and freshwater areas. Under the PST, obligations in these fisheries are for a general harvest rate reduction (estimated in aggregate across fisheries) for ocean mixed-stock fisheries and for stock-specific objectives (i.e., achieving the escapement goal) in terminal areas.

Commercial
Areas 3 – 6
North Coast commercial gill net catches totalled 791 chinook from Areas 3 to 6 (from hail catch data). Chinook catch in Areas 3 and 4 were 466 and 314 chinook respectively. No chinook were reported caught in Area 5 and only 11 were reported caught in Area 6. These preliminary estimates of gill net catches exclude chinook less than 5 pounds (graded as jacks and small red fleshed chinook) not normally included for PSC accounting. Small chinook typically make up less than 5% of commercial gill net catches. Final estimates based on sales slips are not yet available. However, hail catch data has underestimated catch compared to sales slips in the past. In addition, a total of 575 large chinook and 70 jacks were caught in the Tyee Test fishery on the Skeena River.

Central Coast
Central Coast commercial gill net catches totalled 3,613 chinook from Area 8 (from hail catch data).

Johnstone Strait
Johnstone Strait commercial fisheries including Area B seine and Area D gill net was managed by South Coast and corresponding catches are reported in the South Coast section of this report.

Recreational
Tidal sport catch from lodges operating in the Rivers Inlet, Hakai Pass and Bella Bella areas were estimated using log books. Approximately 3,730 chinook were retained at lodges in these areas in 2012. Chinook catch by non-lodge (independent) anglers was estimated to be 2,046 for these areas combined. Independent angler catch was estimated using on-water interview data collected by the Central Coast Conservation and Protection branch of DFO.

Preliminary estimates for tidal sport catches near the mainland coast of Northern B.C. were 7,011 from a creel survey conducted in Areas 3 and 4 in 2012. The 2012 catches in the mainland sport fishery in Areas 5 and 6 were unknown. The preliminary estimate from a freshwater creel survey conducted in the Skeena River below Terrace in 2012 was 421 chinook. Tidal and freshwater catches in Northern B.C. were significantly lower in 2012 than 2011.

First Nations
Chinook catch by First Nations on the Skeena in 2012 appear to be less than catch estimates from 2011. Catches by First Nations in the North Coast exceeded 8,189 chinook in 2012. Nisga'a and Gitanyow catches from the Nass River were 3,658 chinook. Haida catches on Haida Gwaii were estimated to exceed 1,800 chinook. Only a portion of catches from Native fisheries in the Skeena have been reported but current estimates exceed 2,731 chinook.

Catches by First Nations in the tidal portion of the Central Coast were reported as 165 chinook (catch reporting data incomplete), while the non-tidal catch of terminal Atnarko River chinook was 1,558 chinook (jacks excluded).

3.4 OVERVIEW OF NORTHERN B.C. CHINOOK STOCK STATUS

Since assessments of the ISBM fisheries are relative to the escapements achieved in the chinook indicator stocks, a brief overview of the 2012 returns is provided. Northern B.C. terminal runs were less than 2011 in the Nass and Skeena Rivers. Preliminary estimates of Nass River escapements decreased to 8,309. Skeena River chinook escapements also decreased with an estimate of approximately 34,024. Atnarko River chinook escapements were estimated at 5,800, less than the 2011 return.

4 FRASER RIVER SOCKEYE

4.1 OBJECTIVES AND OVERVIEW

The 2012 Fraser sockeye forecast had an 80% prediction interval of 743k – 6.6M. From this distribution of run size forecasts, the Fraser River Panel (FRP) adopted the 50% probability level of abundance forecast for pre-season planning purposes of 2.1 million Fraser sockeye. A majority of the total return (~67%) was expected to be Summer-run sockeye, and secondarily Early Summer-run sockeye (~17%). Pre-season planning focused the Food, Social and Ceremonial fisheries on Summer-run sockeye, with constraints on harvest opportunities to minimize impacts on less abundant stock groups at the p50 pre-season run size forecasts. If the larger p75 run size forecast materialized in-season; harvest levels beyond First Nations Food, Social, and Ceremonial (FSC) fisheries could potentially occur, but would be limited.

Pre-season planning incorporated provisions to meet escapement objectives and meet conservation objectives for stocks of concern while considering international and domestic objectives. Significant effort was placed on developing a pre-season plan for anticipated fisheries. The pre-season plan included the following assumptions and guiding principles in no particular order:

- The Commission's guidance provided in 2011 (direction to the FRP with respect to implementing Paragraphs 3 and 8 of Chapter 4, Annex IV of the Pacific Salmon Treaty) remained in effect for 2012;

- The U.S. share of the annual Fraser River sockeye salmon total allowable catch (TAC), harvested in the waters of Washington State was set at 16.5% of the aggregate. To the extent practicable, the Fraser River Panel shall manage the United States fishery to implement a fishing plan that concentrates harvest on the most abundant management group (or groups). It is understood that the U.S. harvest may exceed 16.5% of the TAC for one or more of the less abundant management groups despite concentrating the harvest in this manner;

- For computing TAC by stock management groupings, the Aboriginal Fishery Exemption (AFE) of 400,000 Fraser River sockeye, shall be allocated to management groups as follows: The Early Stuart sockeye exemption shall be up to 20% of the Fraser River AFE, and the remaining balance of the latter exemption shall be based on the average proportional distribution of First Nations Food, Social and Ceremonial catch for the most recent three cycles and modified annually as required to address concerns for Fraser River sockeye stocks and other species and as otherwise agreed by the Fraser River Panel;

- The Early Summer-run management adjustment would be a weighted average using a zero proportional Management Adjustment (pMA) for Pitt River, 0.26 for Chilliwack River, and a modelled pMA for the remaining stocks based on in river migration conditions.

- Late-run sockeye have historically delayed in the Strait of Georgia for 3-6 weeks prior to entering the Fraser River. Beginning in 1996, this behaviour changed to one where there is a shorter delay or occasionally immediate river entry. Concerns for Late-run early entry and the associated elevated rates of en-route and pre-spawn mortality continue. The pre-season management adjustment (MA) for Late-run sockeye was the weighted average of the observed median for Birkenhead sockeye and a timing based MA for all other Lates excluding Birkenhead sockeye;

- Although the capability to assess in-season run size and marine migration timing would be good for Late-run sockeye, an in-season run size estimate for Cultus Lake sockeye would not be possible due to low abundance relative to co-migrating sockeye stocks. As a result the Cultus exploitation rate is assumed to be the same as the exploitation rate from the similarly timed Late run stocks (excluding Birkenhead) caught seaward of the confluence of the Fraser and the Vedder rivers;

- Cultus Lake sockeye will be managed within the constraints of the exploitation rate identified for the Late-run aggregate. The maximum allowable exploitation rate for Cultus Lake Sockeye will be the greater of a) the exploitation rate floor identified for Late-run sockeye (currently set at 20%-30% dependant on the run size), or b) the exploitation rate that is consistent with continued rebuilding of the population based on in-season information on returns and potential numbers of effective spawners. The exploitation rate on Cultus Lake sockeye is intended to allow for fisheries on more abundant co-migrating stocks;

- The four stock aggregates identified under the Pacific Salmon Treaty Annex generally contain stocks with similar timing in the marine area. Recent trends in timing of some stocks, including Raft River and North Thompson (in the Early Summer-run prior to 2012), and Harrison River (in the Late-run prior to 2012) sockeye now differs substantially from the other stocks in their recent run timing groups. In 2012 the Department managed these stocks as part of the Summer-run aggregate to better align these stocks with other stocks of similar run timing. Escapement plans, management adjustments and harvest rules have been adjusted to account for this change;

- Canada's escapement plan specified escapement requirements that varied with run size for the all run timing aggregates;

- At low abundances, fixed exploitation rate floors are implemented to protect 90% of the run timing aggregate (10% floor) while allowing for fisheries on more abundant co-migrating run timing groups and/or species. The exception is the Late-run aggregate where a 20% exploitation rate floor has been implemented consistent with recent years' practice. New for 2012 was that if the return of

Late-run sockeye was at or above the p75 forecast consideration would be given to increasing the Late-run exploitation rate floor up to 30%;

- For Early Stuart sockeye, window closures and other fishing restrictions were planned for commercial, recreational and First Nations fisheries to protect a significant proportion (90%) of the Early Stuart return. These measures included a rolling three week window closure based on run timing of the Early Stuart sockeye migration through various fishery areas; and

- Conservation concerns for other sockeye stocks and species continued to impact the planning of sockeye fisheries in 2012. The stocks and species of concern in 2012 were: Early Stuart sockeye, Cultus Lake sockeye, Nimpkish sockeye, Sakinaw Lake sockeye, Interior Fraser River coho and Interior Fraser River steelhead.

4.2 PRE-SEASON ASSESSMENT

In addition to Canada's escapement plan, estimates of run size, diversion rate, run timing and assumptions about in-season environmental conditions are key inputs required to seed the pre-season Harvest Planning Model prior to observing in-season information. The main objective of the model is to identify potential fishing opportunities while attempting to meet conservation, international and domestic harvest objectives.

Run Size Forecasts Used For Planning

Forecast uncertainty for sockeye has increased in recent years due to generally low but variable marine survival estimates (smolt-to-adult) relative to the average. In 2009, the final in-season return estimate fell below the 10p forecast and in 2010 the final in-season return was above the 90p forecast.

The 2012 sockeye run-size forecasts were calculated using a new method, which assesses the performance of both long-term stock-recruit models which assume average productivity and non-parametric models based on recent recruit per spawner data over the entire time series via jack knife analysis. This differs from the 2011 forecast, where two forecasts were produced, based on two different assumptions about productivity. The final forecast model for each stock was selected based on its ability to predict the stock's true returns over the full stock-recruitment time series.

As outlined in the Pacific Salmon Treaty, the mid-point of the forecast provided by Canada was used for management purposes, until in-season updates of run size are available. For pre-season planning purposes, the FRP used the 50% probability level for all run timing groups and stocks. The 2012 50% probability forecasts for all four management aggregates were as follows: Early Stuart 99,000; Early Summer-run 277,000; Summer-run 1,585,000; and Late-run 158,000, for a total of 2,119,000 Fraser sockeye. The total four year old proportion of the 2012 forecast (~75% of the total four plus five year old forecast at the 50% probability level) is below average (82%) due mostly to low brood year returns for many stocks.

Diversion Rate

The pre-season forecasts of the percentage of Fraser sockeye migrating through the Johnstone Strait are based on the Northern Diversion Rate values for the aggregate stocks (time series provided by the Pacific Salmon Commission) regressed against time series for three physical variables. The final pre-season forecast of the proportion of Fraser sockeye diverting through Johnstone Strait was 43%.

For the purposes of pre-season planning, it is assumed that Northern Diversion increases over the course of the season. In addition, beginning in 2012, Harrison sockeye are assumed to migrate predominately through the Juan de Fuca approach, regardless of migration timing.

Timing Forecasts

The pre-season forecasts are based on the 50% marine arrival times for the two sockeye salmon stocks (Early Stuart and Chilko River time series provided by the Pacific Salmon Commission) regressed against time series for five physical variables. The DFO forecast of the 50% date (peak timing) for Early Stuart and Chilko Lake sockeye arriving to New Westminster was July 4 and August 9, respectively.

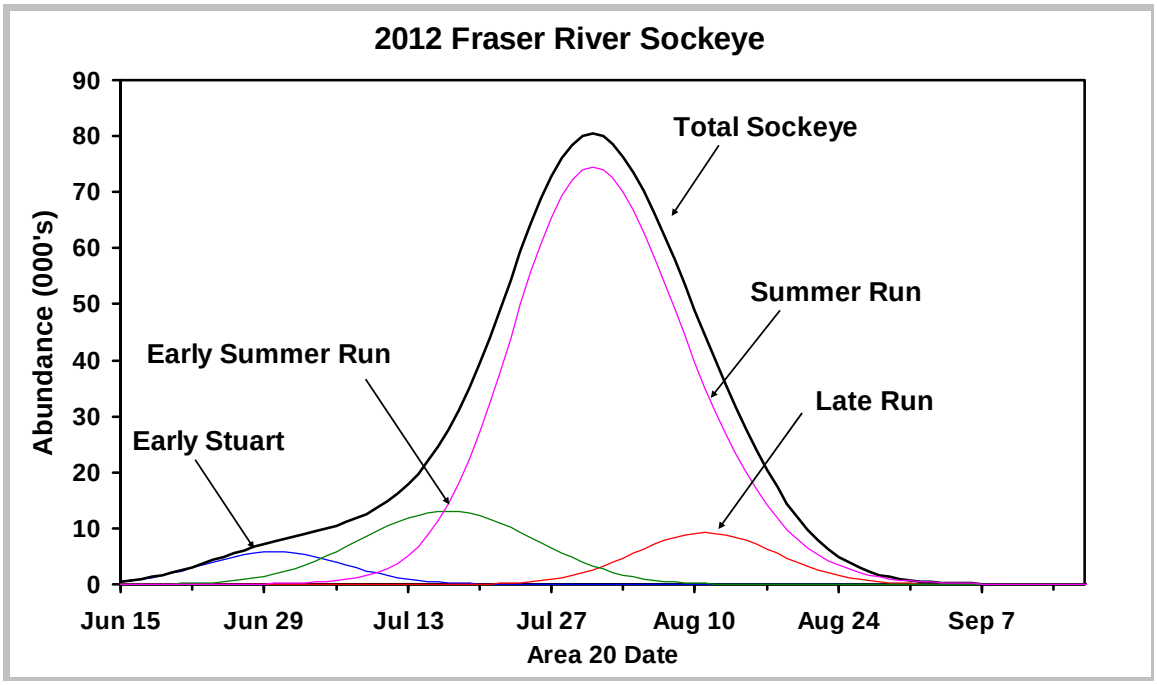
The FRP considered expected run timings for the other stock groups, and reconsidered Chilko sockeye timing, based on their historic relationship to Early Stuart sockeye timing. The following are the pre-season estimates of timing in Area 20 adopted by the FRP.

Table 4-1: Timing Estimates Used for Pre-Season Planning in Area 20

Stock	2012 Area 20 Timing
Early Stuart	June 29
Early Summers	July 16
Summer-run	August 1
Late-run	August 11

The following figure graphically illustrates the relative run size forecasts and run timing overlaps expected in 2012.

Figure 4-1: Relative Run Size Forecasts and Run Timing Overlaps Expected in 2012



Environmental Conditions and Management Adjustments

Management Adjustments reflect a quantity of fish that are added to the spawning escapement targets for the purpose of increasing the likelihood of achieving the spawning escapement targets. The general concept is that more fish are needed to be counted going past Mission, than needed for spawning ground escapement and the anticipated catch above Mission, to account for the historic discrepancy between the number of fish estimated at Mission in-season (minus the actual catch above Mission) and the number of fish counted on the spawning grounds. This discrepancy may be due to a number of factors, including (but not limited to): critically high temperatures and/or discharge in the Fraser River, bias in estimates at Mission hydroacoustics and/or spawning ground escapement estimates, biased catch estimates, unreported catch, delayed mortality associated with escapes or releases from fishing gear, natural mortality, and/or predation. While all of these factors are included in the difference between estimates, the inputs used to estimate MAs are temperature and discharge for Early Stuart, Early Summer and Summer-run sockeye and the 50% migration timing at Mission for Late-run sockeye.

For the Early Stuart, Early Summer-run and Summer-run sockeye, MA estimates can be updated in-season for management purposes as river conditions and peak timing information is acquired. Late-run sockeye MA estimates can be updated in-season based on peak timing estimates.

In 2012, deviations from directly modelled estimates of pMA were made for Early Summers and Lates. The Early Summer-run management adjustment was the weighted average using zero pMA for Pitt River, 0.26 for Chilliwack River, and a modelled pMA

for the remaining stocks based on in river migration conditions. The Late run pMA was the weighted average of the observed median for Birkenhead sockeye and a timing based MA for all other Lates excluding Birkenhead sockeye. The Late run methodology described was also applied in 2011.

The pre-season MA expressed as a percentage of the spawning escapement goal (pMA) and the number of sockeye this represents for 2012 pre-season run sizes are outlined below.

Table 4-2: MA Estimates used for Pre-Season Planning in 2012

	Pre-season Run Size	**pMA**	**MA**
Early Stuarts	99,000	1.95	101,400
Early Summers	277,000	0.32	53,100
Summers	1,585,000	0.06	39,100
Late-run	158,000	0.97	153,300

2012 Escapement Plan

The *Fraser River Sockeye Spawning Initiative* has been a multi-year collaborative planning process to develop a long-term escapement strategy. The annual escapement strategy seeks a balance between long-term objectives and short-term practical considerations, and combines technical analyses with qualitative judgment. A plan is developed every year and is vetted through consultative processes prior to the fishing season. The annual allowable exploitation rate for each run timing aggregate is adjusted based on run size and environmental conditions. The table below was the pre-season escapement plan for 2012 as reflected in the final Salmon Integrated Fisheries Management Plan (IFMP). Note that the Management Adjustments in the Table below have been modified subsequent to the release of the IFMP by the Panel based on adjustments to pre-season timing expectations.

Table 4-3: 2012 Fraser River Sockeye Escapement Plan – Pre-Season Run Estimates

Management Unit	Harvest Rule Parameters: ER Floor	TAM Cap	Lower Fishery Reference Point	Upper Fishery Reference Point	Pre-season pMA
Early Stuart	10%	60%	52,000	130,000	1.95
Early Summer (w/o misc)	10%	60%	100,000	250,000	0.32
Summer	10%	60%	640,000	1,600,000	0.06
Late (w/o misc)	20-30%	60%	300,000	750,000	0.97

Management Unit		**Pre-season Forecast Return** p10	p25	**p50**	p75	p90
Early Stuart	forecast	39,000	61,000	**99,000**	161,000	270,000
	TAM Rule (%)	0%	15%	**47%**	60%	60%
	Escapement Target	39,000	52,000	**52,000**	64,400	108,000
	MA	76,100	101,400	**101,400**	125,600	210,600
	Esc. Target + MA	115,100	153,400	**153,400**	190,000	318,600
	ER floor	10%	10%	**10%**	10%	10%
	ER at Return	0%	0%	**0%**	0%	0%
	Allowable ER	10%	10%	**10%**	10%	10%
	TAC	3,900	6,100	**9,900**	16,100	27,000
	2012 Performance					
	Projected S (after MA)	21,000	33,000	**54,000**	88,000	148,000
	BY Spawners	30,000	30,000	**30,000**	30,000	30,000
	Proj. S as % BY S	70%	110%	**180%**	293%	493%
	cycle avg S	41,000	41,000	**41,000**	41,000	41,000
	Proj. S as % cycle S	51%	80%	**132%**	215%	361%

Management Unit		**Pre-season Forecast Return** p10	p25	**p50**	p75	p90
Early Summer (w/o RNT)	*lower ref. pt. (w misc)*	147,000	167,000	**166,000**	170,000	184,000
	upper ref. pt. (w misc)	368,000	417,000	**415,000**	425,000	460,000
	forecast (incl. misc)	78,000	145,000	**277,000**	522,000	967,000
	TAM Rule (%)	0%	0%	**40%**	60%	60%
	Escapement Target	78,000	145,000	**166,000**	208,800	386,800
	MA	25,000	46,400	**53,100**	66,800	123,800
	Esc. Target + MA	103,000	191,400	**219,100**	275,600	510,600
	ER floor	10%	10%	**10%**	10%	10%
	ER at Return	0%	0%	**21%**	47%	47%
	Allowable ER	10%	10%	**21%**	47%	47%
	TAC	7,800	14,500	**57,900**	246,400	456,400
	2012 Performance					
	Projected S (after MA)	53,000	99,000	**166,000**	209,000	387,000
	BY Spawners	174,000	174,000	**174,000**	174,000	174,000
	Proj. S as % BY S	30%	57%	**95%**	120%	222%
	cycle avg S	132,000	132,000	**132,000**	132,000	132,000
	Proj. S as % cycle S	40%	75%	**126%**	158%	293%

Management Unit		**Pre-season Forecast Return** p10	p25	**p50**	p75	p90
Summer (w. RNT & Har)	*lower ref. pt. (w misc)*	651,000	651,000	**651,000**	651,000	651,000
	upper ref. pt. (w misc)	1,628,000	1,628,000	**1,628,000**	1,628,000	1,628,000
	forecast	580,000	917,000	**1,585,000**	2,776,000	4,808,000
	TAM Rule (%)	0%	29%	**59%**	60%	60%
	Escapement Target	580,000	651,000	**651,000**	1,110,400	1,923,200
	MA	34,800	39,100	**39,100**	66,600	115,400
	Esc. Target + MA	614,800	690,100	**690,100**	1,177,000	2,038,600
	ER floor	10%	10%	**10%**	10%	10%
	ER at Return	0%	25%	**56%**	58%	58%
	Allowable ER	10%	25%	**56%**	58%	58%
	TAC	58,000	226,900	**894,900**	1,599,000	2,769,400
	2012 Performance					
	Projected S (after MA)	492,000	651,000	**651,000**	1,110,000	1,923,000
	BY Spawners	586,000	586,000	**586,000**	586,000	586,000
	Proj. S as % BY S	84%	111%	**111%**	189%	328%
	cycle avg S	694,000	694,000	**694,000**	694,000	694,000
	Proj. S as % cycle S	71%	94%	**94%**	160%	277%

Management Unit		**Pre-season Forecast Return** p10	p25	**p50**	p75	p90
Late (w/o Har)	*lower ref. pt. (w misc)*	327,000	327,000	**327,000**	327,000	327,000
	upper ref. pt. (w misc)	817,000	817,000	**817,000**	817,000	817,000
	forecast	46,000	80,000	**158,000**	304,000	589,000
	TAM Rule (%)	0%	0%	**0%**	0%	44%
	Escapement Target	46,000	80,000	**158,000**	304,000	327,000
	MA	44,600	77,600	**153,300**	294,900	317,200
	Esc. Target + MA	90,600	157,600	**311,300**	598,900	644,200
	ER floor	20%	20%	**20%**	30%	30%
	ER at Return	0%	0%	**0%**	0%	0%
	Allowable ER	20%	20%	**20%**	30%	30%
	TAC	9,200	16,000	**31,600**	91,200	176,700
	2012 Performance					
	Projected S (after MA)	19,000	32,000	**64,000**	108,000	209,000
	BY Spawners	26,000	26,000	**26,000**	26,000	26,000
	Proj. S as % BY S	73%	123%	**246%**	415%	804%
	cycle avg S	114,000	114,000	**114,000**	114,000	114,000
	Proj. S as % cycle S	17%	28%	**56%**	95%	183%

4.3 IN-SEASON ASSESSMENT

Determining the in-season run size and timing for 2012 was challenging at times for the following reasons:

- High Fraser River discharge delayed the start of Mission hydro-acoustic estimates. This increased the uncertainty in estimates of sockeye passage at Mission for Early Stuart sockeye and the beginning of the Early Summer-run sockeye. It is likely that the high discharge had negative impacts on migration for Early Stuart sockeye and some of the earlier timed Early Summer-run stocks;
- Test fishery catch per unit effort was higher than brood year observations in the marine area test fisheries and much higher in the in river test fisheries relative to the marine area test fishery observations for much of the sockeye migration. This made it difficult to confirm appropriate expansion lines used to project sockeye returning to the Mission hydro-acoustic site;
- The multi-modal return profile of the Early Summer-run sockeye made it difficult to determine the peak of the run in-season;
- Low composition of Summer-run sockeye in test fishery catch relative to other stock aggregates increased the uncertainty in the timing and abundance for this group; and
- Although Late-run delay has been observed for the previous three years there was no evidence of a Late-run holding pattern in 2012. While recent delay observations have been shorter than historical delay, the FRP assumed some delay was likely and used a 16 day delay for planning purposes.

Migration and Timing

The following graphs illustrate the 2012 migration relative to the pre-season forecast of timing and abundance for Early Stuart and Early Summer-run sockeye. Note the proportion of the returns assessed using test fishery projections as well as the non-normally distributed migration profile for the Early Summer-run in the Figures below.

Figure 4-2: 2011 Early Stuart Run Sockeye Migration Graph

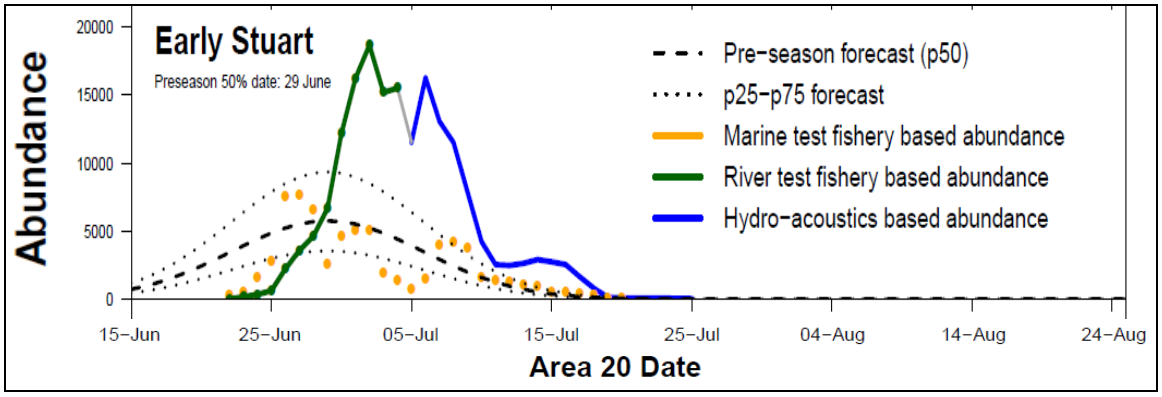
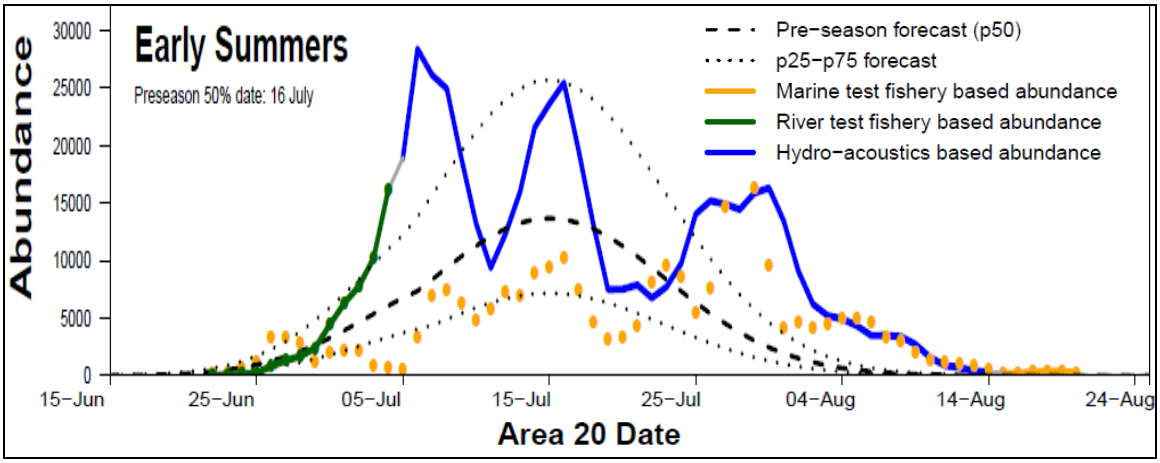


Figure 4-3: 2012 Early Summer Run Sockeye Migration Graph



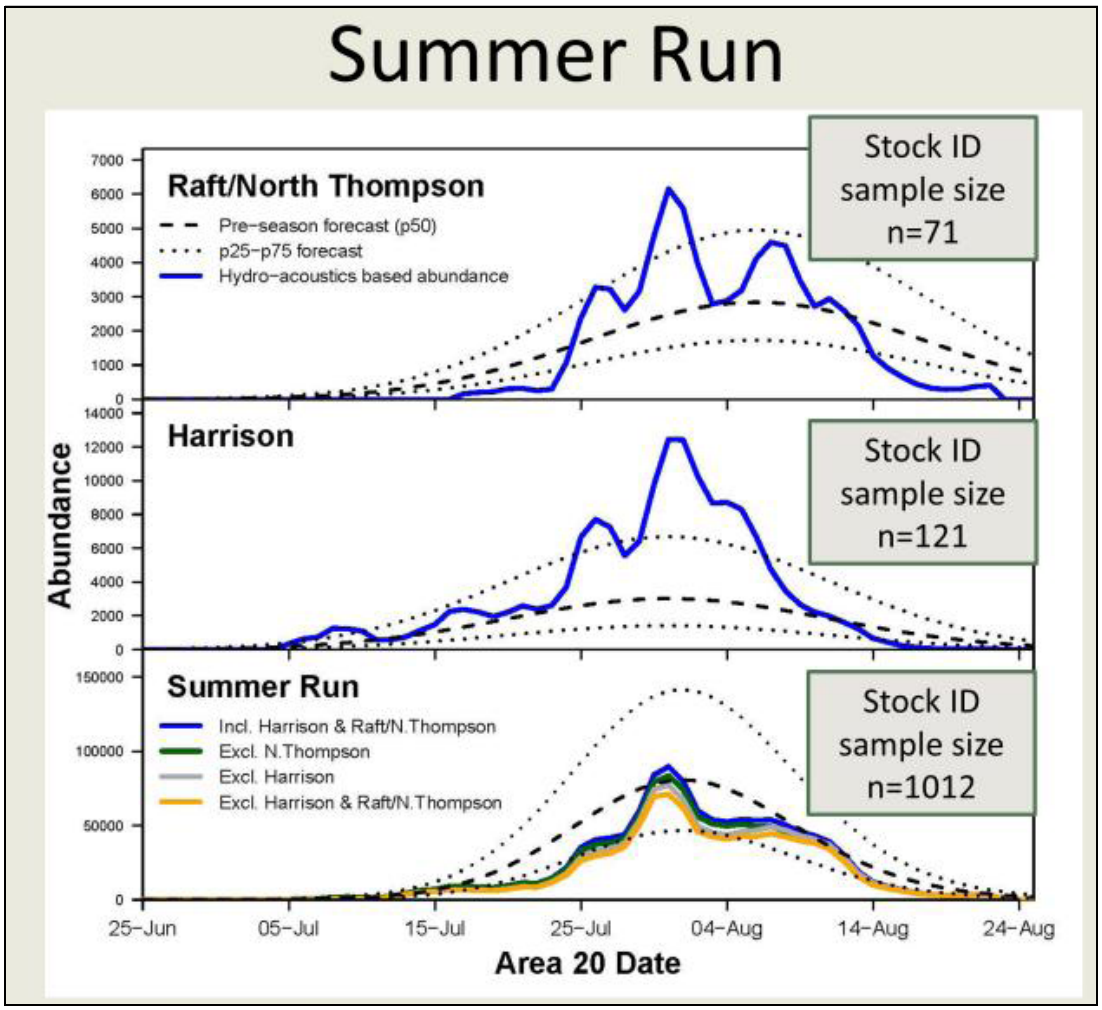
The final in-season Area 20 migration dates (peak) were similar to pre-season expectations for Early Summer and Summer-run sockeye, later for Early Stuart sockeye and earlier for Late-run sockeye. Unlike the Late-run sockeye delay observed in recent years (2009-11), there was no delay observed in 2012.

Table 4-4: Expected vs. Observed Timing by Stock Group

Stock	Area 20 Timing	
	Pre-season	**Final In-season**
Early Stuart	June 29	July 4
Early Summer	July 16	July 16
Summer-run	August 1	August 2
Late-run	August 11	August 5

The Figure below illustrates migration profiles for Raft/North Thompson and Harrison stocks relative to the Summer-run migration profile. The migration profiles of these stocks appear very similar however the Late-run timing was also similar to Summer-run timing in 2012.

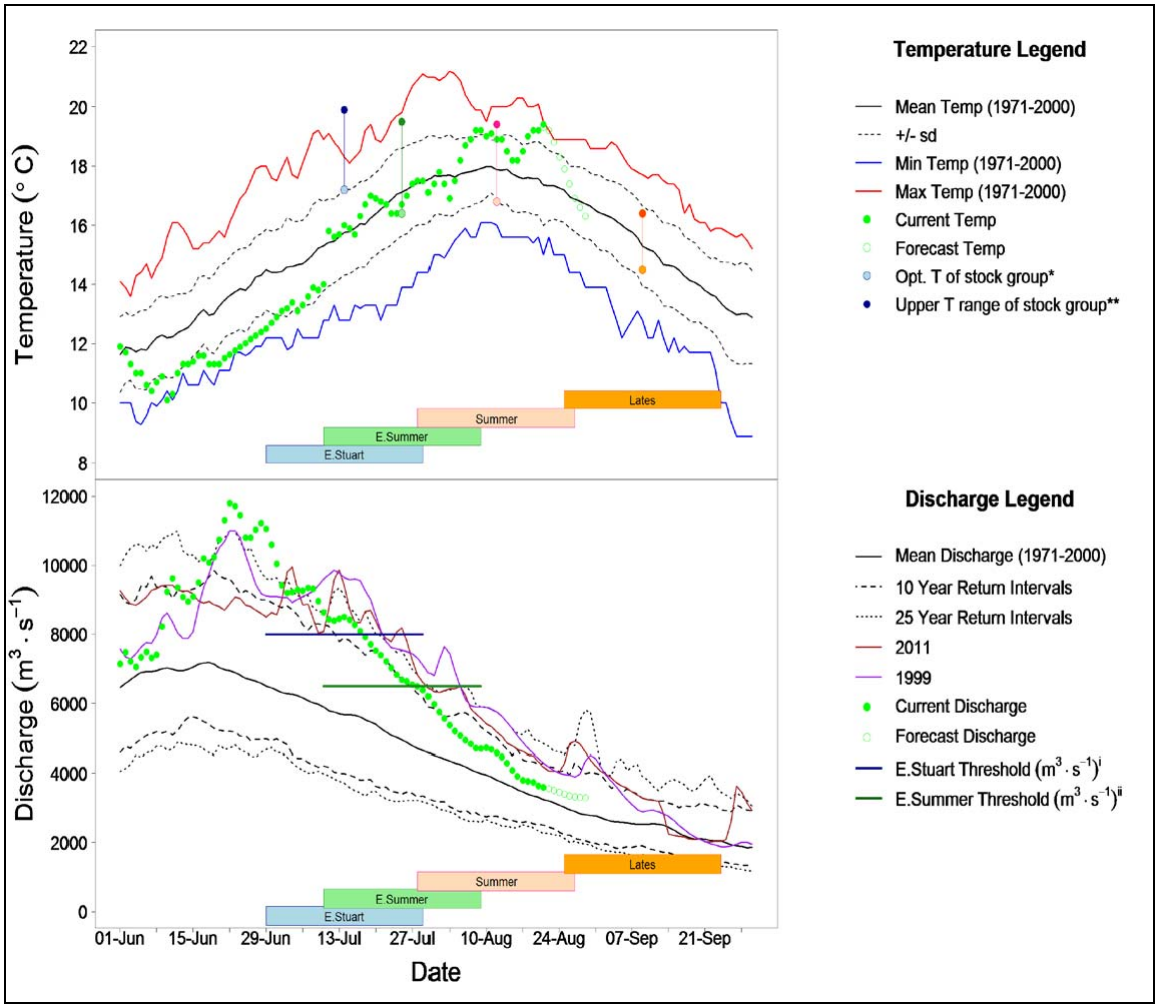
Figure 4-4: 2012 Migration Graphs of Raft/North Thompson and Harrison Stocks Relative to Summer-run Timing



Fraser River Environmental Conditions and Management Adjustment

High water discharge can cause serious adverse effects on migratory fish, particularly the Early Stuart and Early Summer-run groups. In 2012, the Fraser River discharge was above average for the majority of the sockeye migration and above the 25 year return intervals for portions of the Early Stuart migration period. Temperature remained lower than average for the early portion of the Early Stuart migration but increased to average levels by early July. Higher than average temperatures were observed during portions of the Summer and Late-run migration. The figures below illustrate the observed in-season Fraser River discharges at Hope and temperatures at Qualark Creek as well as the corresponding estimated stock aggregate migration periods.

Figure 4-5: Fraser River Discharge at Hope and Temperature at Qualark Creek



Management Adjustment models use environmental conditions and run timing as inputs. Due to the high discharge levels observed in July the Early Stuart and Early Summer MAs increased significantly from pre-season estimates.

Table 4-5: Pre-season and In-season Management Adjustments

Stock	p50 Forecast	Pre-Season pMA	Pre-Season MA	Final In-season Run Size	Final In-Season pMA	Final In-Season MA
Early Stuart	99,000	1.95	101,400	185,000	3.19	236,100
Early Summer	277,000	0.32	53,100	530,000	0.49	103,900
Summer	1,585,000	0.06	39,100	1,300,000	0.09	58,600
Late-run	158,000	0.97	153,300	260,000	0.97	252,200

Run Size

As the season progressed the FRP considered technical advice provided by the Pacific Salmon Commission and Fraser River Panel Technical Committee members and bilaterally adopted run sizes that reflected in-season assessment information. The following table highlights a timeline of run size changes that were adopted by the FRP.

Table 4-6: Timeline of Run Size Changes Adopted by FRP in 2012

	Pre-season	Jul-13	Jul-17	Jul-20	Jul-24	Jul-27	Jul-30	Jul-31	Aug-03
Early Stuart	99,000	**120,000**	**140,000**	**180,000**	180,000	180,000	180,000	180,000	180,000
Early Summer	277,000	277,000	277,000	277,000	**410,000**	**420,000**	**450,000**	**460,000**	**510,000**
Summer	1,585,000	1,585,000	1,585,000	1,585,000	1,585,000	1,585,000	1,585,000	1,585,000	1,585,000
Late	158,000	158,000	158,000	158,000	158,000	158,000	158,000	158,000	158,000

	Pre-season	Aug-06	Aug-07	Aug-10	Aug-14	Aug-17	Aug-21	Aug-24
Early Stuart	99,000	180,000	180,000	180,000	180,000	**185,000**	185,000	185,000
Early Summer	277,000	**530,000**	**550,000**	550,000	550,000	550,000	550,000	***530,000***
Summer	1,585,000	1,585,000	**1,585,000**	1,585,000	***1,300,000***	1,300,000	1,300,000	1,300,000
Late	158,000	158,000	158,000	**200,000**	200,000	**250,000**	**260,000**	260,000

Note: Bold values indicate a change. Bold values in italics indicate a run size decrease.

The final in-season run size estimates were higher than the pre-season p50 forecasts for the Early Stuart, Early Summer and Late-run management aggregates and slightly lower for the Summer-run (see the Table below). Although in-season run size estimates for most of the stock groups were higher than forecasts adopted by the FRP the lower return of the Summer-run and the higher pMAs relative to pre-season expectations limited harvest opportunities.

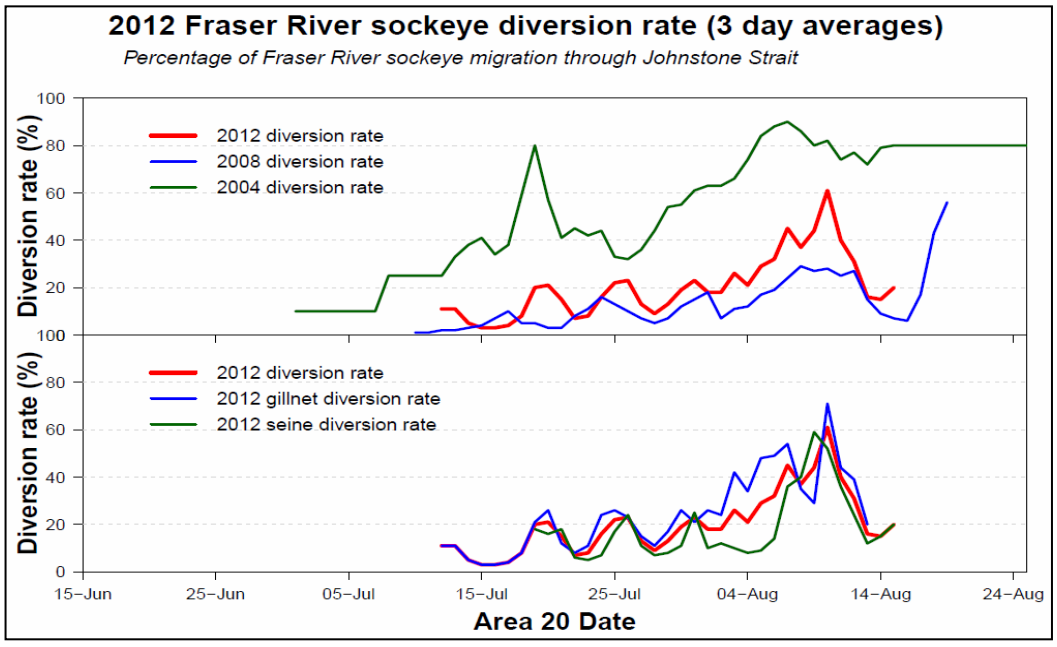
Table 4-7: Pre-Season Forecasts vs. Final In-Season Run Size Estimates

Stock	Pre-Season Forecast			Final In-Season Estimate (Sept 26)
	25% Probability	50% Probability	75% Probability	
Early Stuart	61,000	99,000	161,000	185,000
Early Summer	145,000	277,000	522,000	530,000
Summer	917,000	1,585,000	2,776,000	1,300,000
Late	80,000	158,000	304,000	260,000
Total	**1,203,000**	**2,119,000**	**3,763,000**	**2,275,000**

Diversion Rate

The diversion rate of sockeye through Johnstone Strait was lower than forecast and was estimated to be ~23% (versus the 43% forecast). The figure below describes diversion rate estimates by gear type in 2012.

Figure 4-6: Recent Diversion Estimates for the 2012 Cycle and 2012 Diversion Rate Estimates by Gear Type.



4.4 FISHERIES

There were directed harvest opportunities for Fraser sockeye in First Nations FSC fisheries. There were no directed commercial, or recreational fisheries in Canada in 2012.

Initially, Fraser River sockeye harvest opportunities were restricted for all harvest groups based on the requirement for a three week moving window closure to protect Early Stuart sockeye when in-season assessments indicated there was no TAC for this group. The moving window closure was lifted in both the marine and Fraser River areas as planned pre-season. As the season progressed in-season information indicated that the Summer-run run size was not large enough for the FRP to consider directed commercial and recreational harvest opportunities in Canada.

The Table 4-8 below outlines final in-season estimates of Fraser River sockeye catch in Canada and the U.S..

Table 4-8: Final In-season Estimates of Fraser River Sockeye Catch in Canada & in the U.S.

Total Fraser Sockeye Caught [a]	**625,500**
Test fisheries (incl. Albion and Qualark)[b]	36,000
Canadian Catch	**478,900**
Canadian First Nation FSC fisheries- Marine	44,100
Canadian First Nation FSC fisheries- Fraser[c]	434,800
Canadian commercial fisheries (includes commercial selective & FN economic)	0
Canadian recreational fisheries[d]	0
United States Catch	**110,600**
U.S. non-Treaty Indian fisheries	32,200
U.S. Treaty Indian fisheries	72,900
U.S. Treaty Indian ceremonial fisheries	5,500

[a] Catch rounded to the nearest 100 fish as of Oct 9, 2012.
[b] Includes Fraser sockeye catch in Panel approved Test Fisheries inU.S.waters
[c] Includes 7,200 sockeye caught by Marine area First Nations in the Fraser River
[d] Approximately 300 sockeye of unknown origin were estimated to be caught in marine area recreational fisheries (see Appendix 2). DNA samples from the catch to determine Fraser composition is currently not available.

Total Allowable Catch

The TAC for Fraser sockeye is calculated using: run size estimates, the escapement plan, management adjustment, run timing, and estimates of test fishing catches. In-season, fisheries are planned using in-season information and are not conducted based on pre-season forecasts.

In 2012, fisheries were planned in Canada targeting the stock aggregates with available TAC. Other stock aggregates that could constrain fisheries were harvested incidentally to levels identified in Canada's Escapement Plan. The following table shows the pre-season and final in-season international TAC and catch by aggregate.

Table 4-9: Final In-season Estimates of Fraser River Sockeye Catch as of Oct 9, 2012 in Canada and the U.S..

Stock	Pre-season total TAC*	Final In-season total TAC*	Final In-season Catch**
Early Stuart	0	0	9,100
Early Summer	52,600	205,800	78,000
Summer-run	871,200	570,200	490,300
Lates	0	0	48,100
Total	**923,800**	**776,000**	**625,500**

*TAC in this table includes the Canadian Aboriginal Fisheries Exemption amount of 400,000 fish.
** Values are rounded to the nearest 100 fish

The Table below outlines the final in-season TAC and catch for each country.

Table 4-10: Final In-Season TAC and Final In-season Catch as of October 9, 2012.[a]

Stock	Early Stuart	Early Summer	Summer	Late	Total
Test Fisheries[b]	1,800	8,300	20,000	3,700	33,800
U.S. Catch					
Commercial	0	8,200	84,900	12,000	105,100
C&S	0	400	4,400	700	5,500
U.S. Total	0	8,600	89,300	12,700	110,600
U.S. TAC [c]	0	18,300	49,300	0	67,600
CDN Catch					
Commercial	0	0	0	0	0
Recreational	0	0	0	0	0
FSC	7,200	60,800	379,300	31,600	478,900
Other [d]	100	300	1,700	200	2,200
CDN Total	7,300	61,200	381,200	31,800	481,100
CDN TAC	10,000	187,500	520,900	23,600	742,000

[a] Catch rounded to nearest 100 fish
[b] Includes Fraser sockeye catch in Panel approved Test Fisheries in U.S.waters
[c] 16.5% TAC
[d] Other catch is sockeye captured in multi-species non-Panel approved test fisheries (Albion and Qualark)

Fraser Sockeye Exploitation Rates

The Table below outlines pre-season exploitation rate expectations based on the p50 forecast, pre-season MAs, 2012 Total Allowable Mortality (TAM) rules, and final in-season exploitation rate estimates based on final in-season estimates of run size and catch.

Table 4-11: Potential Exploitation Rates

	Pre-season *	Final In-season (Oct 9, 2012)
Early Stuart	10%	5%
Early Summer	21%	15%
Summer	56%	38%
Late	20%	19%
Cultus **	20%	19%

* ER is based on 2012 TAM rules, pre-season pMAs and the p50 forecast
** ER is assumed to be the same as similarly timed Late-run stocks (excluding Birkenhead) stocks

4.5 POST-SEASON

Sockeye Migration and Escapement Estimates

Early Stuart sockeye experienced difficult migratory conditions in the Fraser River in 2012 due to an above average snowpack in the watershed combined with a cool, wet spring. Discharge levels in the lower Fraser River were approximately 50% higher than average during the Early Stuart migration period, exceeding levels historically associated with poor migratory success. Estimates of spawning success were highly variable throughout the watershed in 2012.

The 2012 preliminary escapement estimate of 26,224 Early Stuart sockeye is 88% of the brood year (29,916) and 46% of the recent (1992-2008) cycle average of 56,799. Spawning success for Early Stuart sockeye in 2012 is an estimated 75.6% (24.4% pre-spawn mortality), which is well below the long term average of 89.1%.

The 2012 preliminary escapement estimate of 268,860 Early Summer sockeye is 31% higher than the brood year (174,632) and slightly above the recent (1992-2008) cycle average of 245,996. This is the third largest Early Summer-run sockeye spawning escapement on record for this cycle. The estimated spawning success for the Early Summer-run aggregate in 2012 is 89.0%, which is equal to the long term average.

The Table below outlines projected escapement information relative to the escapement goals at the final in-season run sizes. Spawning ground estimates for Summer-run and Late-run sockeye are currently not available.

Table 4-12: Preliminary Escapement Information to Date

Management Group	Escapement Goal @ final in-season run size	Predicted Escapement *	Preliminary Spawning Esc.
Early Stuart	74,000	42,000	26,224
Early Summer	212,000	303,200	268,680
Summer	651,000	742,600	N/A**
Late-run	260,000	107,500	N/A**
Total	***1,197,000***	***1,195,300***	

* Based on final in-season catch estimates and predicted differences between estimates

** Estimates not yet available

Post-season Catch Estimates

The current estimates of catch in this report are final in-season estimates as of October 9, 2012. Post season estimates will be available in early January. Preliminary post season estimates of catch by stock group will be available by January 14, 2012.

5 FRASER RIVER PINK

Pink salmon return to the Fraser River in significant numbers on odd years only; therefore, in 2012 there was a negligible number of pink salmon that returned to the Fraser River.

6 SOUTHERN B.C. AGGREGATE ABUNDANCE-BASED MANAGEMENT CHINOOK

6.1 OBJECTIVES AND OVERVIEW

Chinook fisheries are managed by either an aggregate abundance-based management or individual stock-based management regime. Allowable harvest impacts in AABM areas are determined by provisions in the Pacific Salmon Treaty and subject to domestic considerations, such as conservation and allocation. In Southern B.C., all AABM chinook fisheries are located off the West Coast Vancouver Island (WCVI), including components of the recreational fishery, First Nations fisheries, and the WCVI Area G troll fishery.

For the period October 2011 through September 2012, the forecast chinook abundance index was 0.89 of the PST base period. Therefore, under treaty provisions, the maximum allowable catch was 133,300 chinook for WCVI AABM fisheries; which includes a 30% reduction consistent with the new treaty provisions that came into effect in January 2009.

Of this total, 69,248 was the pre-season expected catch for the offshore recreational and First Nations fisheries. The remaining 64,052 chinook were allocated to the commercial fisheries (Area G and T'aaq-wiihak).

Further considerations for managing chinook catch in WCVI AABM fisheries are driven by concerns regarding the low status of natural WCVI, Lower Strait of Georgia (LGS), and Spring $4_2/5_2$ and summer 5_2 Fraser River chinook and Interior Fraser coho populations.

Several ocean fisheries in Canada intercept WCVI origin chinook, including Northern troll, Queen Charlotte Islands (Haida Gwaii) sport, WCVI troll and WCVI sport. Ocean fisheries are limited to a 10% exploitation rate, even if PST provisions allow for a higher catch. Management measures are in place to reduce the impact of fisheries on WCVI origin chinook while still providing harvest opportunities.

Continued efforts were made in 2012 to limit the impact of the troll fishery on low status chinook populations, including time and area constraints and limits on effort (boat-days) to protect all stocks of concern.

AABM chinook catch and release information from all fisheries can be found in Appendix 3.

Table 6-1: Pre-Season and Post-Season Total Allowable and Preliminary Catch Estimates for October 2011-September 2012 WCVI AABM Chinook

	Pre-Season	Post-Season
WCVI AABM Abundance Index	0.89	under review
WCVI AABM Chinook TAC	133,300	under review
AABM Recreational Catch	60,000	62,573
First Nations Catch	5,000	4,300**
Maa-nulth First Nations Catch	4,248	2,024
T'aaq-wiihak Catch	7,654	6,292
Area G Troll Catch	**56,398***	55,530
Total AABM Catch		**130,719**

*The total Area G troll TAC is calculated as the difference between the WCVI AABM chinook TAC less offshore recreational catch and First Nations FSC catch.

**First Nations catch is under review.

6.2 RECREATIONAL

Fishing regulations in WCVI recreational AABM areas include mandatory use of barbless hooks to lower post-release mortality on sub-legal size chinook (less than 45 cm), and a daily limit of two (2) chinook. Additional conservation measures include a 77 cm maximum size limit, imposed in those portions of Areas 123-127 that lie shoreward of a line drawn 1-mile seaward of the surfline. This area is commonly referred to as the 'Chinook Corridor', and is in place to protect migrating WCVI origin chinook. In areas along the WCVI, where hatchery origin chinook are considered to be a high portion of the recreational catch, harvesters are permitted to retain two (2) chinook per day of which one (1) can be larger than 77 cm.

Catch in the WCVI recreational fishery is estimated through a creel survey, which collects effort (number of boat trips), and catch per unit effort data. Catch for any given species within a defined time-area stratum is estimated by multiplying effort by CPUE. Total effort is estimated through vessel counts, gathered through either aerial or on-water boat surveys of the fishing area. CPUE is estimated from interviews with anglers at specific landing sites and from trip logbooks and manifests submitted by lodges and guides through a voluntary monitoring program. Data regarding the daily activity profile of the fishery, fishing locations, and the proportion of guided versus un-guided effort are also gathered from angler interviews.

Total recreational catch and release in the 2012 WCVI AABM fishery was estimated to be 62,573 and 51,027 chinook, respectively, during the survey period (June-Sept). Previous sampling has indicated that there is minimal recreational effort outside of this period and catch is expected to be low.

Effort in the AABM area for 2012 was 33,375 boat trips.

Figure 6-1. Preliminary Recreational WCVI Chinook AABM Catch and Effort, 1995-2012

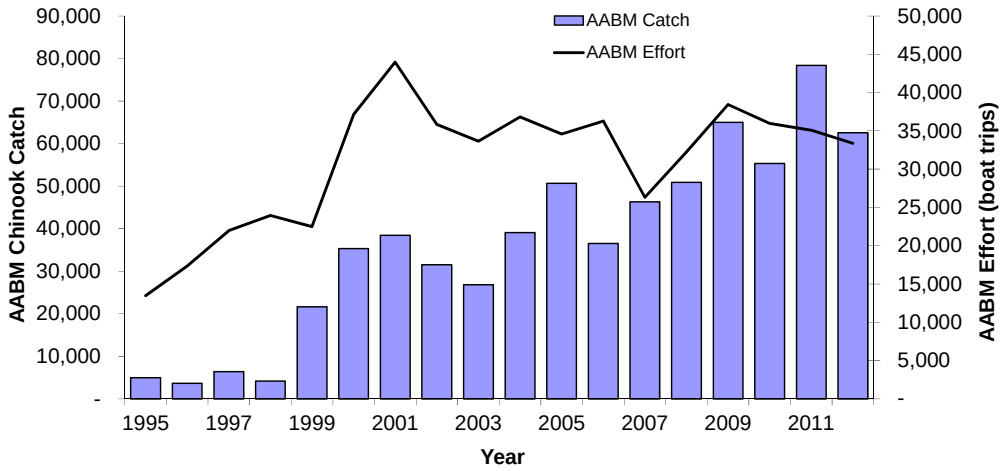


Table 6-2: Preliminary Estimates of WCVI Recreational AABM Effort, Chinook Catch, and Chinook Releases by PFMA, 2012

2012	Area	AABM Effort (Boat Trips)	AABM Chinook Catch	AABM Chinook Releases
Inshore	Juan de Fuca (20W)	-	-	-
Inshore	Area 21	101	18	-
	Nitinat (22)			
	Alberni Inlet (23)	6,128	42	4
	Barkley Sound (23)	4,591	7,391	4,697
	Clayoquot (24)	533	915	438
	Nootka (25)	48	180	-
	Kyuquot (26)	42	75	128
	Quatsino (27)	304	235	186
Offshore	Area 121	2,480	10,222	2,726
	Area 123	6,386	16,018	15,535
	Area 124	4,070	8,909	10,513
	Area 125	3,819	6,231	4,287
	Area 126	1,946	6,582	9,986
	Area 127	2,928	5,755	2,527
	WCVI	**33,375**	**62,573**	**51,027**

6.3 FIRST NATIONS

The 2012 WCVI First Nations AABM chinook reported catch is still under review at this time but is estimated at 4,300 based on observed catches from previous years. Catch from Maa-nulth Nations domestic fisheries for AABM chimook was estimated at 2,024.

6.4 COMMERCIAL

After the completion of the April 2012 Chinook Technical Committee (CTC) chinook model calibration, the WCVI AABM Canadian allowable harvest was 133,300. The FSC harvest was set at 9,248 and the recreational expected catch was 60,000, leaving 64,052 available for commercial harvest. The commercial TAC was apportioned with 88.05% to Area G Troll and 11.95% to the T'aaq wiihak First Nations Demonstration fishery. The Area G Troll TAC was 56,398 chinook. The total estimated Area G troll catch was 55,530 chinook. The T'aaq wiihak First Nations TAC was 7,654 chinook. The total estimated T'aaq wiihak First Nations catch was 6,292 chinook.

For the 2011/2012 chinook year, fisheries continued to be shaped by conservation concerns for the following domestic stocks: Spring $4_2/5_2$ and summer 5_2 Fraser River chinook, Interior Fraser River coho, WCVI origin chinook salmon, and LGS chinook.

Area G Troll Summary

The Area G Troll annual management plan is designed to maintain exploitation rates on stocks of concern within established limits by the use of fishing time and area closures in conjunction with fishing effort limits. The management plan distributes catch and effort throughout the fishing year.

The management plan is subject to change as required to address specific conservation concerns as they arise. For the 2012 fishing season the following changes to annual fishing plan were implemented:

- As a result of poor escapement in 2011 additional conservation measures were required during the 2012 fishing season to further reduce the exploitation rate on Fraser River chinook Spring and Summer 5_2. To accomplish this reduction in exploitation rate the June portion of the Area G fishery was cancelled.
- To avoid exceeding the overall WCVI AABM TAC, 20% of the Area G TAC was allocated to September fisheries. If preliminary AABM catch estimates to August 31 indicate the overall WCVI AABM TAC may be exceeded, the Area G TAC set aside for September would be used to assist Canada with staying within its overall WCVI chinook TAC. For the 2012 season the amount of Area G TAC set aside for September fisheries was increased from 20% to 30% of the annual TAC.

Area G Troll Fishing Periods:

- October to March period

During the period from October 1 to March 15, a harvest level of approximately 20% of the Area G annual TAC was recommended, based on the PST chinook model calibration and assigned harvest levels for the outer WCVI area.

- March 16 to April 19 period

For the 2011/12 year, a full time-area closure was maintained from March 15 to April 19 to avoid interception of spring $4_2/5_2$ and summer 5_2 Fraser River chinook.

- Late April/mid June period

During the period from April 20 to June 15, a harvest of approximately 40% of the Area G annual TAC was recommended, based on the PST chinook model calibration and assigned harvest levels for the outer WCVI area. In addition, effort (boat-days) was limited to recent year averages, and areas of SWVI were closed until May 7 (partial openings from May 2-7) in order to avoid interception of spring $4_2/5_2$ and summer 5_2 Fraser River chinook.

- June 16 to July 24 period

A full time-area closure was maintained from June 15 to July 23 in Management Areas 125 to 127 and from June 16 to July 31 in Management Areas 123 to 124 to avoid interception of spring $4_2/5_2$ and summer 5_2 Fraser River chinook.

- July 24 through early August

During this period, a harvest of approximately 20% of the Area G annual TAC was recommended, based on the PST chinook model calibration and assigned harvest levels for the outer WCVI area. In addition, the fishery was managed to minimize mortality on wild coho through: i) a maximum interception of coho, and ii) the mandatory use of large (minimum 6") plugs. As well, the fishery was managed to minimize mortality of WCVI origin chinook through the use of time-area closures of near shore areas ("chinook conservation corridor") where WCVI chinook stocks are prevalent.

- September period

During the September period, a harvest of approximately 20% of the Area G annual TAC was recommended based on the PST chinook model calibration and assigned harvest levels for the outer WCVI area. The Area G harvest level in September has the potential to increase if there is available remaining WCVI AABM TAC after accounting for First Nation FSC and recreational fisheries. However, if First Nations or the recreational sector exceeds their expected catch the available Area G TAC is reduced. Any harvest opportunities prior to September 15 was managed to avoid interception of coho and WCVI origin chinook. After September 15, retention of adipose fin clip (AFC) hatchery origin coho was permitted.

For all troll fisheries, selective fishing practices were mandatory, including single barbless hooks and revival tanks for resuscitating non-retention species prior to release.

Since 1999, a major objective for the management of the WCVI troll fishery has been to distribute the catch throughout the fall-winter-spring-summer periods. This objective was continued in 2011/2012.

The late July and August plug fisheries were monitored to determine encounter rates of other species and estimate numbers of released chinook. Biological sampling was conducted for size distributions, and stock compositions (Coded Wire Tags, DNA and otolith samples).

Table 6-3: Post-Season Preliminary Monthly Catch Estimates for 2007/08 to 2011/12 WCVI AABM Chinook Troll Fisheries

	2011/2012	**2010/2011**	**2009/2010**	**2008/2009**	**2007/2008**
October	0	0	0	1,882	3,137
November	57	0	0	1,209	0
December	188	0	0	1,107	0
January	129	0	0	3,394	1,634
February	542	1849	0	1,540	1,911
March	243	875	0	586	0
April	10493	8670	8553	3,616	1,717
May	22334	41239	31296	18,062	11,105
	2011/2012	**2010/2011**	**2009/2010**	**2008/2009**	**2007/2008**
June	0	34394	23652	12,165	15,944
July	0	15619*	0	0	0
August	4280*	21284*	11642*	9,630*	9,099*
September	17,264	0	3980	0	45,157
Total	**55,530**	**123,930**	**79,123**	**53,191**	**89,704**

*Plug fishery

T'aaq wiihak First Nations Demonstration Fishery Summary:

In addition to other considerations relating to aboriginal rights, DFO acknowledges that, in its November 3, 2009, the British Columbia Supreme Court decision in *Ahousaht Indian Band et al. v Canada and British Columbia*, the Supreme Court found the plaintiffs (five Nuu-chah-nulth First Nations located on the West Coast of Vancouver Island – Ahousaht, Ehattesaht, Hesquiaht, Mowachaht/Muchalaht, and Tla-o-qui-aht) have what the Court recognized as "aboriginal rights to fish for any species of fish within their Fishing Territories and to sell that fish."

The B.C. Court of Appeal subsequently confirmed the B.C. Supreme Court decision, except that it found that the rights do not included geoduck. The consultations and negotiations between the DFO and the *Ahousaht* five plaintiff First Nations, self-designated as T'aaq-wiihak, commenced in April 2010.

Part of this consultation and negotiation process involved the implementation of an AABM chinook salmon demonstration fishery for the 2012 fishing season. The fishery was carried out in portions of statistical Areas 24, 25, 124 and 125 on the west coast of Vancouver Island between July 18th and September 30th, 2012. The fishery was attended by 42 participants, seven of whom fished from large troll vessels. The remainder utilized vessels 25 feet and under. Total catch estimated for the fishery is 6,292 chinook as of December 1, 2012,

The fishery was monitored by T'aaq-wiihak observers and DFO staff. Biological samples for DNA, and heads from salmon indicating presence of a coded wire tag, were collected by J.O. Thomas and Associates.

7 SOUTHERN B.C. ISBM CHINOOK

7.1 OBJECTIVES AND OVERVIEW

In addition to the PST regime, Canada implemented management actions as required to ensure conservation of Canadian origin chinook and to meet domestic allocation requirements. These chinook fisheries were managed to harvest rates on an individual stock basis (ISBM).

Measures were taken in 2012 in First Nations FSC, recreational and commercial chinook fisheries to protect WCVI, LGS, Spring 4_2 and Spring/Summer 5_2 Fraser River chinook stocks. FSC management actions included time and area closured and reduced fishing times. Recreational measures included barbless hooks, time/area closures, size restrictions and mark-selective fisheries. Commercial measures included barbless hooks, area and gear restrictions, mandatory use of revival tanks, daily catch reporting, mandatory logbooks, hailing catches on a regular basis, and independent on-board observers on vessels when requested. Post-release mortality information for chinook included in ISBM management was determined from studies conducted in 2000-2001 and detailed in the Canadian Stock Assessment Secretariat, Research Document 99/128 (CSAS, Doc 99/128).

Specific management actions were taken to protect WCVI origin chinook in Canadian ocean fisheries (not including enhanced terminal areas), the harvest of which was restricted to an exploitation rate of 10%. Most Southern B.C. commercial fisheries were regulated so that impact on WCVI wild chinook stocks was minimized, with the exception of terminal recreational, commercial and First Nations fisheries.

Lower Strait of Georgia chinook stocks in general are experiencing a period of low productivity and significant management measures in the recreational and commercial fisheries continued to be in place throughout 2012 to protect these stocks. Some LGS chinook stocks are seeing a gradual increase in terminal returns, particularly in the Cowichan River, which is encouraging. Overall their productivity and Outlook remains low.

Spring 4_2 Fraser River chinook and Spring/Summer 5_2 Fraser chinook stocks had specific management measures in place to reduce exploitation in FSC, recreational and commercial fisheries. FSC management actions in the Fraser River included time and area closures and reduced fishing times. Recreational fisheries in Juan de Fuca Strait, the Strait of Georgia and the approach waters of the Fraser River had specific time, area, size and mark selective restrictions designed to minimize the amount of exploitation on these chinook stocks. Fraser River non-tidal recreational fisheries had delayed start up times, reduced fishing times, closures and size restrictions implemented to protrct Spring 4_2 Fraser River Chinook and Spring/Summer Fraser 5_2 chinook stocks. Commercial troll fisheries on the WCVI were also managed with time and area closures in 2012 for Spring/Summer Fraser chinook stocks.

ISBM chinook catch and release information from all fisheries can be found in Appendix 5.

7.2 RECREATIONAL

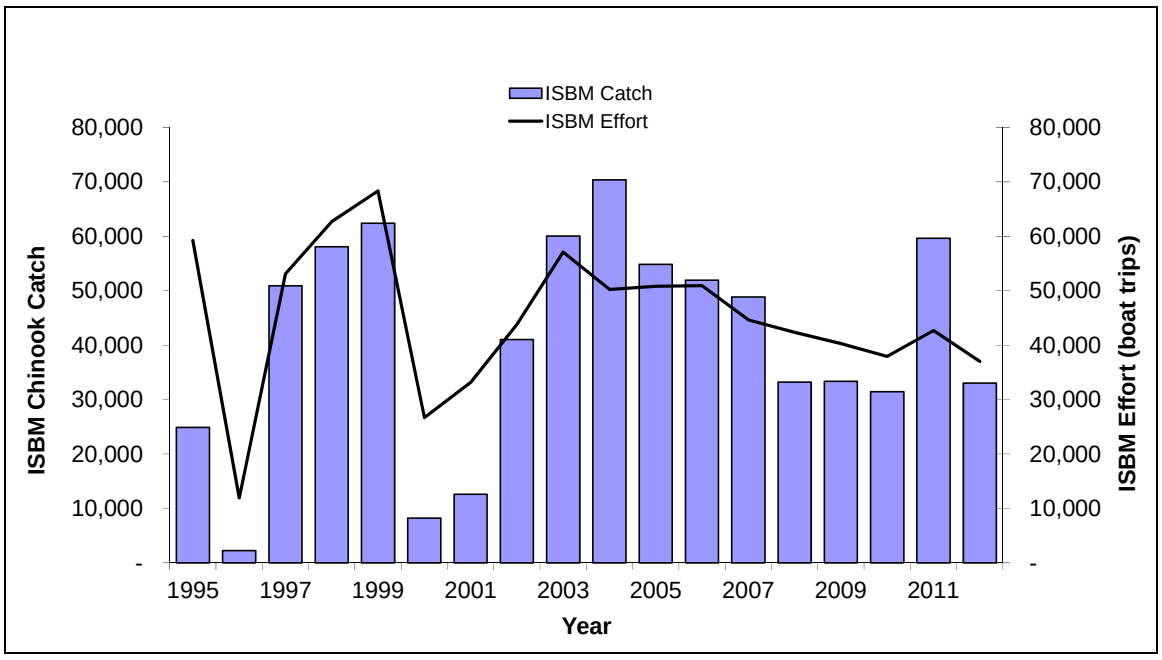
West Coast Vancouver Island

Regulations in 2012 required chinook retained within the chinook corridor (one nautical mile seaward of the surfline) have a maximum size limit of 77cm designed to protect 3+ year old females returning to spawn. This restriction came into effect July 15th in those waters north of Estevan Point and August 1st for those waters south of Estevan Point. These restrictions expire after September 30 and October 15, respectively. Retention of chinook greater than 77cm is permitted in some terminal areas of Nootka and Barkley Sounds where there is a large hatchery contribution to the ISBM chinook harvest. In Port San Juan, chinook non-retention restrictions were in effect from July 15 through October 25.

Table 7-1: Estimated WCVI Recreational ISBM Effort, Chinook Catch and Release by PFMA, 2012

2012	Area	ISBM Effort (Boat Trips)	ISBM Chinook Catch	ISBM Chinook Releases
Inshore	Juan de Fuca (20W)	7,521	6,917	1,177
Inshore	Area 21	233	31	-
	Nitinat (22)			
	Alberni Inlet (23)	7,945	7,765	219
	Barkley Sound (23)	6,385	4,530	845
	Clayoquot (24)	895	105	463
	Nootka (25)	11,620	11,969	10,058
	Kyuquot (26)	285	275	255
	Quatsino (27)	2,128	1,429	1,413
Offshore	Area 121	-	-	-
	Area 123	-	-	-
	Area 124	-	-	-
	Area 125	-	-	-
	Area 126	-	-	-
	Area 127	-	-	-
	WCVI	**37,012**	**33,021**	**14,430**

Figure 7-1: Recreational WCVI Chinook ISBM Catch and Effort, 1995-2012



West Coast Vancouver Island Terminal Areas

Somass/ Stamp

During 2012 there was a non-tidal opening for the Somass/Stamp River (Area 23) from October 19 to December 31. The daily limit was four (4) salmon per day. Anglers were allowed to retain two (2) chinook of which only one (1) could be greater than 77cm in length. The Somass/Stamp River were not monitored by creel survey during 2012.

Nitinat

During 2012 there were two non-tidal openings for chinook on the Nitinat River (Area 22). The first one was from August 25 to September 23. The fishery closed from September 24 until October 18 due to low water concerns primarily around chinook escapements. The fishery typically closes October 1 until October 15 to protect chinook salmon during the peak spawning period. The chinook fishery on the Nitinat re-opened from October 19 until December 31. The daily limit was four (4) salmon per day of which only two (2) could be chinook salmon and only one (1) could be greater than 77 cm in length. The Nitinat River was not monitored by creel survey during 2012. The area above Parker Creek is closed to fishing.

Conuma

During 2012 there was a non-tidal opening for the Conuma River (Area 25) from August 25 to December 31. The daily limit was four (4) salmon per day of which two (2) could be coho (marked or unmarked). The Conuma River was not monitored by creel survey during 2012.

Inside Areas: Strait of Georgia, Johnstone Strait, and Juan de Fuca Strait

For Johnstone Strait and the Strait of Georgia north of Cadboro Point, sport catch regulations included an annual limit of 15 (15) chinook, a daily limit of two (2) chinook and a minimum size limit of 62 cm. For the Canadian portion of Juan de Fuca Strait south of Cadboro Point, the daily limit was two (2) chinook over 45 cm and a seasonal limit of 20 (20) chinook was in effect.

In those waters near Victoria between Cadboro Point and Sheringham Point (Areas 19-1 to 19-4 and Area 20-5), retention regulations were adjusted from March 1 to June 15 where anglers were permitted to retain two (2) chinook per day wild or hatchery marked between of 45cm and 67cm or hatchery marked only chinook over 67 cm in length. From June 16 to July 15 the daily limit remained at two (2) chinook with only one (1) chinook over 67 cm in length.

The "chinook corridor" extending from Subareas 18-1 to 18-6, 18-9, 18-11, 19-5 and a portion of 29-4 and 20-5 that lies south from a point on the east side of Valdes Island and extending 57 degrees true for 5 nautical miles remained in place in 2012. In this corridor the daily limit was two (2) chinook with a minimum size of 62 cm of which only one (1) could be over 67 cm from May 1 to July 15. From June 16 to July 15 the daily limit remained at two (2) chinook with only one (1) chinook over 67 cm in length.

Concern for Cowichan River chinook also prompted a restriction in Subareas 18-6 and 18-7 and 19-7 to 19-12. These areas saw chinook non-retention measures in effect from August 1 through October 15. Additionally, a portion of Subarea 18-7 and 18-8 east of a line from Separation Point to Wilcuma Wharf in Cowichan Bay, across Satellite Channel to Saltspring Island was closed to all finfish fishing from August 1 through October 15. Cowichan Bay west of the Separation/Wilcuma line was closed to all finfish fishing from August 1 through October 31.

Fraser River and Tributaries

Fraser River Spring 4_2, as well as Fraser River Spring and Summer 5_2 chinook stocks of concern entering the Fraser River in Subareas 29-6, 29-7, 29-9 and 29-10 required additional management measures again in 2012 due to continued concerns about stock status. Starting May 1 to July 15 the daily limit for chinook was zero. The daily limit was increased to two (2) wild or hatchery marked fish between 62 cm and 77 cm from July 16 to 27th. From July 28th until December 31st, the daily limit for wild or hatchery marked chinook salmon was two (2) with a minimum length of 62 cm.

In the tidal (Subareas 29-11 to 29-17) and the non tidal areas (Region 2) of the Fraser River there was no fishing for salmon from January 1st to July 15th. From July 16th to the 27th, the daily limit was one (1) wild or hatchery marked chinook, between 30 cm and 77 cm. From July 28th to August 31 the daily limit for wild or hatchery marked chinook salmon was four (4) with only one (1) over 50 cm. From September 1st to December 31st the daily limit for wild or hatchery marked chinook salmon was four (4) with only one (1) over 62 cm.

In addition, there were several tributaries to the Fraser River in which chinook retention was authorized including:

- Alouette River, daily limit of one (1) chinook from July 1st to December 31st
- The Chehalis River, daily limit of four (4) with only one over 50 cm from June 1st until August 10th and again from September 16th until December 31st , a daily limit of four (4) chinook with only one over 62cm.
- The Chilliwack/Vedder River, daily limit of four (4) with only one over 62 cm from July 1st until December 31st
- The Harrison River, daily limit of four (4) with only one over 62 cm from September 1st until December 31st

Tributaries to the Fraser River above Sawmill Creek in which chinook retention was authorized included:

- Bowron River, daily limit of one (1) chinook less than 77cm from July 15 to August 15;
- Fraser River (Prince George) , daily limit of one (1) chinook less than 77 cm from July 10 to July 25;
- Cariboo River, daily limit of one (1) chinook less than 77 cm from July 27 to August 18;
- Chilko River, daily limit of one (1) chinook less than 77 cm from July 25 to August 16;
- Quesnel River, daily limit of one (1) chinook less than 77 cm from July 15 to September 1;
- Fraser - Bridge River, daily limit of one (1) chinook from June 24 to 28; July 1 to 5, 0600 -2100 hours.
- Fraser – Region 3, daily limit of four (4) chinook with zero over 50 cm from July 16 to September 16.
- Clearwater River, daily limit of one (1) chinook with a monthly limit of two (2) which includes chinook caught in the North Thompson River from August 1 to August 21;
- North Thompson River, daily limit of one (1) chinook with a monthly limit of two (2) which includes chinook caught in the Clearwater River from August 1 to August 21;
- Thompson River, daily limit of four (4) chinook with zero over 50 cm from July 16 to August 21;
- Thompson River, daily limit of four (4) chinook per day 1 over 50cm from August 22 to September 16;
- South Thompson River, daily limit of four (4) chinook with 2 over 50 cm and monthly limit of six (6) over 50 cm from August 16 to September 22;
- Middle Shuswap River, daily limit of one (1) chinook greater than 77 cm with a monthly limit of four (4) from July 25 to August 15;
- Lower Shuswap and Mable Lake, daily limit of one (1) chinook greater than 77 cm with a monthly limit of four (4) from July 25 to August 15. Effective August

16 to September 12, daily limit of four (4) chinook with two (2) over 50 cm and monthly limit of four (4) over 50 cm.

In 2012, marine recreational fisheries were monitored by creel surveys in three main areas; 1) Juan de Fuca including Victoria (that portion of Area 19 south of Cadboro Point) and Juan de Fuca Strait through Areas 20-3; 2) Strait of Georgia including Areas 14 through 18, that portion of Area 19 north of Cadboro Point, 28 and 29; and 3) Johnstone Strait including Areas 11 to 13. Monitoring of the Strait of Georgia sport fishery (May to September) and Juan de Fuca Strait sport fishery (March to December) has been fairly consistent from year to year using an access point (landing site) survey for collecting catch, CPUE, and biological information combined with an aerial survey for effort counts. In addition, logbook programs, directed at estimating the recreational catch by fishing guides during guided trips, were conducted in the Campbell River and Victoria Areas in 2012. The Johnstone Strait creel survey commenced in Area 13 in May and continued through until end of September; and from June through August to include Areas 11 and 12.

Table 7-2: Preliminary Catch and Effort Estimates for Southern B.C. Inside Recreational ISBM Fisheries in 2012.

Fishing Area	Survey Period	Chinook Kept	Chinook Released	Effort (Boat Trips)
Strait of Georgia	May - Sep	11,254	34,406	50,490
Johnstone Strait	Jun - Aug	19,071	20,467	40,026
Juan de Fuca Strait	Feb - Oct	15,153	9,429	41,433
Fraser River [1]	Jul - Oct	10,931	7,265	n/a
TOTAL		**56,409**	**71,567**	**131,949**

[1] subject to change; Fraser River recreational assessments are preliminary as of December 1, 2012

7.3 FIRST NATIONS FISHERIES

WCVI FSC and Economic Opportunity Fisheries

In 2012 an agreement was reached with the Hupacasath and Tseshaht First Nations for an economic opportunity fishery targeting Somass chinook (Area 23). There was one economic fishery for a total catch of 9,400 chinook. Hupacasath and Tseshaht First Nations and Barkley Sound / Maanulth First Nation's catch reports indicate a combined ISBM FSC chinook harvest of 729 chinook. Outside WCVI First Nations ISBM catch is reported to be 500 for a total WCVI ISBM catch of 1229.

WCVI Excess Salmon to Spawning Requirements (ESSR) Fisheries

The Tseshaht and Hupacasath First Nations were issued a joint Excess Salmon to Spawning Requirements (ESSR) Licence for chinook at the Robertson Creek Hatchery facility. The total catch was 4,322 chinook (including jacks).

The Ditidaht First Nation was issued an ESSR Licence for chinook at Nitinat Lake and the Nitinat Hatchery. The catch was 2,087 chinook.

The total catch for both ESSR fisheries was 6,409 chinook.

Strait of Georgia FSC Fisheries

Data is still being compiled on various First Nations catches in the Strait of Georgia; however, preliminary catch is estimated at 181 chinook.

Strait of Georgia ESSR Fisheries

There was an ESSR fishery for 2915 chinook salmon. The fish were harvested in Big Qualicum hatchery.

Strait of Georgia Economic Opportunity Fisheries

There were no EO fisheries in the Strait of Georgia in 2012.

Johnstone Strait FSC Fisheries

Data are still being compiled on various First Nations catches in Johnstone Strait; however, preliminary catch 55is estimated at 321 chinook. There were no economic opportunity fisheries.

Fraser River FSC, Economic Opportunity and Inland Demonstration Fisheries

FSC fisheries, economic opportunity and inland demonstration fisheries took place in the Fraser River in 2012, harvesting ISBM chinook in both the upper and lower reaches of the Fraser River. Approximately 6,556 chinook were harvested in the upper Fraser River (above Sawmill Creek) in FSC fisheries (5,522) and demonstration fisheries (1,034).

The total chinook harvested in the lower Fraser River, (below Sawmill Creek), was 21,502 which includes mostly FSC (21,467). In 2012, chinook were to be released during the chum economic opportunity and demonstration fishery; however 35 fish were harvested during the economic opportunity and none during the demonstration fishery.

7.4 COMMERCIAL FISHERIES

In 2012 commercial gill net fisheries in Tlupana Inlet (Nootka Sound) and Alberni Inlet targeted ISBM chinook on the WCVI. No other commercial fisheries targeted ISBM chinook in 2012.

Area D Gill Net

In 2012, gill net fisheries occurred in Tlupana Inlet targeting chinook returns to Conuma River hatchery. Area D gill net openings in Tlupana Inlet occurred on August 7 and 15th for a total chinook catch of 8,135. Maximum effort was 61 vessels per day.

An Area D gill net fishery took place in the upper Alberni Inlet targeting Robertson Creek hatchery chinook. A total of 51 vessels participated in a 2-hour opening for a catch of 1,285 chinook. There was also an incidental catch of chinook during the Area D sockeye fishery in June and July with 809 chinook retained and 236 released. The total WCVI commercial net ISBM harvest was 10,230 chinook.

7.5 STOCK STATUS

Fraser River and Area Chinook

Interior Fraser

Spring chinook returns to the Fraser continue to be of concern. Returns to the Spring 5_2 aggregate remained at very low levels, although the aggregate as a whole escaped at approximately the same level as the 2007 parent brood. Some stocks were of particular concern, including Salmon River near Prince George (92) and Westroad River (~720).

Returns to the Spring 4_2 aggregate were also poor (~7,250 total), however most populations achieved or exceeded parental escapements. The aggregate escapement exceeded the parental brood escapement by approximately 20%.

Yearling (stream-type) summer chinook (Summer 5_2 aggregate) returns were also poor to modest, however, on average; returns were almost as abundant as the parent brood year escapements. In contrast, escapements to the late South Thompson ocean-type 4_1 aggregate declined steeply. Returns to the Lower Shuswap (~3800) and Middle Shuswap (~280) Rivers were of particular concern, averaging less than 30% of parent escapements. Returns to the South Thompson, Little River and Lower Adams were marginally better than those of the Shuswap Rivers, however, they only averaged about 60% of brood year escapements.

Lower Fraser River

Spring-run: Lower Fraser Spring chinook returns were also mixed. Returns to Birkenhead River (~600) were only about 30% the parental escapements (1968) and less than 2011 escapement (~950). Escapements to the upper Pitt River (Blue Creek) were estimated at ~103, equal to the estimate for the parent brood, in 2007.

Summer-run: Summer-run chinook returns to Maria Slough were approximately 400, much less than that observed in the parental brood year (~650). Returns to Big Silver Creek were estimated to be approximately 165, less than the 209 estimate for the parent

brood. Information for other Lower Fraser summer populations is not available at this time.

Fall-run: Annual lower Fraser River fall-run chinook stock group escapements are, on average, large (>100,000). The major contributor and principal focus of assessment of this stock group is chinook returning to the Harrison River, and Harrison River transplants to the Chilliwack River. For both the Harrison and Chilliwack rivers, the field study portions of the escapement assessments are just concluding; and data entry and analyses have not started. Extreme weather events and fluctuating water levels in these systems make in-season assessments difficult. Field estimates for Harrison indicate escapements are likely to be under 60,000 adults. No in-season estimates have been developed at Chilliwack, and the preliminary escapement estimates will not be available for either system until early January.

Howe Sound/Squamish River

No information is available at this time.

Burrard Inlet

No information is available at this time.

Boundary Bay

No information is available at this time.

Strait of Georgia Chinook

Fall Stocks

Total returns to Strait of Georgia streams north of Nanaimo, virtually all of which are enhanced, have been stable for the last seven to ten years (Puntledge and Englishman rivers) or eighteen years (Big Qualicum and Little Qualicum rivers). In general, 2012 chinook escapements were similar to 2011 throughout the Strait of Georgia.

On the mainland side of the northern Strait of Georgia, Sliammon and Lang hatcheries continue to have variable returns, however in the last four years the returns to Lang Creek have been stronger than in previous years. There are a few very small, wild populations remaining in the Theodosia and Skwakwa rivers, and those rivers entering Jervis Inlet, where assessment data are poor or not available. Historically, a large proportion of the chinook stock aggregate originating from rivers north of Nanaimo migrate into central and northern B.C. and Alaska. Exploitation rates on this stock aggregate have gradually been reduced over the last 15 years, thus the stable trend in annual returns to rivers over this period suggests a reduction in marine survival.

In the southern Strait of Georgia, returns to the Nanaimo River have been generally stable since 1995 at slightly higher levels than those recorded back to 1975. Escapement to Nanaimo River in 2012, although not yet finalised, appear slightly lower than recent year

averages. The area of most concern is further south, where chinook stocks returning to the Chemainus and Goldstream rivers have experienced declines in recent years. Unlike the central and northern Strait stocks, these southern populations historically rear within the Strait of Georgia. However, there appears to be an increasing proportion rearing off the west coast of Vancouver Island.

In particular, Cowichan River chinook (a wild chinook indicator stock) has been in decline since 1995-1996 and reached a low total adult return to river of 1260 in 2009. This population continues to be a stock of concern. Exploitation rates on Cowichan chinook were historically high (averaging 80-90%), declined to a low of 34% on the 1995 brood year, and then have steadily increased to 75% on the 2000 and 2001 brood years. Various harvest restrictions have been put into effect over the last 20 years to reduce exploitation on Strait of Georgia chinook. Additional conservation measures were introduced in 2005 to reduce the harvest of Cowichan chinook by the Strait of Georgia sport and WCVI troll fisheries. First Nations harvest of Cowichan chinook has been substantially reduced in recent years. The declining trends since 2000 in various southern Strait of Georgia rivers has been attributed to high exploitation rates, a decline in marine survival, and habitat issues.

In 2012 chinook escapement to Cowichan River was similar to 2011, maintaining rebuilding from the low escapement in 2009. A preliminary estimate of the freshwater entry is 3,700 adult and 1,200 jack chinook. Of these approximately 660 adults and 30 jacks were used for hatchery brood stock and about 2,700 adults and 1,060 jacks were estimated to spawn naturally. The number of chinook caught in local FSC fisheries has not yet been reported. The near average number of age 2 jack chinook in 2012 suggests a similar or slightly lower escapement in 2013.

Spring/Summer stocks

Of the three early runs in the Strait of Georgia, assessment data are available for Puntledge and Nanaimo; the Cowichan summer run still exists but it is small and quantitative data are not available for that stock. Efforts to recover Puntledge Summers to viable levels have resulted in improved returns to the river since 1999. The 2006 and 2007 natural spawning escapements ranged from 200 - 500 adults (not including brood capture), which is down from the record high in 2005 of approximately 2,500 adults, but is substantially higher than escapements recorded in the previous decades. The preliminary estimate for 2012 escapement to Puntledge is approximately 520 adults (including 250 brood removals) which was lower than the previous two years. Of concern is the exploitation rate which climbed sharply from a low of approximately 30% in 2001 to 55-60% in 2003-2004. Monitoring of Nanaimo spring and summer chinook escapement has occurred less frequently. This year's escapement of Nanaimo summers is estimated to be around 600 chinook adults and 30 jacks which is above average for the last 15 years.

West Coast Vancouver Island Chinook

The status of WCVI origin chinook has remained low for several years. Those populations that are not enhanced have remained well below target or declined since major El Nino events in the mid 1990s. Populations in the SWVI area (e.g. Area 24 and southward) tend to be lower status than those populations in the NWVI area.

2012 salmon escapement estimates from extensively surveyed WCVI streams are preliminary. Observations indicate escapements to wild indicator systems in both SWVI and NWVI systems are well below recent year averages and are similar to 2011 escapements. Returns to enhanced systems (Stamp, Conuma and Nitinat) were below average relative to recent years and similar to forecast.

For WCVI hatchery stocks, the terminal return is defined as total catch (First Nation, recreational and commercial) in the near approach areas of the hatchery plus escapement (brood collection plus natural spawners). In these approach areas, catch is dominated by the hatchery stock (e.g. >95%), therefore, higher exploitation rates are permitted than in times and areas dominated by naturally produced WCVI chinook stocks.

In 2012, the preliminary total terminal return of Stamp River/Robertson Creek hatchery chinook was approximately 34,000 adults, relative to the pre-season forecast of 34,000. The preliminary escapement through Stamp Falls is 14,800 adult chinook. The total terminal return to the Conuma River hatchery system was about 25,000 relative to a pre-season forecast of 29,000. The total terminal return to the Nitinat River hatchery system was about 13,500 relative to a pre-season forecast of 13,000. (All data are still being reviewed.)

Johnstone Strait/Mainland Inlet Chinook

Currently only two systems are monitored consistently in Areas 12 and 13. The Nimpkish River is assessed using standardized swim surveys and stream walks by hatchery staff and an intensive mark-recapture program is carried out by Quinsam hatchery to estimate escapement on the Campbell/Quinsam system. A mark recapture program on the Phillips River has been in development over the last few years with the plan to develop a mainland chinook indicator. Other systems are covered using intermittent visual surveys.

Nimpkish River

Preliminary observations from swim surveys indicate a significant increase in the abundance of chinook returning to the main spawning areas downstream of Woss Lake. Final estimates are not available at this time.

Campbell/Quinsam System

Due to another large snow pack year, flows in the Campbell were higher than normal throughout the early summer, however remained moderate throughout the fall. In conjunction with relatively low and clear conditions on the Quinsam, visibility on both systems was good, providing some of the best conditions for dead pitch surveys in recent years.

Spawning occurred within the usual time frame on the Campbell River. A large proportion of chinook continue to utilize upper river spawning areas (above Second Island Channel) as well as the newly deposited gravel pads on river left (above the mill pumphouse).

Installation of the floating fence on the Quinsam (to assist with brood stock capture) occurred in early October. Chinook migrated in with rain events during the second week of October, with many fish already ripe. Due to the level of migration and ripeness at that time, initial estimates of the return were low. Final preliminary escapement has improved with the completion of the key stream mark recapture programs; with an estimated 4,955 adults returning to the Campbell/Quinsam system, a slight increase over the last two years. Hatchery brood targets were met; average fish size appeared to be smaller for both sexes and egg-take fecundities ranged at the lower end of normal.

Phillips River

A mark-recapture program on the Phillips River has been in development over the last few years. The preliminary escapement estimate for 2012 is approximately 2,400 chinook which is a significant improvement over the 2011 escapement estimate of 833 chinook. The local hatchery was able to meet its brood target and will plan to release 150,000 coded wire tagged (CWT'd) chinook smolts next spring to contribute to the assessment program.

8 SOUTHERN B.C. COHO

8.1 OBJECTIVES AND OVERVIEW

In 2012 the abundance forecast indicated that the status of Interior Fraser River (including Thompson River) coho remained at category 1, Stock of Concern, as defined in the 2012 Salmon Outlook. The lower Fraser was categorized as low, while Georgia Basin (east and west) was stock of concern to low. Johnstone Strait coho management units were all forecast low to near target.

In 2012, Interior Fraser coho were a primary concern when implementing fisheries. Under the Abundance Based Management provisions in the Pacific Salmon Treaty, Canadian fisheries were managed to limit the total mortality to 3% across all Canadian fisheries. The total exploitation on Interior Fraser coho was limited to a maximum of 13% (including 10% U.S. exploitation).

To reduce the exploitation on Interior Fraser coho Canadian fisheries operating in areas of Southern B.C. where Interior Fraser coho are known to be prevalent are not permitted to retain wild "unmarked" coho. Wild coho retention is permitted in some terminal areas along the West Coast Vancouver Island (WCVI), in the Mainland Inlets, in a small portion of upper Johnstone Strait, and Queen Charlotte Strait, and in mixed stock areas after Interior Fraser coho migration is considered to be through these areas.

Table 8-1: Preliminary coho catch estimates of the recreational, First Nations (FSC, economic opportunity and ESSR), and commercial fisheries for Southern B.C. in 2012.

	Kept	**Released**
Recreational	89,773	174,831
First Nations	62,532	7,833
Commercial	2,198	15,113
Total	**154,503**	**197,777**

Coho catch and release information from all fisheries can be found in Appendix 6.

8.2 RECREATIONAL

Tidal Recreational Fisheries

Tidal recreational fisheries can be categorized as occurring in mixed stock areas, where multiple stocks are found concurrently in the same fishing area, and in terminal areas where local single stocks dominate the catch. These areas typically have different management measures to protect stocks of concern and where appropriate to provide

harvest opportunities. The table below outlines the areas in Southern B.C. where these mixed stock fisheries occurred and the general regulations pertaining to them.

Table 8-2: Southern B.C. coho fishery regulations in 2012.

Mixed stock fishing area	Daily Limit (marked or unmarked)	Size Limit	Coho Season
Area 11	2	30 cm.	June 1 – July 31
Area 11	2, 1 may be wild	30 cm.	Aug 1 – Dec 31
Area 12	2, 1 may be wild	30 cm.	June 1 – July 31
Area 12	2 marked	30 cm.	Aug 1 – Dec 31
Strait of Georgia: areas 13-19, 28, portions of 29, excluding some terminal areas and times.	2 marked	30 cm.	June 1 – Dec 31
WCVI offshore areas 121-127 and areas 21 and 26	2 marked	30 cm.	Jun 1 – Aug 31
WCVI offshore areas 121-127 and areas 21 and 26	4 marked	30 cm.	Sept 1 – Dec 31
WCVI inshore area 22, 23 and 25	2	30 cm.	Jun 1 – Jul 31
WCVI inshore area 22, 23 and 25,	4	30 cm.	Aug 1 – Dec 31
WCVI inshore area 24 and 27	2	30 cm.	Jun 1 – Aug 31
WCVI inshore area 24, 27	4, 2 may be wild	30cm	Sept 1 – Dec 31
Juan de Fuca: areas 19-20	2 marked	30 cm.	Jun 1 – Dec 31
Port San Juan: 20-2	4, 2 may be wild	30cm	Sept 7 – Dec 31

The table below outlines coho catch and release information for recreational coho fisheries in Southern B.C. The WCVI coho fisheries had a boundary in place distinguishing coho catch in the mixed-stock fishery (outside the coho boundary) and catch in the terminal area (inside the coho boundary). This coho boundary was put in place to protect Interior Fraser River wild coho which are found off WCVI during mid to late summer.

Table 8-3: Recreational coho catch and effort estimates for Southern B.C. in 2012.

Area	Kept	Released	Effort (Boat Trips)
WCVI – Inshore (20W – 27)	25,253	16,387	70,389*
WCVI – Offshore (21 – 127)	25,638	63,402	
Strait of Georgia (14-19 May – Sep)**	3,569	24,340	75,588
Fraser River**	12,661	14,671	NA
Juan de Fuca (19-20 Mar – Sep)	16,621	44,343	41,433
Johnstone Strait (11-13)	6,031	11,688	14,928
TOTALS	**89,773**	**174,831**	**202,338**

* Combined effort data for WCVI inside and WCVI outside coho.

** Separate portions of PFMA 19 are calculated for SOG estimates and JDF estimates.

*** Subject to change; Fraser River recreational assessments preliminary.

Non-Tidal Recreational Fisheries

Johnstone Strait

In Johnstone Strait, non-tidal openings for coho were available on:

- Cayeghle River (including the Colonial River) from April 1st to March 31st for one (1) per day.
- Campbell/Quinsam River from October 1st to December 31st for four (4) per day, two (2) of which could be wild over 35 cm.
- Cluxewe River from April 1st to March 31st for two (2) per day, hatchery marked only.
- Kokisilah River from April 1 to March 31 for one (1) per day, maximum size limit of 35 cm.
- Nahwitti River from April 1st to March 31st for one (1) per day.
- Quatse River from June 15th to March 31st for two (2) per day, hatchery marked only.

Anglers are restricted to the use of barbless hooks. The Campbell/Quinsam fishery was the only fishery of the above that was monitored by creel survey during 2012.

Strait of Georgia

During 2012 there were limited non-tidal openings throughout the Strait of Georgia.

- Qualicum River from October 18th to March 31st for four (4) per day, two (2) of which could be wild over 35 cm.
- Chemainus River from October 15th to March 31st for one (1) per day, maximum size limit of 35 cm.
- Little Qualicum River – closed due to poor coho escapement.
- Puntledge River– from October 26th to November 30th for two (2) per day, one (1) of which can be greater than 30 cm.
- Nanaimo River from November 1st to December 31st for one (1) per day, maximum size limit of 35 cm.
- Cowichan River from October 22nd to December 31st for one (1) per day, minimum size limit 25 cm,

West Coast Vancouver Island

San Juan River

There were no non-tidal openings on the San Juan River this year due to low coho escapement estimates and concern that returns were not going to meet escapement goals

Somass/ Stamp River

There was a non-tidal opening for the Somass/Stamp Rivers (Area 23) from October 19 to December 31, 2012. The daily limit was four salmon per day of which two could be coho salmon either marked or unmarked. A single barbless hook restriction is in effect all year and there is a bait restriction in the Upper Somass and Stamp after September 15.

Nitinat River

There were two non-tidal openings for coho on the Nitinat River (Area 22) in 2012. The first one was from August 25 to September 23. The fishery closed from September 24 until October 18 due to low water concerns. The fishery typically closes October 1 until October 15 to protect chinook salmon during the peak spawning period. The coho fishery on the Nitinat re-opened from October 19 until December 31. The daily limit for coho was two (marked or unmarked). The area above Parker Creek is closed to fishing. The Nitinat River was not monitored by creel survey in 2012.

Conuma River

There was a non-tidal opening on the Conuma River (Area 25) in 2012 from August 25 to December 31. The daily limit was four salmon per day of which two could be coho (marked or unmarked). The Conuma River was not monitored by creel survey during 2012.

Washlawlis River and Waukwass River and Other West Coast Rivers

The Washlawlis and Waukwass rivers are open year-round with a daily limit of one coho, marked or unmarked. Barbless hooks are required. No creel survey information is collected. Other rivers receiving some directed effort for coho stocks are the Wakeman, Artlish, Zeballos, Tahsis, Burman, Ash, Taylor, Pacheena, Toquart, Leiner. The quota for these west coast streams is zero (0).

Fraser River and Tributaries

During 2012 the retention of 2 hatchery marked coho per day was authorized in the lower Fraser River up to Sawmill Creek. Due to the migration timing of Interior Fraser coho, the openings were scheduled to occur once the majority of this coho population was through the area. A description of the areas in the Fraser River which were open to the retention of hatchery marked coho follows with the corresponding opening dates.

- From the CPR Bridge at Mission, B.C. upstream to the Highway #1 Bridge at Hope - open from October 9th to December 31st.

- From the Highway #1 bridge at Hope to Sawmill Creek - open from October 14th until December 31st.

- There are no directed coho openings in the Fraser River or tributaries upstream of Sawmill Creek.

In addition, the following tributaries to the Fraser River allowed a daily retention of one (1) hatchery marked coho from October 1st to December 31st: Alouette River and Coquitlam River. Kanaka Creek allowed a daily retention of one (1) hatchery marked coho from November 1st to November 30th.

The following tributaries to the Fraser River allowed a daily retention of four (4) hatchery marked coho from July 1st to December 31st: Chapman Creek, Chilliwack River, and Chehalis River.

The Harrison River allowed a daily retention of four (4) hatchery marked coho from September 1st to December 31st.

The following tributaries to the Fraser River allowed a daily retention of four (4) hatchery marked coho, with only two (2) over 35cm from January 1st to December 31st: Nicomen Slough, Norrish Creek and Stave River.

The following rivers, which enter Boundary Bay allowed the retention of one (1) hatchery marked coho per day from October 1st to December 31st: Little Campbell River, Serpentine River and Nicomekl River.

8.3 FIRST NATIONS FISHERIES (FOOD SOCIAL AND CEREMONIAL, ECONOMIC OPPORTUNITY AND EXCESS SALMON TO SPAWNING REQUIREMENTS)

WCVI

In 2012 an agreement was reached with the Hupacasath and Tseshaht First Nations for an economic opportunity (EO) fishery targeting coho (Area 23). Due to chinook conservation concerns there were no targeted net fisheries for EO or Food, Social and Ceremonial (FSC) for coho by the Somass First Nations. There was some coho catch in rod and reel fisheries in the lower Somass River and by-catch in Somass First Nations FSC salmon net fisheries. The total catch in these fisheries was 825. The EO portion of the catch was 300 coho. This was the total EO catch of coho for WCVI First Nations.

The total WCVI First Nation's harvest including FSC and EO fisheries was 10,029 coho. FSC catch by Maanuulth First Nations was 3,093 coho and the combined total FSC catch for other WCVI First Nations was 6,636 coho.

The Tseshaht and Hupacasath First Nations were issued a joint Excess Salmon to Spawning Requirements (ESSR) Licence for coho at the Robertson Creek Hatchery facility. The total catch was 12,926 coho.

The Ditidaht First Nation was issued an ESSR Licence for Nitinat Lake and the Nitinat Hatchery. The total catch was 591 coho.

The total catch for the ESSR fisheries was 13,517 coho.

Lower Fraser

Total FSC, EO and ESSR catch in 2012 for the Lower Fraser River was 34,883 coho, the majority of which was caught in ESSR fisheries (33,891).

B.C. Interior

There were no EO or ESSR fisheries in the B.C. Interior (Fraser River above Sawmill Creek) in 2012. Total retained coho catch in 2012 FSC and demonstration fisheries above Sawmill Creek was 74.

Strait of Georgia FSC Fisheries

Data are still being compiled on various First Nations catches in the Strait of Georgia with the total preliminary catch estimated to be 10 coho caught in FSC fisheries. ESSR fisheries took place at the Big Qualicum hatchery (4160 adults and 2289 jacks).

Strait of Georgia ESSR Fisheries

There were two (2) ESSR licences issued where coho salmon were harvested. 3,251 coho salmon were harvested at Big Qualicum Hatchery and 202 coho salmon were harvested at the Chapman Creek CEDP Hatchery in Sechelt. Cowichan Tribes reported releasing 1,726 coho in their chum ESSR fishery in the Cowichan River.

Johnstone Strait

Data are still being compiled on various First Nations catches in the Johnstone Strait with the total preliminary catch estimated at 640 coho caught in FSC fisheries.

8.4 COMMERCIAL FISHERIES

In 2012, Southern B.C. commercial fisheries were regulated so that impacts on coho, in particular Interior Fraser coho stocks, were minimized. Terminal opportunities to retain coho by-catch during directed chinook and chum fisheries were available to Area D gill nets.

Area G troll AABM chinook fisheries are permitted to retain incidentally caught Selective Hatchery Marked coho after September 15 until March 15. For the 2011/12 (October 1, 2011 to September 30, 2012) AABM chinook fishing periods, the estimated total coho retained was 1,988 and releases during this period were estimated at 7,756 coho salmon.

WCVI Terminal Area Coho

In 2012, commercial gill net and seine fisheries occurred in Alberni Inlet and off-shore from Nitinat Lake. Gill net fisheries occurred in Tlupana Inlet, outer Barkley Sound, Nootka Sound and Esperanza Inlet. When targeting sockeye, chum or hatchery chinook returns harvesters may encounter and retain or release coho by-catch. In 2012 the total WCVI coho by-catch in commercial sockeye, chum and chinook net fisheries was 159 retained and 1,899 released.

8.5 STOCK STATUS

Upper Fraser

Field programs to estimate escapements are still underway, and only very preliminary results are available for some systems. Early returns to the Interior Fraser River indicate that escapement has likely increased in comparison to 2011 returns and are likely at levels above those observed in the 2009 parent brood escapements. Very preliminary data indicate returns to the entire Interior Fraser River may range between 40,000 and 60,000; however, preliminary estimates are not yet available for many systems, and near final estimates will not be available until early February, as most field studies are not yet completed.

Lower Fraser

The Lower Fraser Area (LFA) can be divided into four sub-areas: lower Fraser River, Howe Sound/Squamish River, Burrard Inlet and Boundary Bay.

(i) Lower Fraser River

Escapement studies are currently underway, and many populations have not reached peak spawning at the time of writing. Preliminary escapement estimates for the surveyed systems should be available by late February 2013.

A hatchery coho indicator stock is provided by Inch Creek hatchery. Adult escapement is assessed annually and marine survival and exploitation rates are calculated, these estimates are not yet available. Adult coho visual surveys are conducted for a number of systems within the lower Fraser River sub-area as part of multi-species assessments; however estimates are not yet available as the field programs will not be complete until late January or early February 2013.

(ii) Howe Sound/Squamish River

Assessments for Howe Sound and Squamish River are incomplete at this time. Staff at the DFO Tenderfoot hatchery will be taking brood stock until February 2013.

(iii) Burrard Inlet

An assessment of the returns to DFO Capilano hatchery is not yet complete. The 2012 abundance and status of this stock group is not known at this time.

(iv) Boundary Bay

Community-run SEP projects contribute significantly to coho returns to this sub-area. The 2012 data will not be available until late February 2013.

Strait of Georgia

The observed 2010 marine survivals for both wild and hatchery coho were lower than the previous year (0.5% to 0.8% hatchery, wild 1.6%) These levels are less than replacement levels. The forecast models predicted continuing low levels of marine survival in 2012, 0.5% to 0.9% for hatchery stocks and 1.4% to 2.1% for wild stocks. This regime of low marine survivals has been observed since the early 1990s.

Hatchery stocks

The preliminary 2012 coho escapement estimates of monitored hatcheries show a continuation of increasing escapements from the low returns in recent years. Escapements to northern Strait of Georgia stocks (Puntledge, Qualicum, Lang) are average to higher over the short term. The standout escapement was Qualicum River which had a much higher than average escapement, allowing a non-tidal fishery to proceed. Escapements to southern Strait of Georgia stocks (Nanaimo, Goldstream) are below the short term average but improving over the last couple of years. These stocks are slowly increasing over the brood year escapements.

Wild stocks

There are two wild indicators in the Strait of Georgia at Black Creek and Myrtle Creek.

Myrtle Creek

The 2012 Myrtle Creek project is ongoing and results will not be available for another month. The escapement is expected to be higher than 2011 (20 adults) which was an improvement over previous years (2010 escapement was 13 adults, similar to previous years). A spawning habitat project was started in 2011 to augment the limited spawning habitat in this creek and continued in 2012 with additional spawning gravel placed this year. The 2012 forecast of marine survival was 2.4%

Black Creek

The 2012 Black Creek Adult project is ongoing; escapement to date has been above average with moderate to high water levels since the third week of October. The majority of adult coho have moved past the fence, but low levels of fish will continue to migrate into early December. Dead pitch commenced in the second week of November (early). Initially, minimal carcasses were encountered, however recovery improved in the latter part of November. The preliminary escapement (fence count) of 5,167 adults is higher than 2008-2011 estimates, the second highest escapement in 10 years, and appears to be similar to that of 2007 (5,453 adults). The 2012 escapement may be a continuation of the building trend of the past several years (2008-2010), with the 2011 escapement being an anomaly. The preliminary 2012 forecast of marine survival is 2.07%.

West Coast Vancouver Island

There are two indicator stocks in WCVI: Robertson Creek Hatchery and Carnation Creek. In 2012, preliminary escapement to Robertson Creek Hatchery is estimated at about 24,400; similar to that expected, and slightly lower than recent year averages. Escapement to the Carnation Creek indicator system is under review. Preliminary estimates of escapement to other WCVI systems suggest escapement at about recent year averages. However, the overall abundance of WCVI coho was low given the relatively limited harvest of these populations relative to historic periods.

Johnstone Strait and Mainland Inlet

The Keogh River plays an important role as the wild coho indicator stock for the upper Johnstone Strait Area. Smolt production in 2011 was around 90,000, the second highest production since 1997 and well above the long term average of 59,000. Preliminary indications from the resulting adult escapement in 2012 are that marine survival has improved significantly compared to the last few years.. Smolt production from the Keogh in 2012 of approximately 108,000 was significantly higher than the long term average and may result in a strong return in 2013 if marine conditions stay the same or improve.

The marine survival indicator for Area 13 is the Quinsam River Hatchery. Coho were slow to move into the Quinsam River this year; migration usually coincides with rain events in early October, however no major influxes of fish were observed at the hatchery fence, nor were large numbers staging in the upper or lower areas of the Campbell. At the time there was concern over angling pressure on a potentially low escapement. However, migration continued steadily throughout the remainder of the fall, with a late showing of fish arriving with heavy rains towards the beginning of November. The preliminary estimate of 5,757 adult coho returning to the Quinsam River is comparable to 2007 and 2008; adult body size this year was variable. The jack component of the run, an estimated 2,767 fish (32% of the return), is the largest proportion of jacks observed in the last six years (2007-2012); jack body size was also noted as larger than usual.

Preliminary extensive escapement reports for coho are also indicating abundances lower than both 2010 and 2011 in some systems, but above average escapements for a few scattered systems. At this time it is still too early to provide an indication of stock status

9 JOHNSTONE STRAIT CHUM

9.1 OBJECTIVES AND OVERVIEW

The Johnstone Strait chum fisheries primarily target chum that spawn in Johnstone Strait, Strait of Georgia, and Fraser River areas. In order to improve the management of Johnstone Strait chum fisheries and to ensure sufficient escapements, a 20% fixed exploitation rate strategy was implemented in 2002 in Johnstone Strait. This year constituted the 11th year of the fixed exploitation rate harvest strategy. Of the 20% exploitation rate, 16% is allocated to the commercial sector; the remaining 4% is set aside for the First Nations and recreational harvesters. Since the implementation of this management strategy, annual fisheries have been planned well in advance of the chum return.

For commercial fisheries, the pre-season fishing schedule was developed based on expectation of effort, exploitation levels by gear group, and historical run timing (peak estimated as October 9th). The fishing schedule was developed to achieve the commercial allocation sharing guidelines of 77% for seine, 17% for gill net and 6% for troll. Adjustments to the fishing plan are made in-season, if warranted.

Based on the Pacific Salmon Treaty chum salmon agreement, commercial chum fisheries in Johnstone Strait are suspended when an abundance estimate of less than 1 million chum salmon migrating through Johnstone Strait is identified.

In 2012, the Area B (seine) and Area D (gill net) were competitive derby fisheries.

The Area H (troll) fleet was managed using an effort based individual transferable effort (ITE) demonstration fishery for the 5th year (2008 - 2012). A total of 330 boat-days (185 in period 1 and 145 in period 2) were modeled to correspond to the troll share of the harvest rate described above, and two time periods were defined to spread the catch over a 34 day period. Each Area H licence holder was assigned three boat-days in period 1 and two boat-days in period 2. Boat-days from each period could be transferred to other licence holders within each period but not between periods. The transfer of boat days between fishing periods was not permitted in 2012. Subareas 13-6 and 13-7 (Deepwater Bay area) were closed to commercial fishing on weekends and holidays.

Chum catch and release information from all fisheries can be found in Appendix 7.

9.2 FIRST NATIONS

First Nations fisheries for chum were not restricted. The preliminary estimated catch by First Nations in the Johnstone Strait area is 10,597 chum salmon.

9.3 MARINE RECREATIONAL

The marine recreational daily limits for chum are four (4) per day and a possession limit of eight (8). The total recreational catch in Johnstone Strait, Areas 11, 12 and 13, was estimated at 1,000 chum this season as catchability for the recreational fleet was low compared to recent years. The peak of the effort coincided with the annual Brown's Bay chum derby which took place on the weekend of October 27 and 28, 2012. The total catch during the derby was 224 chum. This year, there was no creel survey in the month of October when the majority of the chum salmon fishing effort occurs in Area 13.

9.4 NON-TIDAL RECREATIONAL

There is anecdotal information of limited recreational chum fisheries in non-tidal waters in the Johnstone Strait area. Overall effort and catch is not estimated but expected to be minimal.

9.5 COMMERCIAL

The commercial chum fisheries in Johnstone Strait occurred between September 28 and October 31. The total commercial chum catch from Johnstone Strait during chum directed fisheries is estimated at 391,324 pieces. This represents the total catch of chum in Johnstone Strait for 2012 as no other commercial fisheries occurred.

There was a general requirement to apply selective fishing techniques, including area and gear restrictions and the mandatory use of revival tanks in all commercial fisheries. Catch monitoring included requirements for catch reporting and mandatory logbooks.

A description of each fishery is provided below:

Area B Seine

In 2012, there were two commercial seine openings for chum salmon in portions of Areas 12 and 13. The first opening took place on October 3 for 12 hours and the second opening took place on October 22 for 10 hrs, and October 23 for five hours. The first opening was originally scheduled for October 2 but was postponed by one day because of strong winds. The second opening was extended for an additional five hours on October 23 due to lower than expected effort during both openings.

The chum catches for the first and second openings were estimated at 203,413 pieces and 85,081 pieces respectively; for a total catch of 288,494 chum.

Area D Gill net

In 2012, there were three 41 hour commercial gill net openings for chum salmon in portions of Areas 12 and 13. The first opening took place from 16:00 hours on October 5 to 09:00 hours on October 7, the second opening from 16:00 hours on October 11 to 09:00 hours on October 13 and the third opening from 16:00 hours on October 24 to 09:00 hours on October 26.

The estimated chum catches for the three Area D gill net fisheries were 28,351 pieces, 34,761 pieces and 12,171 pieces respectively; for a total estimated catch of 75,283 pieces.

Area H Troll

In 2012, the Area H troll ITE demonstration fishery was divided into two fishing periods: September 28 to October 14 (period 1) and October 16 to October 31 (period 2). Each vessel was allocated three boat days during the first fishing period and two days during the second fishing period. Boat days could be transferred between vessels within each fishing period. Boat days could not be transferred between fishing periods in 2012.

The chum catch for the first fishing period was 13,981 pieces and 13,566 pieces for the second fishing period, with a total chum catch of 27,547 pieces. Total effort for the Johnstone Strait fishery was 248 boat days.

Table 9-1: Johnstone Strait Commercial Catch and By Date and Gear Type

Gear Type	Fishery Dates	Effort	Catch
B - Seine	Oct 3	86	203,413
	Oct 22 and 23	77	85,081
D - Gill net	Oct 5-Oct7	157	28,351
	Oct 11-Oct 13	143	34,761
	Oct 24-Oct 26	81	12,171
H - Troll	Sep 28-Oct 14	151	13,981
	Oct 16-Oct 31	97	13,566

Table 9-2: Johnstone Strait Fisheries (Area 12 and 13)

Gear Type	Total Catch	% of catch	J.S. Allocation Plan
Area B	288,494	73.7%	77%
Area D	75,283	19.2%	17%
Area H	27,547	7.0%	6%
Total Catch:	**391,324**		

9.6 STOCK STATUS

Mixed Stocks

The main components of the Inside South Coast (ISC) chum return was expected to be both Fraser and non-Fraser stocks. These stocks are typically dominated by four year old fish which out-migrated to the ocean in 2009. It was quite apparent that other salmon species that also out-migrated in 2009 encountered lower productivity and reduced survivals (pinks and coho returns in 2010). The pre-season expectation for ISC chum suggested low to near target returns to the area.

The Johnstone Strait test-fishery provided timing and abundance information of the 2012 return which is important for assessing the performance of the 20% fixed exploitation rate strategy. It also provided an index of abundance that was used to determine the likelihood of whether the abundance of returning chum is over the 1.0 million critical level required to continue with commercial openings. Catch per unit effort in the test fishery was relatively strong and it was determined that the ISC index of abundance was likely above the 1.0 million critical level. Age composition derived from the test-fishery and commercial samples demonstrated a higher than normal contribution of the five-year old brood component. The samples also demonstrated that the size of the fish tended to be larger than average especially early in the season. The strong CPUE in the test fishery and high contribution of Age five adult indicate that the good survivals during the 2008 outmigration of the juveniles carried over both in the Age four and Age five returns (2011 and 2012).

Preliminary information on escapements and catches to date suggest returns were average to above average in most populations including the Fraser. In-season information is still being collected and analyzed regarding total stock size.

Terminal returns

Most summer run chum returns in Area 12 have shown improved return abundance relative to parental broods in 2007 and 2008. No age information was collected from the spawning grounds, but it is highly likely that the composition of Age 5 fish matched what we saw in the fall timed stocks.

Preliminary information on the status of fall run chum in the Johnstone Strait Area indicates returns are below average for a variety of systems within the area. Initial observations on the Nimpkish River indicate low abundance of returning chum.

10 FRASER RIVER CHUM

10.1 OBJECTIVES AND OVERVIEW

Chum salmon return to the Fraser River from September through December, with the typical peak of migration through the lower river occurring from mid to late-October. Spawning locations are predominately located in the Fraser Valley downstream of Hope, B.C., with major spawning aggregations occurring within the Harrison River (including Weaver Creek and Chehalis River), the Stave River, and the Chilliwack River. No spawning locations have been identified upstream of Hells Gate.

The escapement objective for Fraser River chum is 800,000. Since 2001, this objective has been achieved in all but two years. Escapements in 2009 and 2010 did not meet the escapement goal, with approximately 460,000 and 550,000 returning to spawn in those years, respectively.

10.2 GENERAL OVERVIEW OF FISHERIES

Fraser River chum are typically harvested in Johnstone Strait, the Strait of Georgia, Juan de Fuca Strait, in U.S. waters of 7 and 7A, as well as in the Fraser River.

Within the Fraser River, chum-directed fisheries include: First Nations FSC fisheries; recreational fisheries; and commercial fisheries. In recent years, significant conservation measures have been implemented in river during the Fraser River chum migration period in order to protect co-migrating stocks of concern (Interior Fraser coho and Interior Fraser steelhead). Depending on the fishery, these measures have included both time and area closures, as well as gear restrictions. These conservation measures have restricted Fraser River commercial chum fishing opportunities in the past several years, resulting in significant economic consequences to the Area E Gill Net fleet due to the limited opportunities to access chum allocations.

Catch data from all chum fisheries can be found in Appendix 7.

10.3 FIRST NATIONS

FSC gill-net fisheries commenced October 6th (below Mission) and October 12th (above Mission) following closures to protect co-migrating Interior Fraser coho. The estimated catch from all fisheries (includes FSC, Economic Opportunity, Demonstration, Treaty, and ESSR) below Sawmill Creek was 165,844. There were 30,374 chum harvested in FSC fisheries, 76,274 harvested in Economic Opportunity fisheries, 15,238 harvested in the Demonstration fishery, 10,775 harvested in the Tsawwassen Treaty fisheries, and as of December 3 there have been 33,183 chum reported harvested through ESSR fisheries. ESSR harvests are ongoing for 2012.

10.4 RECREATIONAL

In 2012, some of the major Fraser River watershed recreational salmon fisheries impacting chum salmon were assessed, including significant salmon fisheries occurring in the lower Fraser River mainstem and the Chilliwack River (a tributary to the Fraser River in the lower Fraser Valley).

The lower Fraser River mainstem recreational fishery was open to the retention of chum salmon from July 16th to December 31st (with a daily limit of two (2)). In 2012, this mainstem fishery was assessed from July 16th to November 30th; in-season estimates to October 31st of kept and released chum are 2,329 and 6,851 respectively. The Chilliwack River recreational fishery was open to the retention of chum salmon from July 1st to December 31st. The Chilliwack River fishery was assessed from September 1st to November 15th in 2012. In-season estimates, to October 31st, of kept and released chum are 4,239 and 28,175 respectively. These in-season estimates will change once analysis of the fishery data collected after October 31st is complete.

The Harrison River, Stave River and Nicomen Slough recreational fisheries were originally open to the retention of chum salmon year round (daily limit of two (2)). In 2012, no assessment was conducted on the Harrison River or Stave River fisheries; however, the Nicomen Slough/Norrish Creek fishery was assessed from October 7th to November 30th. In-season estimates, to October 31st, of kept and released chum are eight (8) and 1,029 respectively. These in-season estimates will change once analysis of the fishery data collected after October 31st is complete.

In total, for assessed recreational fisheries occurring in the lower Fraser River area in 2012, current in-season estimates, to October 31st, of kept and released chum are 6,576 and 36,055, respectively.

10.5 COMMERCIAL

The Fraser River chum test fishery at Albion operated every other day from September 1st until October 19th, alternating days with Albion chinook test fishery. From October 21st until November 30th, the chum net fished every day. In 2012, the total number of chum harvested during the Albion chum assessment was 8,799 fish. The Albion chinook test fishery caught an additional 4,388 chum.

Commercial fisheries in the lower Fraser River (below Mission) remained closed during the Interior Fraser coho window closure and further closures were in place until late October to meet requirements of the Interior Fraser steelhead objective. One Area E Gill Net commercial opening took place in the Fraser River (Area 29) during the 2012 chum season, consisting of a 24-hour duration fishery on October 25-26, 2012 for a total estimated harvest of 63, 987 chum salmon retained and 13 released.

10.6 STOCK STATUS

The number of adult chum returning to the Fraser River each fall is estimated in-season with a Bayesian model based on Albion test fishing catch. Catch of chum was very high at Albion all season, particularly in the mid-October period, when the largest catches were observed in the history of this test fishery. In the Johnstone Strait, test fishing was initially strong, but was sporadic through the remainder of the year, due to poor weather and significant interference from marine mammals. chum returns through Johnstone Strait tracked between 3 to 3.5 million, with indications that the timing of the run may be earlier than average.

The average body size of Fraser River chum was large in 2012, particularly early in the run. This same trend was also observed in the Johnstone Strait test fishery, and was partly attributed to a large contribution of five year old chum in the early weeks of the test fishery. While age composition is not yet available for chum sampled from Albion, we suspect that this data will also indicate that the large average body size seen in the early component of the return was similarly due to a strong showing of five year old returns.

For fishery planning purposes, and given early indications of a strong chum return to the Fraser River, the Department provided a provisional in-season update on October 16th of 1.9 million chum. Confidence intervals and estimates of peak run timing were not provided at this time, as the 50% migration date for the run had not yet been confirmed.

A subsequent estimate of Fraser River chum abundance was provided on October 22nd. The estimated return on that date was 2.326 million (80% probability interval of 1.975 to 2.713 million), with a 50% migration date through the lower river of October 14. This peak date was much earlier than that observed in recent years (average peak date from 1996-2011 is October 19).

The final in-season estimate of run size (provided on October 24th) was 2.253 million (80% probability interval of 1.928 to 2.600 million), with a 50% migration date of October 14th.

Fraser River chum salmon return to numerous spawning locations in the lower Fraser River and its tributaries. A quantitative stock statushas not been prepared for Fraser River chum salmon (i.e. in the manner of Strategy 1 of *Canada's Policy for Conservation of Wild Pacific Salmon*); however, spawning escapement is currently assessed annually for four of the six largest chum producing systems, as well as for a number of smaller tributaries. From the late 1990's up to and including 2009, the spawning escapement for these annually assessed Fraser River chum systems had trended downwards. Although a modest increase in escapement was estimated in 2010, both the 2009 and 2010 chum salmon escapement was estimated at less than the established 800,000 escapement goal. Escapement estimates for 2011 improved on the modest increase estimated in 2010 such that the escapement goal was achieved.

Current year assessments are still ongoing; however in-season escapement estimates for 2012 align with the Albion based in-season estimates of terminal run size, that indicate a continuation of this increasing trend in chum salmon spawning escapement.

11 STRAIT OF GEORGIA CHUM

11.1 OBJECTIVES AND OVERVIEW

Strait of Georgia chum fisheries consist of terminal opportunities for chum returning to their natal spawning streams. Many of the potential terminal fishing areas have enhancement facilities and/or spawning channels associated with the rivers. Terminal fishery strategies consist of monitoring and assessing stocks (escapement and returning abundance) with the objective of ensuring adequate escapement and providing harvest opportunities where possible. Stock assessments may include test fisheries, escapement enumeration, and over flights. In some areas where stocks receive considerable enhancement or where stocks have above average productivity, limited fishing may occur prior to major escapement occurring.

Commercial

Area 14

This fishery is directed at the enhanced stocks of three systems: Puntledge, Qualicum and Little Qualicum rivers. The Qualicum River is often referred to as the 'Big' Qualicum River, to better distinguish it from the Little Qualicum River. Chum returning to this area have been enhanced since the late 1960s and terminal fisheries have occurred in October and November since the 1970s. The returning Area 14 chum abundance is forecasted pre-season using brood escapement, average survival and age composition. In-season run strength is assessed from any early catches, visual observations at river estuaries and by escapement counts to the three river systems. The escapement goals for the three river systems are 60,000 for Puntledge River, 130,000 for Little Qualicum River, and 100,000 for Qualicum River, adding up to an overall escapement goal of 290,000 chum not including enhancement facility requirements (about 10,000 chum bringing the total escapement goal to 300,000). For 2012 preliminary escapement estimates indicate the Qualicum and the Little Qualicum rivers will achieve their target escapements. The Puntledge River to November 23 had achieved approximately 90% of its escapement target.

This fishery has a specific harvest strategy, implemented since 1981. The strategy consists of limited early harvest prior to escapement occurring. The allowable early chum harvest is calculated from 65% of the predicted surplus (terminal return run size minus escapement of 300,000 and buffer of 100,000). The buffer safeguards against errors in forecast stock abundance. The surplus within the 100,000 buffer and remaining 35% of the surplus may be harvested provided that escapement targets have been achieved. Since 2002, Puntledge River stock returns have been above average resulting in terminal fisheries focusing on this slightly earlier timed stock. In 2012 limited seine, gill net, and troll fisheries took place in Area 14.

The 2012 Area 14 pre-season forecast predicted a chum return between 207,400 to 311,000. The total return of chum salmon to Area 14 systems was within the forecasted

range. The preliminary estimate of total return (catch plus escapement) to the three key Area 14 systems, the Qualicum River (100k esc target), the Little Qualicum River (130k) and the Puntledge River (60k) is 300,000.

There was an Area D gill net and an Area H troll opening in portions of Area 14 on October 28 through to October 30 targeting Puntledge River hatchery chum stocks. This was an exploratory fishery to determine abundance after numerous independent reports of large bodies of chum salmon in the approach areas to the Puntledge River.

Gill net catches in this opening were lower than anticipated and the fishery was not extended past the original 48 hour opening period. No Area H trollers participated in the opening. There was an Area D gill net and Area B seine opportunity targeting Big Qualicum chum from November 20 to November 23 in sub-areas 14-4 and 14-5. This fishery opened when the escapement target (100,000) to the Big Qualicum River was achieved. Catches in these openings were extremely low.

The estimated commercial chum catch in Area 14 to November 29 is 14,070 for gill nets. There was no seine catch reported.

Chum catch and release information from all fisheries can be found in Appendix 7.

Area 16

This fishery targets wild chum stocks returning to river systems in the Jervis Inlet area. The main systems are Tzoonie, Deserted and Skwawka rivers. The overall escapement goal for Jervis Inlet streams is 110,000. These terminal fisheries occur when the individual or combined escapement goals have been assured. Fishing opportunities do not occur on a regular basis. There were no fisheries in Area 16 in 2012.

Area 17

This fishery is a terminal fishery targeting Nanaimo River stocks. The Nanaimo River chum stocks are supplemented by the Nanaimo River hatchery (supplementation is on a sliding scale), where increased enhancement occurs during poor escapement years. Escapements fluctuate annually and fishery openings are planned in-season based on escapement estimates. The overall escapement goal for the Nanaimo River is 60,000. There were no fisheries in Area 17 in 2012.

Area 18

This fishery is directed primarily at Cowichan River stocks, however, Goldstream chum are also harvested. Fishery openings in mid to late November are limited to Satellite Channel in order to minimize impacts on Goldstream stocks. Chemainus River stocks could also be impacted if the fisheries are earlier in November, but likely to a lesser extent.

Fishery openings are planned in-season based on escapement estimates from a DIDSON counter and information from a test fishery. Management is also guided by advice from the Cowichan Fisheries Roundtable (the Roundtable) and the Mid Vancouver Island (MVI) Chum Subcommittee. The overall escapement goal for the Cowichan River is currently 160,000 chum counted by the DIDSON counter. There were gillnet and seine fisheries in Area 18 with gillnets catching 60,466 chum and seines catching 91,103 chum.

The Area 18/19 seine test fishery in conjunction with the DIDSON fish counter provide timely in-season stock information regarding chum returns to the Cowichan system. A weekly conference call was held with the Cowichan Fisheries Roundtable Harvest Committee to discuss stock status and potential fishing opportunities. As of November 15 the Cowichan chum escapement was 235,000. Escapements will be monitored until December 02.

Area 19

This fishery is directed primarily at Goldstream River stocks although some Cowichan River chum salmon are also harvested. Fishery openings set for mid to late November are limited to the portion of Saanich Inlet (Sub area 19-8) which is outside or to the north of Squally Reach. This area restriction is implemented to minimize impact on Goldstream chinook and coho stocks.

Fisheries are planned in-season based on escapement estimates and a test fishery. Area 19 falls under the same management regime as Area 18. The overall escapement goal for the Goldstream River is 15,000. There were no fisheries in Area 19 in 2012.

Chum catch and release information from all fisheries can be found in Appendix 7.

11.2 FIRST NATIONS

Food, Social and Ceremonial Fisheries
The preliminary estimated FSC catch by First Nations in the Strait of Georgia is estimated to be approximately 5,270 chum; additional catch data is currently being compiled.

ESSR Fisheries

The K'omoks First Nation was issued an ESSR Licence for chum and incidental catch of coho and chinook at the Puntledge River Hatchery. There was no surplus chum for an ESSR fishery this year as a result of the Puntledge River not achieving its chum escapement target.

The Qualicum First Nation was issued an ESSR Licence for chum and incidental catch of coho and chinook at the Big Qualicum River hatchery. The total chum harvest was 2,425 chum

The Sliammon First Nation had an ESSR harvest at the CEDP hatchery on Sliammon

Creek. The First Nation harvested 2,020 chum salmon.

Cowichan Tribes was issued an ESSR licence for chum to be harvested from the Cowichan River. The First Nation harvested 15,420 chum salmon.

The total ESSR harvest for Areas 14 – 19 was 19,865 chum salmon.

11.3 RECREATIONAL

The majority of recreational effort directed at chum salmon occurs in the lower portions of the Discovery Passage area, particularly in the waters around Campbell River. These catch estimates are reported with the Johnstone Strait chum estimates, section 9. Some marine chum fisheries take place in the approach waters of the Puntledge and Qualicum Rivers but the catch and effort are both very low and not currently surveyed.

Tidal recreational fisheries are subject to the normal daily and possession limits (daily limit four (4) per day/possession eight (8)) and are open throughout the area. In all areas anglers were restricted to the use of barbless hooks and there was a minimum size limit of 30 cm. Occasionally recreational in river fisheries occur where surpluses or target escapements will be met. These fisheries occur almost exclusively where enhancement facilities are present. Details on chum opportunities are reported in the Tidal Waters Sport Fishing Guide and also in the Freshwater Supplement. In-season changes and opportunities are also posted online at the Pacific Region recreational fisheries website: http://www.pac.dfo-mpo.gc.ca/fm-gp/rec/index-eng.htm

The recreational creel survey extends from the marine area of Discovery Passage, (outside of Campbell River) to Saanich Inlet. The majority of recreational effort directed at chum salmon occurs in the Discovery Passage area in October. Recreational monitoring throughout the Strait of Georgia consists of a creel survey and voluntary logbooks completed by professional angling guides and other skilled anglers. The total creel catch estimate for the recreational fleet in the Strait of Georgia area from May to September is 13 retained (with a Standard Error of 16) and zero (0) released. Note that Area 13 estimates are included with Johnstone Strait chum estimates, section 8.

11.4 COMMERCIAL

Strait of Georgia commercial chum fisheries for seine, gill net and troll were conducted between October 28 and December 1. The total commercial chum catch from Strait of Georgia is estimated at 165,639 pieces (see table 11.1 below). A description of each fishery is provided in the following table.

Table 11-1: Strait of Georgia Commercial Chum Catch by Date and Gear Type

Fishery Date	Gear type	Area	Effort (boat days)	Catch
Oct. 28 - 30	GN	14	173	14,058
Oct 28 – 30	TR	14	0	0
Nov 3 – 13	GN	18	320	60,466
Nov 7 – 15	SN	18	102	91,103
Nov 20-23	GN	14	7	12
Nov 21-23	SN	14	5	0

11.5 STOCK STATUS

Historically, chum returns have been highly variable relative to brood year escapements. An average to above average chum return to the Strait of Georgia was forecast for 2012. The forecast was based on average to above average brood year escapements (primarily 2008) and anticipated average survival.

Conditions for returning chum migration and spawning were good with water flows ample for most of the season. Spawning escapements continue to be monitored and are currently being compiled. To date, returns have been variable relative to forecast with escapements higher (e.g. Jervis, Cowichan, Goldstream) or lower than target (e.g. combined Mid-Island systems, Nanaimo). See Table 11.2.

Two marine test-fisheries were conducted, one off the Cowichan River and the other adjacent to Goldstream River. The Cowichan and Goldstream seine test-fishery commenced on October 25th and continued until November 29th for a total of nine fishing days. Test catches totaled approximately 24,000 chum for both areas with a majority of the catch coming from Shute Passage in Satellite Channel. Each test fishing day generally consists of six sets; all captured fish were released.

Spawning escapements continue to be monitored and are currently being compiled.

Table 11-2: Strait of Georgia Chum Preliminary Spawning Escapements

Stock	**Target Escapement Target**	**2012 forecast Expected range**	**Preliminary 2012 Escapement**
Jervis Inlet	110K	25K – 37K	85K
Mid-Island	300K	260K – 389K	224K
Puntledge	*60K*		*54K*
Little Qualicum	*130k*		*68K*
Stock	**Target Escapement Target**	**2012 forecast Expected range**	**Preliminary 2012 Escapement**
Big Qualicum	*100K*		*102K*
Nanaimo	63.5K	55K – 82K	50K
Cowichan	160K	174K – 260K	260K
Goldstream	15K	32K – 47K	41K

12 WEST COAST VANCOUVER ISLAND CHUM

12.1 OBJECTIVES AND OVERVIEW

Commercial chum salmon fisheries normally occur on the WCVI from late September to early November in years of chum abundance. The majority of chum fishing on WCVI takes place adjacent to Nitinat Lake (Area 21), in Nootka Sound and Tlupana and Esperanza Inlets (Area 25). During the past few years there have been limited-fleet gill net assessment fisheries in Barkley Sound (Area 23), Clayoquot Sound (Area 24), Nootka Sound and Esperanza Inlet (Area 25). Commercial fisheries target wild chum stocks returning to local streams and enhanced chum stocks from Nitinat and Conuma hatcheries.

With the exception of Nitinat and Tlupana Inlet where hatchery stocks dominate adult returns, WCVI chum fisheries are managed to between a 10% and 20% harvest rate. Fishery managers consider run timing, fishing effort and fleet distribution when implementing in-season management measures. In-season management measures, such as limiting fishing effort to one or two days per week, are implemented to ensure that target harvest rate objectives are not exceeded.

Area D and Area E commercial gill-net fleets and the Area B commercial seine fleet target WCVI chum. Seine opportunities generally occur once surplus to escapement and hatchery brood requirements have been identified for Nitinat Lake, Nitinat River and Nitinat hatchery.

Commercial seine fisheries took place for Nitinat chum stocks in 2012. A sufficient abundance was identified according to the process outlined in the 2012/13 Southern B.C. Salmon Integrated Fisheries Management Plan.

There have been limited-fleet gill net fisheries in Esperanza Inlet (Area 25) and Barkley Sound (Area 23) since 2004 and a limited-fleet assessment fishery was initiated and has continued in Clayoquot Sound (Area 24) since 2007. These fisheries operated in 2012, except for Esperanza, based on a moderate pre-season forecast for chum abundance.

In 2012, revised target escapements (75% Sustainable Escapement Goals (SEG's)) and limit reference points (LRP) (25% SEGs) for all WCVI areas were developed, as shown in Table 12-1 below. Although the WCVI chum forecast is highly uncertain, the forecast is used to inform pre-season fishery planning. Where the forecast is below the LRP for an area, fisheries must be curtailed

For 2012, the pre-season forecast was for escapement to all areas to be below the target, with the exception of Nitinat. The 2012 forecast was above the LRP for all areas except Nootka and Esperanza (Area 25).

Table 12-1. Southwest Vancouver Island Chum Conservation Unit Preseason Forecast for 2012

Area	Limit Reference Point (25% SEG)	Escapement Target (75% SEG)	2012 Forecast
22	61,000	250,000 - 350,000 *	292,412
23	24,000	106,000	62,481
24	31,000	83,000	59,289
25 Nootka	46,000	152,000	39,378
25 Esperanza	25,000	51,000	16,783
26	25,000	81,000	59,899

* In recent years a target of 350,000 has been used to ensure brood collection and increase distribution of spawners within tributaries to Nitinat Lake.

Escapement to Nootka Sound streams has been at or below both the target escapement and the limit reference point since 2006 and there is concern for the sustainability of these stocks. In addition, Conuma Hatchery staff have been unable to reach their broodstock target in recent years. As the 2012 forecast return was below both the target escapement and the limit reference point, commercial fisheries were not conducted for Outer Nootka in 2012.

Esperanza stocks have been at or below the LRP for four of the last five years, and the 2012 forecast was for the return to be below both the target escapement and the limit reference point. Limited effort assessment fisheries were not conducted in 2012.

First Nations Food, Social and Ceremonial and Treaty Domesticfisheries for chum salmon occur primarily in terminal areas. Excess Salmon to Spawning Requirements fisheries were conducted by the Ditidaht First Nation at Nitinat Lake targeting Nitinat hatchery surplus production. Economic Opportunity fisheries were carried out by the Hupacasath and Tseshaht First Nations in upper Alberni Inlet and in the lower Somass River.

In river recreational fisheries generally have low effort, but recently effort has increased in some terminal area rivers (i.e. Nitinat River). Directed effort and catch of chum in recreational marine fisheries off WCVI remains low.

Chum catch and release information from all fisheries can be found in Appendix 7.

12.2 FIRST NATIONS

The Ditidaht First Nation conducts annual chum FSC fisheries and in years of higher chum abundance operates ESSR fisheries in Nitinat Lake and rack harvests at Nitinat hatchery.

Tseshaht and Hupacasath First Nations conducted chum catch monitoring and chum adult enumeration surveys in Alberni Inlet local river systems in 2012 under contract with

DFO. Observations were reported weekly to DFO Stock Assessment and Resource Management staff.

WCVI FSC and Economic Opportunity Fisheries

In 2012, an agreement was reached with the Hupacasath and Tseshaht First Nations for an economic opportunity fishery targeting chum (Area 23). Their catch in the economic fishery was 700 chum. Their FSC catch was 500, for a total catch of 1,200 (EO and FSC combined). The remaining WCVI First Nations including Maa-nulth FSC catch was reported as 5,568 chum. The total combined catch for the WCVI First Nations was 6,068 chum.

ESSR Fisheries

The Ditidaht First Nation was issued an ESSR Licence for chum at Nitinat Lake and Nitinat hatchery. The catch was 22,402 in the lake and 27,536 at the hatchery. The total catch for the ESSR fisheries was 49,938 chum.

12.3 RECREATIONAL

The WCVI recreational fishery is open year-round with a limit of four (4) per day. Anglers are restricted to the use of barbless hooks and there is a minimum size limit of 30 cm. In offshore and inshore areas of WCVI there is minimal recreational effort on chum. Based on anecdotal evidence, recreational anglers kept an estimated 20 chum in offshore areas and 60 chum in inshore

There was also a chum fishery in the Nitinat River which was open from October 15 until December 31. The daily limit was two (2) chum per day and anglers were restricted to the use of barbless hooks. This fishery was not monitored by creel survey in 2012.

12.4 COMMERCIAL

Nitinat

There were seine and gill-net commercial fisheries in 2012 based on abundance in Nitinat Lake and River. The pre-season forecast for Nitinat chum was 292,400. The return is estimated at approximately 275,000. In previous years the Nitinat commercial chum fishery was the largest on the West Coast of Vancouver Island. This fishery targets returning Nitinat River hatchery stocks. The fishing period is generally October 1st to November 15th. The fishery is managed to achieve a minimum escapement target of 225,000 and maximum escapement target of 325,000 chum salmon. The commercial TAC is based on the pre-season forecast which is updated in-season with information from the Nitinat Lake test-fishery and escapement information. Nitinat commercial chum catch totals are found in Table 12-2 and Table 12-3.

Area B Seine
In 2012 the Area B seine fishery was not successful. The fishery was open for two (2) days, October 21 and 27, with a small fleet of 10 boats. The total catch for both fisheries was 97 chum.

Area E Gillnet
In 2012 the Area E fishery was open for six (6) days Oct 6-7, Oct 19-20 and 21-22. The total catch was 23,219 chum and the peak effort was 61 vessels.

The total commercial catch for Nitinat Chum was 23,316.

Barkley (Area 23), Clayoquot (Area 24) and Nootka/Esperanza (Area 25)
Commercial chum fisheries in Areas 23, 24 and 25 are typically managed using weekly in-season effort estimates. The harvest-rate approach is designed to achieve a harvest rate of 20% or less on all stocks in Nootka Sound and 10 to 15% in Esperanza Inlet, Clayoquot Sound and Barkley Sound chum stocks. In Tlupana Inlet, where hatchery stocks are predominant, exploitation rates may be higher in years of higher abundance.

The main objective of the gill net assessment fishery strategy is to provide advance indication of chum salmon abundance that could initiate larger fleet fisheries in Nootka Sound and Tlupana Inlet.

Gill net assessment fisheries took place in Areas 23 and 24.

Barkley Sound (Area 23)

In 2012 the fishery opened for six (6) days Sep 30- Oct 1, Oct 9-10, and Oct 16-17. The total catch was 3,532 chum. The effort was four vessels.

Clayquot Sound (Area 24)

In 2012 the fishery opened for six (6) days Oct 9-10, Oct 16-17, and Oct 23-24. The total catch was 1,147 chum. Only one vessel participated in this fishery although up to three would have been permitted.

Table 12-2. 2012 Commercial Chum Area D Limited Effort Gill Net Fisheries Summary (Barkley and Clayoquot Sounds)

	Barkley Sound (Area 23)			Clayoquot (Area 24)		
Fishing Date	**Effort (Vessels)**	**Chum Catch**	**Coho Retained**	**Effort (Vessels)**	**Chum Catch**	**Coho Retained**
30-Sep	4	816	21	*no fishery*		
01-Oct	4	445	5			
09-Oct	4	876	2	1	340	27
10-Oct	4	438	4	1	394	43
16-Oct	4	782	1	1	260	8
17-Oct	3	175	2	1	151	10
23-Oct	0	0	0	1	2	1
24-Oct	0	0	0	0	0	0
Total/Avg	**23**	**3532**	**35**	**5**	**1147**	**89**

Table 12-3. 2012 Commercial Chum Fisheries Summary (Nitinat)

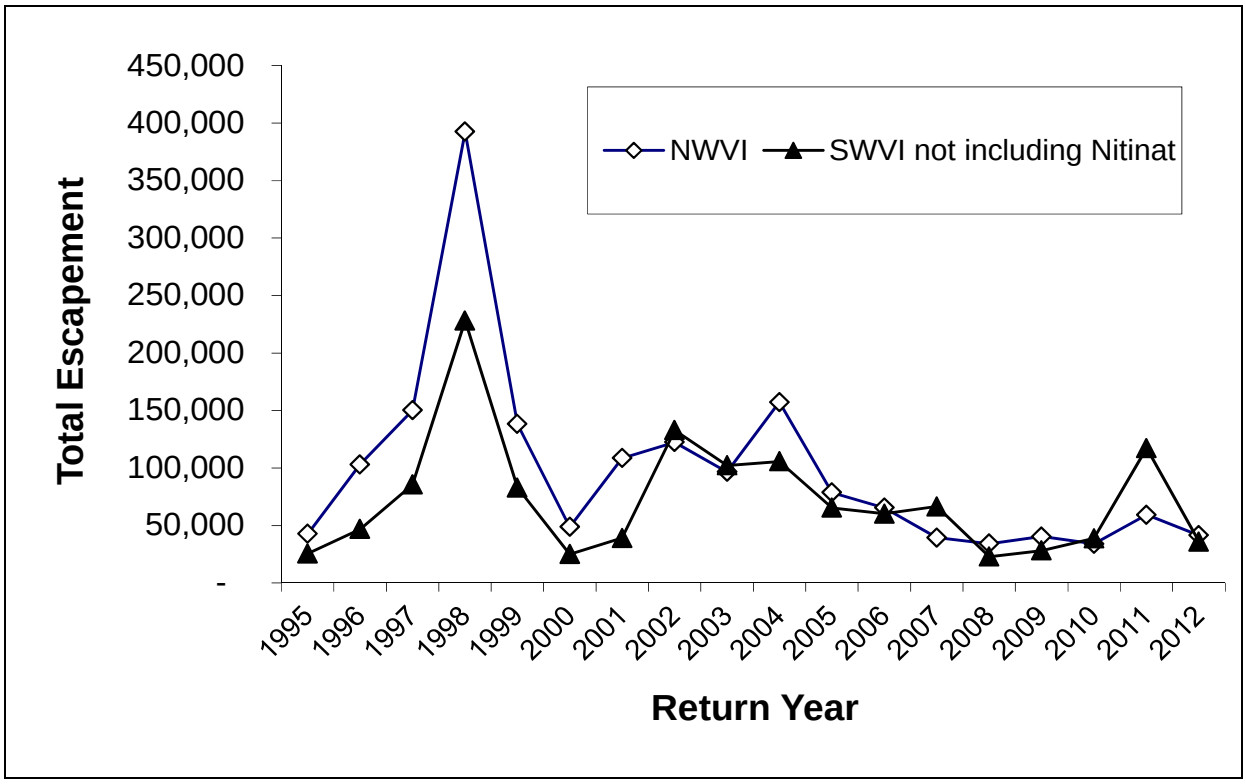
	Nitinat (Area 21) - GILL NET			Nitinat (Area 21) - SEINE		
Fishing Date	**Effort (Vessels)**	**Chum Catch**	**Coho Retained**	**Effort (Vessels)**	**Chum Catch**	**Coho Retained**
06-Oct	68	7,442	0	0	0	0
07-Oct	66	6,840	0	0	0	0
19-Oct	37	6,918	0	0	0	0
20-Oct	37	2,011	0	0	0	0
21-Oct	1	8	0	10	97	4 released
22-Oct	1	0	0	0	0	0
Total	**210**	**23,219**	**0**	**10**	**97**	**0**

12.5 STOCK STATUS

Productivity of chum populations in the WCVI conservation unit (CU) was average to above average from 2001 to 2006. Low returns from 2007 to 2010 reflect a decline in productivity most likely related to lower than average marine survival rates, particularly during the 2005 to 2007 sea entry years. Chum returns in 2011 showed some improvement, likely due to the favorable 2008 sea entry year and returns were about average in SWVI but still well below average in NWVI. However, 2012 chum returns were poor. Overall, chum escapement to most natural systems in the WCVI CU was approximately 50% lower than the long term average (1995-2005).

All 2012 salmon escapement estimates from extensively surveyed WCVI streams (summarized in the Figure 12-1) are preliminary and represent peak live plus dead counts.

Figure 12-1: Escapement of WCVI Chum Stocks, by Catch Region (SWVI, NWVI) and Return Year (1995-2012). 2012 escapement estimates are incomplete and very preliminary.



13 APPENDICES

Appendix 1: Catches in Canadian Treaty Limit Fisheries, 1995 to 2012 (Preliminary)

Fisheries/Stocks	*Species*	*2012*	*2011*	*2010*	*2009*	*2008*	*2007*	*2006*	*2005*	*2004*	*2003*	*2002*	*2001*	*2000*	*1999*	*1998*	*1997*	*1996*	*1995*
Stikine River (all gears)	Sockeye Coho Chinook-lg Chinook-jk	30,352 5,748 4,573 1,213	55,623 4,703 2,307 1,165	50,543 4,952 1,766 1,001	48,049 5,061 2,330 714	33,6 2,398 7,860 1,067	59,237 47 10,576 1,735	101,209 72 15,776 2,078	85,890 276 18,997 2,177	84,866 275 3,857 2,574	58,784 190 1,396 1,052	17,294 82 1,362 578	25,600 233 1,480 103	27,468 301 3,086 628	38,055 181 2,916 1,264	43,803 726 2,164 423	65,559 401 4,483 286	74,281 1,404 2,471 421	53,467 3,418 1,646 860
Taku River (commercial gill net)	Sockeye Coho Chinook-lg Chinook-jk	30,209 8,689 1,909 478	24,012 6,102 2,333 514	20,211 10,349 4,658 697	11,057 5,649 7,031 1,183	19,445 4,866 1,184 330	16,564 5,399 862 337	21,093 9,180 7,312 198	21,932 6,860 7,534 821	19,860 5,954 2,074 334	32,730 3,168 1,894 547	31,053 3,082 1,561 291	47,660 2,568 1,458 118	28,009 4,395 1,576 87	20,681 4,416 908 257	19,038 5,090 1,107 227	24,003 2,594 2,731 84	41,665 5,028 3,331 144	32,640 13,629 1,577 298
Areas 3 (1-4)* (commercial net)****	Pink	118,164	160,757	30,686	404,460	8,330	1,740,270	228,378	878,552	402,459	667,103	876,631	473,318	127,000	2,162,280	61,000	329,000	987,000	2,613,000
Area 1 (commercial troll)****	Pink	57,013	52,221	19,948	60,402	29,295	61,276	34,854	39,430	27,751	98,347	41,418	175,000	28,295	25,000	0	261,000	732,000	1,284,000
North Coast** (troll + sport)	Chinook	120,305 80,256 + 40,050	122,660 74,660+ 48,000	136,613 90,213+ 46,400	109,470 75,470+ 34,000	95,647 52,147+ 43,500	144,235 83,235 + 61,000	215,985 151,485 + 64,500	243,606 174,806 + 68,800	241,508 167,508 + 74,000	191,657 137,357 + 54,300	150,137 103,037 + 47,100	43,500	32,048	70,701	144,650	145,568	26,900	119,100
West Coast Vancouver Island (troll + sport + FN)	Chinook	130,719 62,573 + 61,822 + 4,300		137,660 79,123+ 52,698+ 5,839	125,488 53,191+ 68,775+ 3,381	143,81789,704+ 50,319+ 3794	139,150 87,921 + 46,229 + 5,000	145,970 103,978 + 36,992 + 5,000	195,791 143,614 + 52,177	210,875 168,837 + 42,038	179,706 152,677 + 27,029	165,824 134,308 + 31,516	102,266 78,302 + 23,964	89,139 64,216 + 24,923	28,540 6,906+ 21,634	10,855 6,678+ 4,177	59,796 53,396+ 6,400	3677 4+ 3,673	86,230 81,258+ 4,972
Fraser River Canadian Commercial Catch	Sockeye Pink	0 0	443,000 4,751,800	9,305,104 0	0 1,442,840	16,942 0	0 333,300	4,633,623 68,325	137,000 338,000	1,993,800 0	1,042,986 1,149,189	2,182,700 0	295,000 579,000	953,000 0	54,000 3,000	1,295,000 0	8,737,000 3,660,000	1,019,000 0	903,000 3,777,000
Fraser River U.S. Commercial Catch	Sockeye Pink	105,100 0	266,000 2,893,400	1,970,000 0	0 2,726,230	49,800 0	3,900 377,600	701,300 0	0 0	192,200 0	244,000 773,000	434,600 0	240,000 427,000	494,000 0	41,000 3,000	707,000 0	1,578,000 1,565,000	257,000 0	415,000 1,919,000
West Coast Vancouver Island (commercial troll)	Coho	1,988		458	0	369	1,424	2,399	5,989	0	0	0	0	0	0	0	0	761,000	1,345,000
Johnstone Strait (clockwork catch)***	Chum	27,547		62,510	510,708	298,931	494,944	800,363	787,226	1,089,100	1,026,029	700,000	236,000	161,000	41,411	1,820,000	104,593	101,971	269,000

*AREA 5-11 CATCHES INCLUDED PRIOR TO 1995 AND EXCLUDED FROM 1995-1998 INCLUSIVE. NOT PART OF 1999 ANNEX IV PROVISIONS.

** NORTH COAST CATCH EXCLUDES TERMINAL EXCLUSION CATCHES OF 6,000 ('91), 6,100 ('92), 7,400 ('93), 6,400 ('94), 1,702 ('95), 16,000 ('96), 5,943 ('97), and 2,182 in 1998. NO TERMINAL EXCLUSION IN THE 1999 AGREEMENT - COVERED UNDER THE AABM ARRANGEMENT; CENTRAL COAST AREAS NOT PART OF 1999 ANNEX IV PROVISIONS.

*** CANADIAN CATCH INCLUDES COMMERCIAL, FSC AND TEST-FISH CATCHES IN AREAS 11-13 FOR 1991-94 INCLUSIVE, AND IN AREAS 12-13 FOR 1995 TO 2004 INCLUSIVE. 2002-PRESENT, CATCHES FROM FISHERIES MANAGED TO FIXED HARVEST RATE OF 20%.

****ALL PINK CATCHES FOR ALL YEARS (1995-2011) IN AREAS 3(1-4) AND AREA 1 HAVE BEEN UPDATED TO REFLECT FINAL ESTIMATES.

NOTE 1: WCVI CHINOOK CATCHES FROM 1995-1998 ARE REPORTED BY CALENDAR YEAR; CATCHES FROM 2008-1999 ARE REPORTED BY CHINOOK YEAR (OCT-SEPT).

NOTE 2: 1999 CATCHES ARE REPORTED ACCORDING TO FISHERIES/STOCKS UNDER THE 1999 ANNEX IV PROVISIONS.

Appendix 2: Preliminary 2012 South Coast Sockeye Catch by Fishery and Area

Fishery	Gear	Fishery (Area)	Numbers		
			Non-Fraser Kept	Fraser Kept	All stocks Released
Commercial	Area G Troll	WCVI AABM Chinook (23 - 27, 123 - 127)	0	0	0
	Area H Troll	JST Chum (12,13)	0	0	6
	Area H Troll	MVI Chum (14)	0	0	0
	Area B Seine	Barkley Sockeye (23)	79,360	0	143
	Area B Seine	Nitinat Chum (21, 121)	0	0	0
	Area B Seine	JST Chum (12,13)	3	0	1
	Area B Seine	Fraser Chum (29)	0	0	0
	Area B Seine	Cowichan Chum (Area 18)	0	0	0
	Area B Seine	MVI Chum (14)	0	0	0
	Area D Gillnet	Barkley Sockeye (23)	115,105	0	4
	Area D Gillnet	Barkley Chum (23)	0	0	0
	Area D Gillnet	Somass Chinook (23)	0	0	0
	Area D Gillnet	Clayoquot Chum (24)	0	0	0
	Area D Gillnet	Tlupana Chinook (25)	0	0	0
	Area D Gillnet	JST Chum (12,13)	0	0	3
	Area D Gillnet	MVI Chum (14)	0	0	0
	Area E Gillnet	Fraser Chum (29)	0	0	4
	Area E Gillnet	Nitinat Chum (21, 121)	0	0	0
	Area E Gillnet	Cowichan Chum (Area 18)	0	0	0
Total Commercial Catch			**194,468**	**0**	**161**
Recreational*	Sport	Juan de Fuca (19,20)*	21	0	1,924
	Sport	Strait of Georgia (14-18,28,29)*	89	0	1,108
	Sport	Johnstone Strait (11-13)*	4	0	363
	Sport	WCVI - Inshore (20W-27)	17,839	0	335
	Sport	WCVI - Offshore (121-127)*	177	0	470
	Sport	Fraser River	0	0	22,933
Total Recreational Catch			**18,130**		**27,133**
First Nations FSC		Johnstone Strait	1,066	22,334	0
		Strait of Georgia	0	14,994	0
		WCVI	28,100	6,771	0
		Fraser River	2	434,845	3,282
Total First Nations FSC Catch			**29,168**	**478,944**	**3,282**
First Nations EO		Johnstone Strait	0	0	0
		Strait of Georgia	0	0	0
		WCVI	151,049	0	0
		Fraser River	0	0	18
Total First Nations EO Catch			**151,049**	**0**	**18**
First Nations ESSR		Johnstone Strait	0	0	0
		Strait of Georgia	0	0	0
		WCVI	0	0	0
		Fraser River	0	0	0
Total First Nations ESSR Catch			**0**	**0**	**0**
TOTAL - ALL FISHERIES			**392,815**	**478,944**	**30,594**

*No DNA samples available to estimate Fraser composition in catch estimates outside of WCVI inshore areas.

Appendix 3: Preliminary 2012 South Coast Pink Catch by Fishery and Area

PINK

Fishery	Gear	Fishery (Area)	Numbers	
			Kept	Released
Commercial	Area G Troll	WCVI AABM Chinook (23 - 27, 123 - 127)	217	115
	Area H Troll	JST Chum (12,13)	10	10
	Area H Troll	MVI Chum (14)	0	0
	Area B Seine	Barkley Sockeye (23)	0	0
	Area B Seine	Nitinat Chum (21, 121)	0	0
	Area B Seine	JST Chum (12,13)	174	56
	Area B Seine	Fraser Chum (29)	0	0
	Area B Seine	Cowichan Chum (Area 18)	0	0
	Area B Seine	MVI Chum (14)	0	0
	Area D Gillnet	Barkley Sockeye (23)	1	23
	Area D Gillnet	Barkley Chum (23)	0	0
	Area D Gillnet	Somass Chinook (23)	0	0
	Area D Gillnet	Clayoquot Chum (24)	0	0
	Area D Gillnet	Tlupana Chinook (25)	0	1
	Area D Gillnet	JST Chum (12,13)	6	16
	Area D Gillnet	MVI Chum (14)	23	0
	Area E Gillnet	Fraser Chum (29)	0	4
	Area E Gillnet	Nitinat Chum (21, 121)	0	0
	Area E Gillnet	Cowichan Chum (Area 18)	0	0
Total Commercial Catch			**431**	**225**
Recreational	Sport	Juan de Fuca (19,20)	234	72
	Sport	Strait of Georgia (14-18,28,29)	4,753	3,020
	Sport	Johnstone Strait (11-13)	10,935	24,171
	Sport	WCVI - Inshore (20W-27)	96	67
	Sport	WCVI - Offshore (121-127)	67	242
	Sport	Fraser River	0	0
Total Recreational Catch			**16,085**	**27,572**
First Nations FSC		Johnstone Strait	7,446	0
		Strait of Georgia	8	0
		WCVI	10	0
		Fraser River	2	2
Total First Nations FSC Catch			**7,466**	**2**
First Nations EO and Demo		Johnstone Strait	0	0
		Strait of Georgia	0	0
		WCVI	0	0
		Fraser River	0	11
Total First Nations EO Catch			**0**	**11**
First Nations ESSR		Johnstone Strait	65,276	0
		Strait of Georgia	0	0
		WCVI	0	0
		Fraser River	0	0
Total First Nations ESSR Catch			**65,276**	**0**
TOTAL - ALL FISHERIES			**89,258**	**27,810**

Appendix 4: Preliminary 2012 South Coast AABM Chinook Catch By Fishery and Area

AABM Chinook				
			Numbers	
PST Regime	Fishery	Month	Kept	Released
WCVI-AABM	Area G Troll *	Oct-11	0	0
		Nov-11	57	24
		Dec-11	188	30
		Jan-12	129	25
		Feb-12	542	66
		Mar-12	243	17
		Apr-12	10,493	240
		May-12	22,334	341
		Jun-12	0	0
		Jul-12	0	0
		Aug-12	4,280	255
	**	Sep-12	17,264	5,165
	T'aaq-wiihak	July -Sept	6,292	0
Troll Total			**61,822**	**6,163**
Recreational	Sport	WCVI - Inshore (20W-27)	8,856	5,453
	Sport	WCVI - Offshore (121-127)	53,717	45,574
Total			**62,573**	**51,027**
First Nations	Johnstone Strait		n/a	n/a
	Strait of Georgia		n/a	n/a
	WCVI Offshore		6,079	34
	WCVI Inshore		245	16
	Fraser River		0	0
Total			**6,324**	**50**
All Total			**130,719**	**57,240**
*Oct'11-Sept'12				
** includes release data from Sub-legal DNA sampling program				

Appendix 5: Preliminary 2012 South Coast ISBM Chinook Catch By Fishery and Area

ISBM CHINOOK

Fishery	Gear	Fishery (Area)	Numbers	
			Kept	Released
ISBM	Area G Troll	WCVI Chinook	0	0
	T'aaq-wiihak Demo Fishery	Tlupana Chinook (25)	3	0
	Area H Troll	JST Chum (12,13)	0	52
	Area H Troll	MVI Chum (14)	0	0
	Area B Seine	Barkley Sockeye (23)	1	210
	Area B Seine	Nitinat Chum (21, 121)	0	0
	Area B Seine	JST Chum (12,13)	0	30
	Area B Seine	Fraser Chum (29)	0	2
	Area B Seine	Cowichan Chum (Area 18)	0	7
	Area B Seine	MVI Chum (14)	0	0
	Area D Gillnet	Barkley Sockeye (23)	809	236
	Area D Gillnet	Barkley Chum (23)	0	0
	Area D Gillnet	Somass Chinook (23)	1,285	0
	Area D Gillnet	Clayoquot Chum (24)	0	0
	Area D Gillnet	Tlupana Chinook (25)	8,135	46
	Area D Gillnet	JST Chum (12,13)	0	7
	Area D Gillnet	MVI Chum (14)	0	0
	Area E Gillnet	Fraser Chum (29)	1	39
	Area E Gillnet	Nitinat Chum (21, 121)	0	0
	Area E Gillnet	Cowichan Chum (Area 18)	0	1
Total Commercial Catch			**10,234**	**630**
Recreational	Sport	Juan de Fuca (19,20)	15,153	9,429
	Sport	Strait of Georgia (14-18,28,29)	11,254	34,406
	Sport	Johnstone Strait (11-13)	19,071	20,467
	Sport	WCVI - Inshore (20W-27)	33,021	14,430
	Sport	WCVI - Offshore (121-127)	NA	NA
	Sport	Fraser River	10,931	7,265
Total Recreational Catch			**89,430**	**85,997**
First Nations FSC		Johnstone Strait	321	0
		Strait of Georgia	181	0
		WCVI	1,229	10
		Fraser River	27,037	104
Total First Nations FSC Catch			**28,768**	**114**
First Nations EO and Demo		Johnstone Strait	0	0
		Strait of Georgia	0	0
		WCVI	9,400	0
		Fraser River*	1,069	566
Total First Nations EO Catch			**10,469**	**566**
First Nations ESSR		Johnstone Strait	0	0
		Strait of Georgia**	2,915	0
		WCVI	6,409	0
		Fraser River	9,875	0
Total First Nations ESSR Catch			**19,199**	**0**
TOTAL - ALL FISHERIES			**158,100**	**87,307**

* Number includes Fraser River Economic Opportunity (EO), Demonstration and Tsaw w assen Harvest Agreement fisheries

**Number includes both adults and jacks; FSC & ESSR combined.

Appendix 6: Preliminary 2012 South Coast Coho Catch By Fishery and Area

COHO

Fishery	Gear	Fishery (Area)	Numbers	
			Kept	Released
Commercial	Area G Troll	WCVI AABM Chinook (23 - 27, 123 - 127)	1,988	7,756
	T'aaq-wiihak	WCVI AABM Chinook (23 - 27, 123 - 127)	38	0
	Area H Troll	JST Chum (12,13)	0	439
	Area H Troll	MVI Chum (14)	0	0
	Area B Seine	Barkley Sockeye (23)	10	0
	Area B Seine	Nitinat Chum (21, 121)	0	4
	Area B Seine	JST Chum (12,13)	0	1,680
	Area B Seine	Fraser Chum (29)	0	4
	Area B Seine	Cowichan Chum (Area 18)	0	363
	Area B Seine	MVI Chum (14)	0	0
	Area D Gillnet	Barkley Sockeye (23)	11	1,841
	Area D Gillnet	Barkley Chum (23)	35	2
	Area D Gillnet	Somass Chinook (23)	21	0
	Area D Gillnet	Clayoquot Chum (24)	89	0
	Area D Gillnet	Tlupana Chinook (25)	3	0
	Area D Gillnet	JST Chum (12,13)	3	1,370
	Area D Gillnet	MVI Chum (14)	0	87
	Area E Gillnet	Fraser Chum (29)	0	1,356
	Area E Gillnet	Nitinat Chum (21, 121)	0	56
	Area E Gillnet	Cowichan Chum (Area 18)	0	155
Total Commercial Catch			**2,198**	**15,113**
Recreational	Sport	Juan de Fuca (19,20)	16,621	44,343
	Sport	Strait of Georgia (14-18,28,29)	3,569	24,340
	Sport	Johnstone Strait (11-13)	6,031	11,688
	Sport	WCVI - Inshore (20W-27)	25,253	16,387
	Sport	WCVI - Offshore (121-127)	25,638	63,402
	Sport	Fraser River	12,661	14,671
Total Recreational Catch			**89,773**	**174,831**
First Nations FSC		Johnstone Strait	640	0
		Strait of Georgia	10	0
		WCVI	9,729	110
		Fraser River*	941	129
Total First Nations FSC Catch			**11,320**	**239**
First Nations EO		Johnstone Strait	0	0
		Strait of Georgia		
		WCVI	300	0
		Fraser River*	51	5,868
Total First Nations EO Catch			**351**	**5,868**
First Nations ESSR		Johnstone Strait	0	0
		Strait of Georgia	3,453	1,726
		WCVI	13,517	0
		Fraser River	33,891	0
Total First Nations ESSR Catch			**50,861**	**1,726**
TOTAL - ALL FISHERIES			**154,503**	**197,777**

* Number includes Fraser River Economic Opportunity (EO), Demonstration and Tsaw w assen Harvest Agreement fisheri

Appendix 7: Preliminary 2012 South Coast Chum Catch By Fishery and Area

Chum				
			Numbers	
Fishery	Gear	Fishery (Area)	Kept	Released
Commercial	Area G Troll	WCVI AABM Chinook (23 - 27, 123 - 127)	180	13
	Area H Troll	JST Chum (12,13)	27,547	0
	Area H Troll	MVI Chum (14)	0	0
	Area B Seine	Barkley Sockeye (23)	0	0
	Area B Seine	Nitinat Chum (21, 121)	97	0
	Area B Seine	JST Chum (12,13)	288,494	2
	Area B Seine	Fraser Chum (29)	104	0
	Area B Seine	Cowichan Chum (Area 18)	91,103	0
	Area B Seine	MVI Chum (14)	0	0
	Area D Gillnet	Barkley Sockeye (23)	25	6
	Area D Gillnet	Barkley Chum (23)	3,532	0
	Area D Gillnet	Somass Chinook (23)	1	1
	Area D Gillnet	Clayoquot Chum (24)	1,147	0
	Area D Gillnet	Tlupana Chinook (25)	11	0
	Area D Gillnet	JST Chum (12,13)	75,283	4
	Area D Gillnet	MVI Chum (14)	14,070	0
	Area E Gillnet	Fraser Chum (29)	63,987	13
	Area E Gillnet	Nitinat Chum (21, 121)	23,219	0
	Area E Gillnet	Cowichan Chum (Area 18)	60,466	0
Total Commercial Catch			**649,266**	**39**
Recreational	Sport	Juan de Fuca (19,20)	0	0
	Sport	Strait of Georgia (14-18,28,29)	445	0
	Sport	Johnstone Strait (11-13)	53	31
	Sport	WCVI - Inshore (20W-27)	190	61
	Sport	WCVI - Offshore (121-127)	0	0
	Sport	Fraser River	6,576	36,055
Total Recreational Catch			**7,264**	**36,147**
First Nations FSC		Johnstone Strait	10,597	0
		Strait of Georgia	5,270	0
		WCVI	6,068	0
		Fraser River	30,374	2
Total First Nations FSC Catch			**52,309**	**2**
First Nations EO		Johnstone Strait	0	0
		Strait of Georgia	0	0
		WCVI	700	0
		Fraser River **	102,287	249
Total First Nations EO Catch			**102,987**	**249**
First Nations ESSR		Johnstone Strait	0	0
		Strait of Georgia	19,865	0
		WCVI	49,938	0
		Fraser River	33,183	0
Total First Nations ESSR Catch			**102,986**	**0**
TOTAL - ALL FISHERIES			**914,812**	**36,437**

* Number includes Fraser River Economic Opportunity (EO), Demonstration and Tsaw w assen Harvest Agreement fisheries

Appendix 8: Preliminary 2012 Southern B.C. Commercial Catch Totals By Gear and Area

Commercial total, all species

License Group	Fishing Area	Sockeye Kept	Sockeye Released	Coho Kept	Coho Released	Pink Kept	Pink Released	Chum Kept	Chum Released	Chinook Kept	Chinook Released
Area G Troll	WCVI AABM Chinook (23 - 27, 123 - 127)	0	2	1,988	7,756	217	115	180	13	55,530	6,163
T'aaq-wiihak Demo	WCVI AABM Chinook (23 - 27, 123 - 127)	0	0	38	0	0	0	0	0	6,295	0
Area H Troll	JST Chum (12,13)	0	6	0	439	10	10	27,547	0	0	52
Area H Troll	MVI Chum (14)	0	0	0	0	0	0	0	0	0	0
Area B Seine	Barkley Sockeye (23)	79,690	143	10	0	0	0	0	0	1	210
Area B Seine	Nitinat Chum (21, 121)	0	0	0	4	0	0	97	0	0	0
Area B Seine	JST Chum (12,13)	3	1	0	1,680	174	56	288,494	2	0	30
Area B Seine	Fraser Chum (29)	0	0	0	4	0	0	104	0	0	2
Area B Seine	Cowichan Chum (Area 18)	0	0	0	363	0	0	91,103	0	0	7
Area B Seine	MVI Chum (14)	0	0	0	0	0	0	0	0	0	0
Area D Gillnet	Barkley Sockeye (23)	115,105	4	11	1,841	1	23	25	6	809	236
Area D Gillnet	Barkley Chum (23)	0	0	35	2	0	0	3,532	0	0	0
Area D Gillnet	Somass Chinook (23)	0	0	21	0	0	0	1	1	1,285	0
Area D Gillnet	Clayoquot Chum (24)	0	0	89	0	0	0	1,147	0	0	0
Area D Gillnet	Tlupana Chinook (25)	0	0	3	0	0	1	11	0	8,135	46
Area D Gillnet	JST Chum (12,13)	0	3	3	1,370	6	16	75,283	4	0	7
Area D Gillnet	MVI Chum (14)	0	0	0	87	23	0	14,070	0	0	0
Area E Gillnet	Fraser Chum (29)	0	4	0	1,356	0	4	63,987	13	1	39
Area E Gillnet	Nitinat Chum (21, 121)	0	0	0	56	0	0	23,219	0	0	0
Area E Gillnet	Cowichan Chum (Area 18)	0	0	0	155	0	0	60,466	0	0	1
TOTALS		**194,798**	**159**	**2,198**	**13,546**	**431**	**221**	**501,594**	**26**	**72,055**	**6,753**

Appendix 9: 2012 Southern B.C. Recreational Catch Totals By Area

	Sockeye Kept	Sockeye Released	Coho Kept	Coho Released	Pink Kept	Pink Released	Chum Kept	Chum Released	Chinook ISBM Kept	Chinook ISBM Released	Chinook AABM Kept	Chinook AABM Released
Juan de Fuca (19,20)	21	1,924	16,621	44,343	234	72	0	0	15,153	9,429		
Strait of Georgia (14-18,28,29)	89	1,108	3,569	24,340	4,753	3,020	445	0	11,254	34,406		
Johnstone Strait (11-13)	4	363	6,031	11,688	10,935	24,171	53	31	19,071	20,467		
WCVI - Inshore (20W-27)	17,839	335	25,253	16,387	96	67	190	61	33,021	14,430	8,856	5,453
WCVI - Offshore (121-127)	177	470	25,638	63,402	67	242	0	0	NA	NA	53,717	45,574
Fraser River	0	22,933	12,661	14,671	0	0	6,576	36,055	10,931	7,265	0	0
TOTAL	**18,130**	**27,133**	**89,773**	**174,831**	**16,085**	**27,572**	**7,264**	**36,147**	**89,430**	**85,997**	**62,573**	**51,027**

All totals are preliminary.

JDF includes all of 19 and a portion of Area 20 (20 SG).
WCVI Inshore contains a portion of 20W (West of Sherringham)

Appendix 10: 2012 Southern B.C. First Nations Catch Estimates By Area

Fishery type	Fishing Area	Sockeye Kept	Sockeye Released	Coho Kept	Coho Released	Pink Kept	Pink Released	Chum Kept	Chum Released	Chinook ISBM Kept	Chinook ISBM Released	Chinook AABM Kept	Chinook AABM Released
FSC	Johnstone Strait	23,400	0	640	0	7,446	0	10,597	0	321	0		
	Strait of Georgia	14,994	0	10	0	8	0	5,270	0	181	0		
	WCVI	34,871	0	9,729	110	10	0	6,068	0	1,229	10	6324	50
	Fraser River	434,847	3,282	941	129	2	2	30,374	2	27,037	104	0	0
TOTAL		**508,112**	**3,282**	**11,320**	**239**	**7,466**	**2**	**52,309**	**2**	**28,768**	**114**	**6,324**	**50**
EO	Johnstone Strait												
	Strait of Georgia												
	WCVI	151,049	0	300	0	0	0	700	0	9,400	0	0	0
	Fraser River	0	18	51	5,868	0	11	102,287	249	1,069	566	0	0
TOTAL		**151,049**	**18**	**351**	**5,868**	**0**	**11**	**102,987**	**249**	**10,469**	**566**	**0**	**0**
ESSR	Johnstone Strait	0	0	0	0	65,276	0	0	0	0	0	0	0
	Strait of Georgia	0	0	3,453	0	0	0	19,865	0	2,915	0	0	0
	WCVI	0	0	13,517	0	0	0	49,938	0	6,409	0	0	0
	Fraser River	0	0	33,891	0	0	0	33,183	0	9,875	0	0	0
TOTAL		**0**	**0**	**50,861**	**0**	**65,276**	**0**	**102,986**	**0**	**19,199**	**0**	**0**	**0**
All FN fisheries		**659,161**	**3,300**	**62,532**	**6,107**	**72,742**	**13**	**258,282**	**251**	**58,436**	**680**	**6,324**	**50**

Appendix 11: 2012 South Coast Test-Fishery Catches

Test-Fisheries	Sockeye	Sockeye	Coho	Coho	Pink	Pink	Chum	Chum	Chinook	Chinook	GRAND
	retain	release	retain	release	retain	release	retain	release	retain	release	TOTAL
Albion Chinook Gillnet	608	0	0	35	0	0	4,388	0	817	0	**5,848**
Albion Chum Gillnet	12	0	0	272	1	0	8,799	0	222	0	**9,306**
Area 12 Chum Seine	0	7	0	222	0	400	1,278	76,849	0	20	**78,776**
Naka Creek Sockeye Gillnet	1,546	0	0	158	602	0	25	0	7	5	**2,343**
Area 13 Sockeye Seine	2,802	3,016	0	119	1,144	18,370	0	263	0	102	**25,816**
Area 23 Sockeye Seine	1,046	3,276	0	2	0	0	0	0	0	88	**4,412**
Blinkhorn Sockeye Seine	3,667	10,386	0	361	2	108,855	0	836	0	314	**124,421**
Cowichan Chum Seine	0	0	0	10	0	0	483	23,172	0	1	**23,666**
Saanich Chum Seine	0	0	0	1	0	0	0	588	0	0	**589**
Nitinat Lake Chum Gillnet	0	0	0	64	0	0	10,789	1	7	2	**10,863**
Round Island Sockeye Gillnet	820	4	0	287	978	8	32	0	30	21	**2,180**
San Juan Sockeye Seine	4,604	13,174	0	3,150	0	216	0	98	0	988	**22,230**
Qualark Gillnet	1,639	0	0	0	0	0	0	0	230	29	**1,898**
San Juan Sockeye Gillnet	10,545	1	0	1,429	39	0	54	0	363	136	**12,567**
Whonnock Gillnet	1,670	41	0	68	0	0	274	6	464	19	**2,542**
Cottonwood Gillnet	1,072	17	0	62	0	0	18	2	97	36	**1,304**
Grand Total	**30,031**	**29,922**	**0**	**6,240**	**2,766**	**127,849**	**26,140**	**101,815**	**2,237**	**1,761**	**328,761**

2012 POST SEASON REPORT

UNITED STATES SALMON FISHERIES

Of RELEVANCE TO THE PACIFIC SALMON TREATY

Report Submitted to the Pacific Salmon Commission
By the United States Section

January, 2013

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PRELIMINARY 2012 SOUTHEAST ALASKA FISHERIES

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District 104 Purse Seine Fishery

The 2009 Pacific Salmon Treaty (PST) Agreement calls for abundance based management of the District 104 purse seine fishery. The agreement allows the District 104 purse seine fishery to harvest 2.45 percent of the Annual Allowable Harvest (AAH) of Nass and Skeena sockeye prior to Alaska Department of Fish and Game (ADFG) statistical week 31 (referred to as the treaty period). The AAH is calculated as the total run of Nass and Skeena sockeye salmon minus either the escapement requirement of 1.1 million (200,000 Nass and 900,000 Skeena) or the actual in-river escapement, whichever is less.

The District 104 purse seine fishery opens the first Sunday in July; in 2012 the initial opening was July 1 (Week 27). The pre-Week 31 fishing plan for District 104 was based on the preseason Canadian Dept. of Fisheries and Oceans (DFO) forecast returns of approximately 1,846,000 Nass and Skeena sockeye salmon.

In the 2012 treaty period (Alaska statistical weeks 27-30), 18,300 sockeye were harvested in the following: one 12-hour openings in Week 27; one 15-hour openings in Week 28; two 15-hour openings in Week 29; and two 15-hour openings in Week 30 (Table 1). A total of 30 purse seine vessels fished at some time in the district during the treaty period. In past years 60% to 80% of treaty-period sockeye have been of Nass and Skeena origin. Thus, we would anticipate that between 11,000 and 14,600 Nass and Skeena sockeye may have been harvested in the District 104 purse seine fishery during the treaty period. The final number of Nass and Skeena sockeye harvested, and the actual catch by stock, will not be available until catch, escapement, and stock composition estimates are finalized for the year.

Table 1. Catch and effort in the Alaska District 104 purse seine fishery, 2012.

Week/ Opening	Start Date	Chinook	Sockeye	Coho	Pink	Chum	Boats	Hours
27	7/1	0	372	230	418	3,826	3	12
28	7/8	0	1,504	1,771	2,516	16,047	9	15
29	7/15	0	6,117	1,220	19,561	7,211	7	15
29B	7/19	0	2,371	1,650	9,365	5,335	19	15
30	7/22	0	4,951	5,484	56,540	13,301	17	15
30B	7/26	0	2,985	5,458	89,665	8,195	11	15
31	7/29	0	3,478	10,317	214,277	14,043	29	15
31B	8/2	0	4,706	10,926	410,996	23,318	41	39
32	8/6	706	9,970	7,614	842,167	19,503	31	39
32B	8/10	906	16,758	14,973	1,336,631	39,622	54	39
33	8/14	539	10,664	14,388	1,715,445	54,323	98	39
33B	8/18	724	6,600	13,550	893,161	43,742	77	39
34	8/22	79	1,318	2,372	172,737	6,806	31	39
35	8/26	73	599	3,073	29,974	2,770	13	15
Weeks 27-30		0	18,300	15,813	178,065	53,915	30	87
Weeks 31-35		3,027	54,093	77,213	5,615,388	204,127	118	264
Total		3,027	72,393	93,026	5,793,453	258,042	119	351

Since the Pacific Salmon Treaty was signed in 1985, the number of hours open, boats fishing and boat-days fished in the pre-Week 31 annex period in District 104 are down 54%, 60% and 84% respectively compared to the averages in the pre-treaty 1980-1984 period (Table 2). The total pre-Week 31 Treaty-period sockeye harvest is also down 44%. The seine fleet moves freely between districts as various species are harvested, so seining opportunities elsewhere affect the effort and catch in District 104.

Table 2. Fishing opportunity, effort, and sockeye harvest prior to week 31 in the District 104 purse seine fishery, 1980-2012.

Year	Hours Fished	Boats Fishing	Fraction Days Fished (1d=15hrs)	Boat-Days Fished (Fraction Boats and Fraction Days)	Sockeye Harvest	Sockeye Catch per Boat-Day
1980	207	244	13.8	2,877	266,273	93
1981	132	212	8.8	1,108	185,188	167
1982	117	255	7.8	1,435	213,150	149
1983	108	241	7.2	1,211	170,306	141
1984	132	174	8.8	805	103,319	128
1985	84	141	5.6	502	100,590	200
1986	108	194	7.2	968	91,320	94
1987	90	134	6	457	72,385	158
1988	108	210	7.2	994	248,789	250
1989	84	135	5.6	438	157,566	360
1990	42	171	2.8	276	169,943	615
1991	41	134	2.7	243	98,583	406
1992	29	108	1.9	142	79,643	561
1993	45	171	3	343	163,189	476
1994	55	84	3.7	202	158,524	783
1995	58	109	3.9	218	71,376	328
1996	31	113	2.1	128	215,144	1,684
1997	56	159	3.7	409	572,942	1,402
1998	32	78	2.1	89	17,394	196
1999	30	38	2	44	7,664	174
2000	81	66	5.4	192	48,969	255
2001	50	95	3.3	182	203,090	1,115
2002	72	44	4.8	124	26,554	215
2003	52	40	3.5	97	84,742	875
2004	107	24	7.1	102	30,758	302
2005	68	38	4.5	93	35,690	382
2006	95	39	6.3	117	89,615	766
2007	50	68	3.3	136	112,135	824
2008	33	17	2.2	22	6,262	281
2009	72	38	4.8	95	15,971	168
2010	55	21	3.7	39	4,617	118
2011	84	29	5.6	77	25,280	329
2012	75	30	5.8	93	18,300	196
Avg. 80-84	139	225	9	1,487	187,647	136
Avg. 85-12	64	90	4	244	104,537	483
% Change	-54%	-60%	-54%	-84%	-44%	256%

In the 2012 season, the District 104 purse seine fishery harvested 5,793,453 pink salmon, 72,393 sockeye, 258,042 chum, 93,026 coho, and 3,027 Chinook salmon. Catches of all salmon species were below average throughout the season. The number of days that the fishery was open was about the treaty period (1985-2011) average except for weeks 33 and 35 when days open to fishing were below average (Figure 1). The number of boats fishing was below average throughout the season except for about average in week 33 (Figure 2).

Figure 1. District 104 Purse Seine Days Open (hours/15)

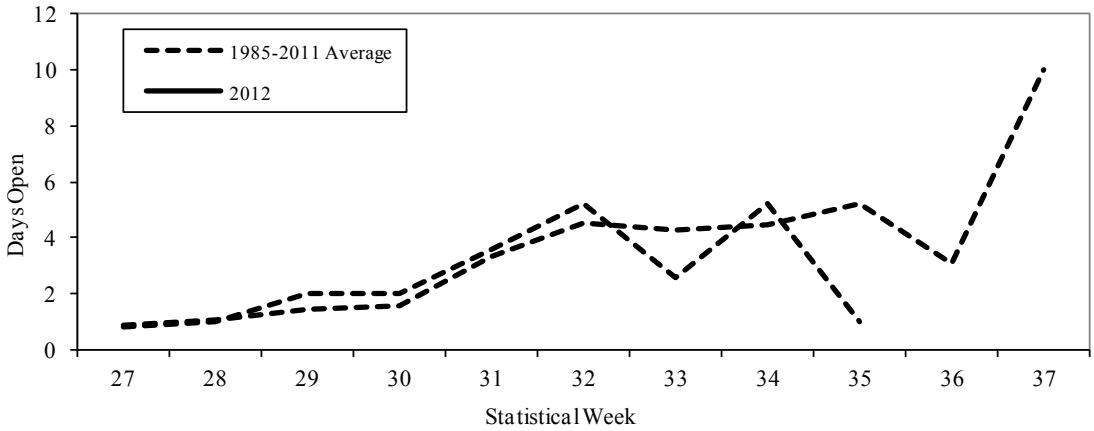
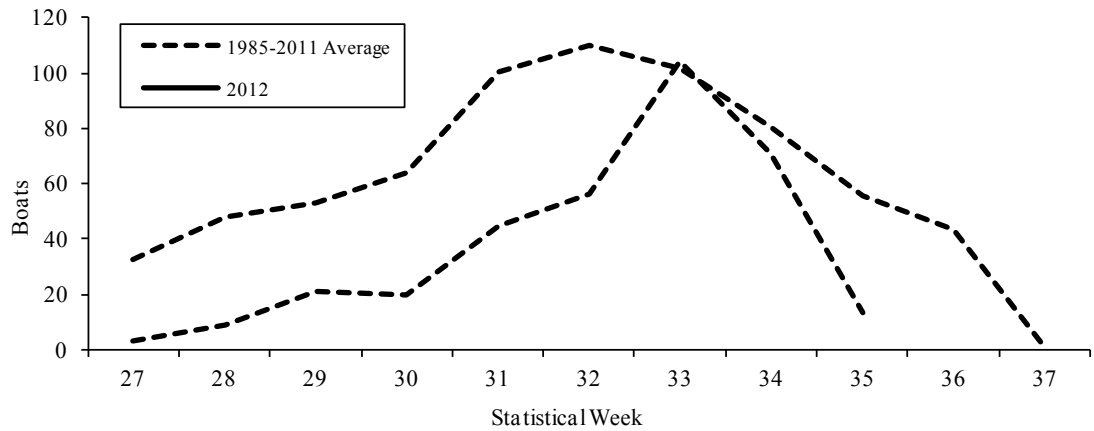
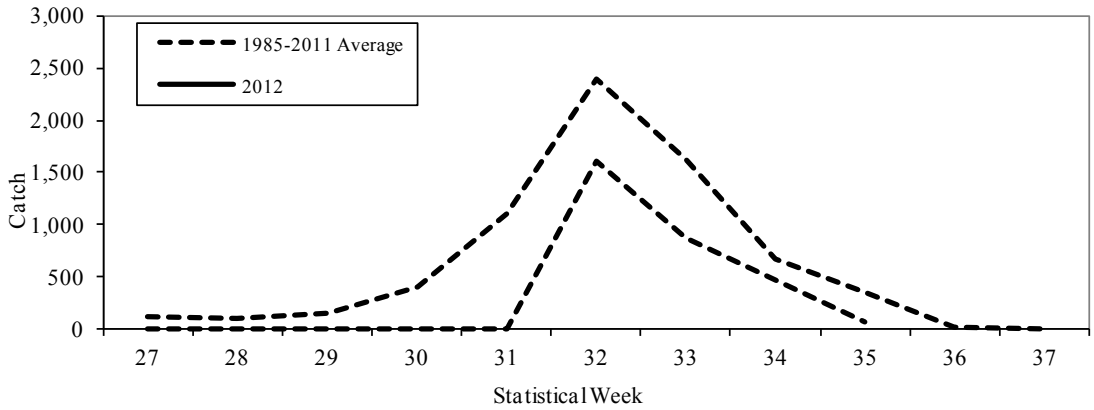


Figure 2. District 104 Purse Seine Boats Fishing



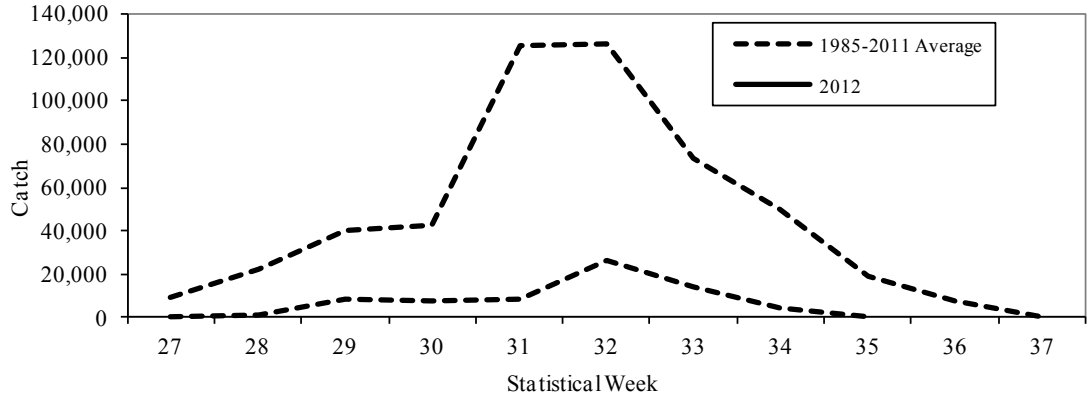
Chinook salmon catches in the District 104 purse seine fishery were below average throughout the season (Figure 3). The 2012 District 104 purse seine non-retention period for Chinook salmon lasted from the beginning of the season until the week 32.

Figure 3. District 104 Purse Seine Chinook Salmon Catch



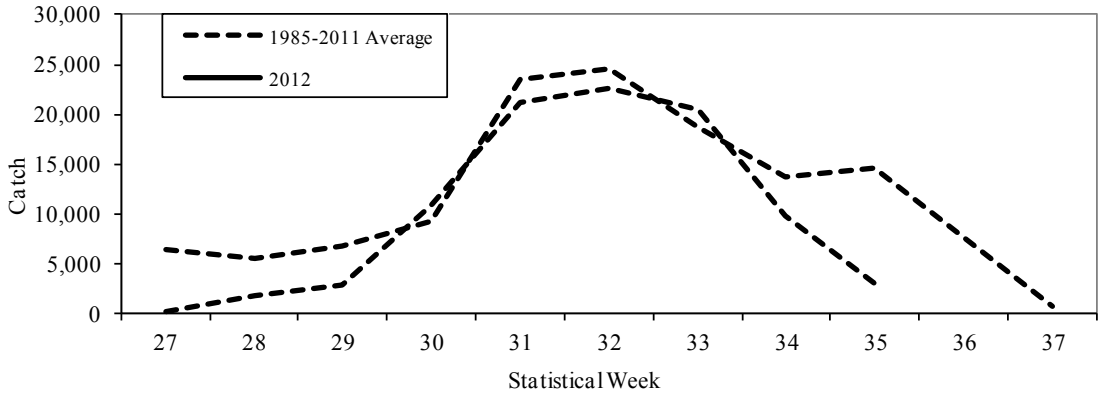
Sockeye salmon catches were below average throughout the season (Figure 4). The treaty period (week 28-30) sockeye catch was 18,300 while the total catch was 72,393.

Figure 4. District 104 Purse Seine Sockeye Salmon Catch



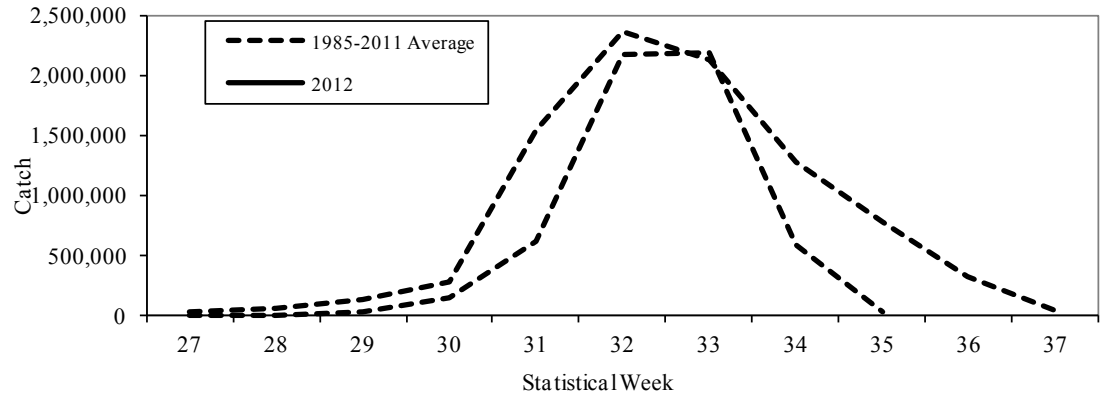
Catches of coho salmon were below average early, near average mid-season, and below average later in the season (Figures 5).

Figure 5. District 104 Purse Seine Coho Salmon Catch



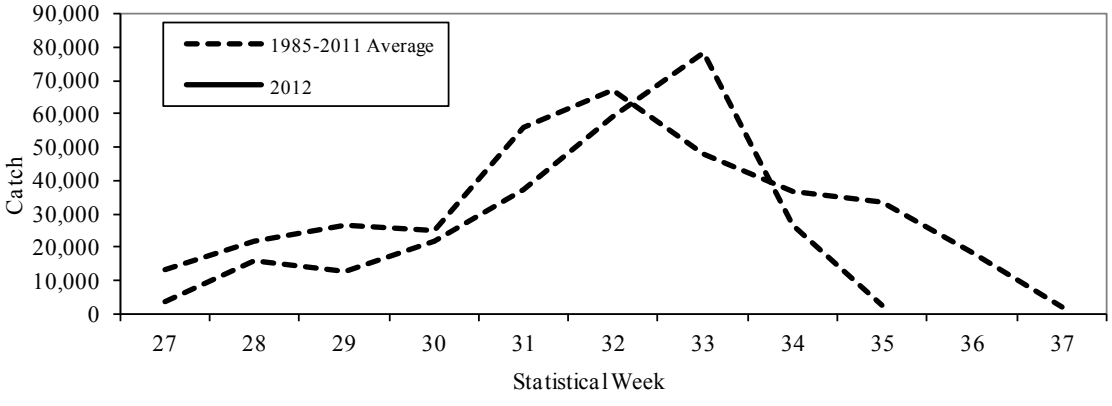
Pink salmon catches were below average most of the season (Figure 6).

Figure 6. District 104 Purse Seine Pink Salmon Catch



With the exception of week 33 catches of chum salmon were below average (Figure 7).

Figure 7. District 104 Purse Seine Chum Salmon Catch



District 101 Drift Gillnet Fishery

The 2009 PST agreement calls for abundance based management of the District 101 (Tree Point) drift gillnet fishery. The agreement specifies a harvest of 13.8 percent of the AAH of the Nass River sockeye run. For the 2012 season, DFO forecast a total return of 446,000 Nass River sockeye salmon. The AAH is calculated as the total run of Nass sockeye salmon minus either the escapement requirement of 200,000 or the actual in-river escapement, whichever is less.

The District 101 drift gillnet fishery opens by regulation on the third Sunday in June which was June 17. During the early weeks of the fishery, management is based on the run strength of Alaska wild stock chum and sockeye salmon and on the run strength of the Nass River sockeye salmon. Beginning in the third week of July, when pink salmon stocks begin to enter the fishery in large numbers, management emphasis shifts by regulation to that species. By regulation, the District 101 Pink Salmon Management Plan sets gillnet fishing time in this district in relation to the District 101 purse seine fishing time when both fleets are concurrently harvesting the same pink salmon stocks.

A total of 62,506 sockeye salmon were harvested in the District 101 drift gillnet fishery in 2012 (Table 3). The sockeye harvest was 48% of the 1985-2011 average of 130,281. The number of hours fished was above average. The total number of boats fishing during the 2012 season was 85, which is about 75% of the 1985-2011 average of 114. The final number of Nass River sockeye harvested at Tree Point will not be available until catch, escapement, and stock composition estimates are finalized for the 2012 season.

In past years approximately 70% of the District 101 gillnet sockeye harvest has been of Nass River origin. Thus, we would anticipate that approximately 43,800 Nass River sockeye may have been harvested in the District 101 gillnet fishery in 2012. Final numbers will not be available until the analysis is completed.

Table 3. Weekly catch and effort in the Alaska District 101 commercial drift gillnet fishery, 2012.

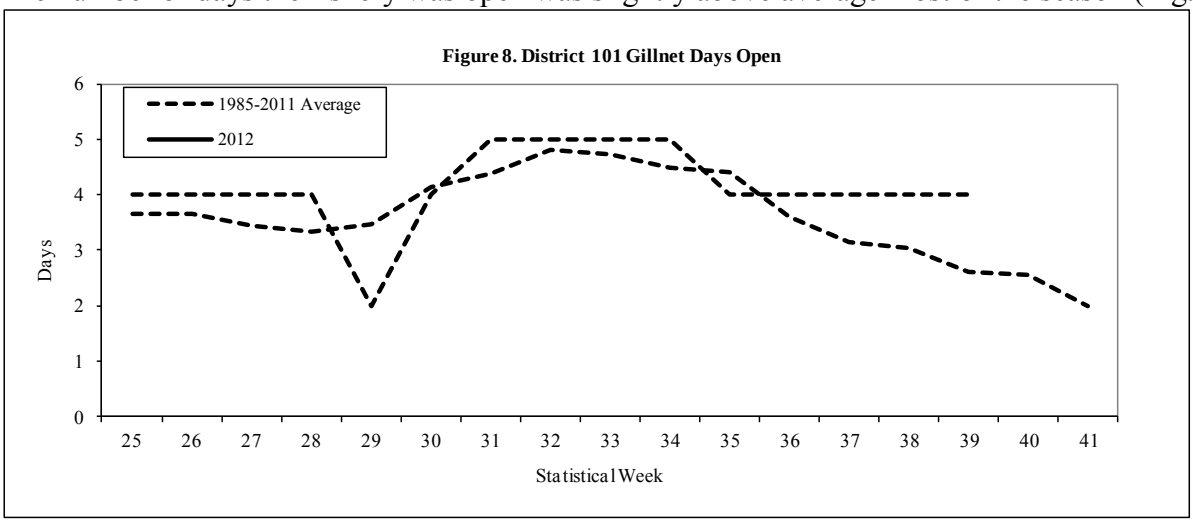
Week	Start Date	Chinook	Sockeye	Coho	Pink	Chum	Boats	Hours
25	17-Jun	442	21,859	352	72	14,710	50	96
26	24-Jun	324	13,083	130	239	35,209	59	96
27	1-Jul	197	9,305	595	4,536	48,579	54	96
28	8-Jul	154	7,553	1,864	33,904	54,775	55	96
29	15-Jul	86	2,475	1,001	9,474	42,268	48	48
30	22-Jul	85	2,643	1,853	26,027	40,701	38	96
31	29-Jul	42	2,826	2,154	34,931	23,628	46	120
32	5-Aug	20	1,517	2,828	33,946	7,313	40	120
33	12-Aug	24	642	4,467	18,261	5,741	33	120
34	19-Aug	12	262	5,665	28,391	10,943	34	120
35	26-Aug	15	212	9,298	12,277	11,533	34	96
36	2-Sep	2	118	12,350	1,728	10,534	38	96
37	9-Sep	1	7	7,975	62	4,579	31	96
38	16-Sep	0	4	7,765	12	2,485	32	96
39	23-Sep	0	0	4,208	0	1,341	10	96
Total		1,404	62,506	62,505	203,860	314,339	85	1,488
1985-2011 Avg.		1,481	130,281	45,842	518,856	306,358	114	1,331

Table 4. Sockeye harvest in the Alaska District 101 gillnet fishery, 1985 to 2012, and comparison of harvest and effort (boats, hours, and boat-hours) between weeks 26 and 35 when sockeye salmon are most abundant in this district.

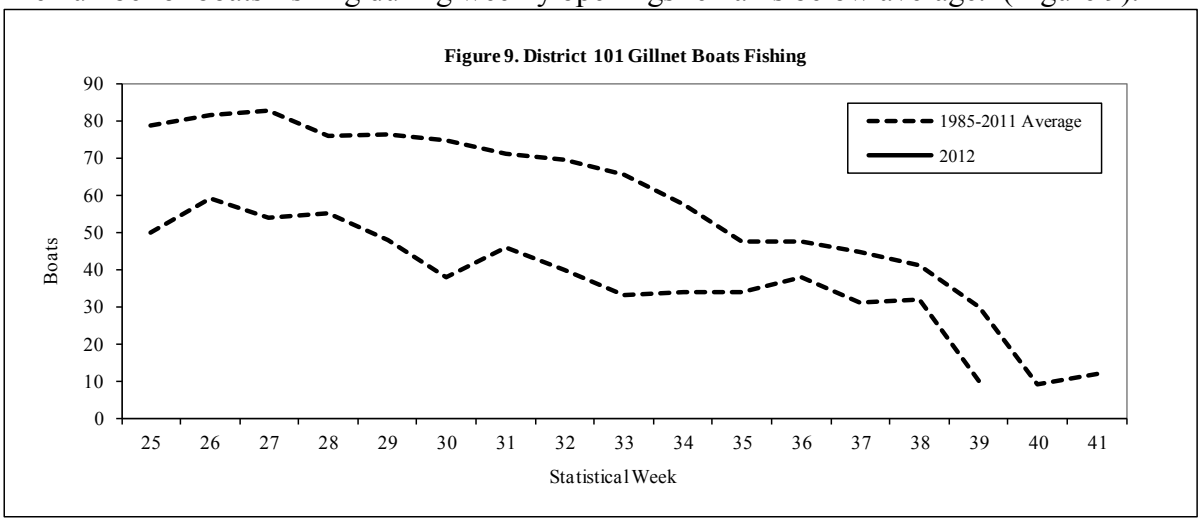
Year	Total Sockeye Harvest	Catch and Effort between Weeks 26-35			
		Sockeye Harvest	Boats	Hours	Boat-Hours
1985	173,100	159,021	153	1,032	157,865
1986	145,699	143,286	198	960	190,044
1987	107,503	106,638	170	615	104,519
1988	116,115	115,888	187	756	141,338
1989	144,936	130,024	176	1,023	180,016
1990	85,691	78,131	150	840	125,969
1991	131,492	123,508	130	984	127,920
1992	244,649	243,878	118	1,080	127,416
1993	394,098	390,299	148	1,032	152,733
1994	100,377	98,725	142	984	139,700
1995	164,294	151,131	128	1,008	129,024
1996	212,403	175,569	129	1,104	142,408
1997	169,474	152,662	128	1,008	129,024
1998	160,506	159,307	124	1,044	129,454
1999	160,028	158,268	118	1,032	121,776
2000	94,651	94,399	95	912	86,640
2001	80,041	62,129	73	1,020	74,445
2002	120,353	106,360	68	1,008	68,544
2003	105,263	96,921	68	1,104	75,058
2004	142,357	141,395	61	1,104	67,332
2005	79,725	75,875	69	1,104	76,162
2006	62,770	53,048	45	840	37,791
2007	66,822	50,642	54	1,032	55,717
2008	34,113	30,672	47	936	43,983
2009	69,859	69,325	62	1,080	66,948
2010	62,680	61,987	66	1,008	66,515
2011	88,618	87,744	84	840	70,541
2112	62,506	40,518	81	1,008	81,632
Average 1985-2011	130,282	122,846	111	981	106,996

The District 101 gillnet fishery opened Sunday June 17 (Week 25). The fishery was open a slightly higher than average number of days early in the season (Figure 8). Under the Pink Salmon Management Plan, which establishes drift gillnet fishing time in District 101 in relation to District 101 purse seine fishing time when both gear types are concurrently harvesting the same pink salmon stocks, fishing time was reduced to two days a week in Statistical Week 29 (July 15). Beginning in Week 36 (September 2) management was based on the strength of wild stock fall chum and coho salmon.

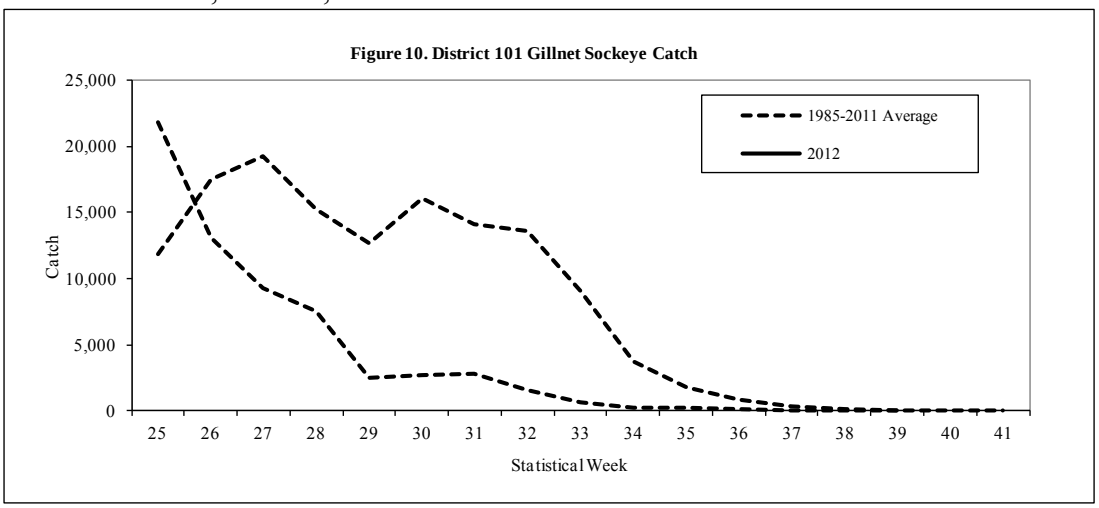
The number of days the fishery was open was slightly above average most of the season (Fig. 8).



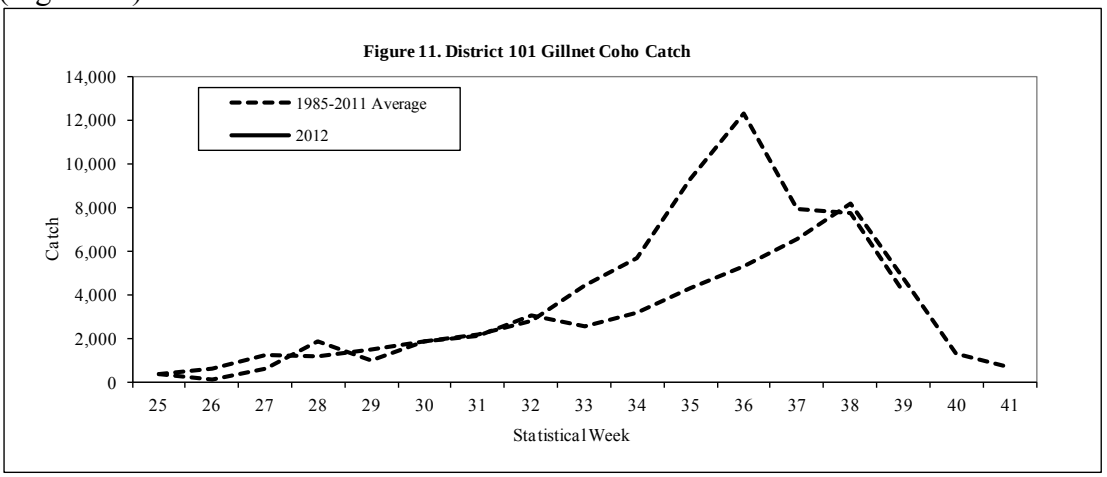
The number of boats fishing during weekly openings remains below average. (Figure 9).



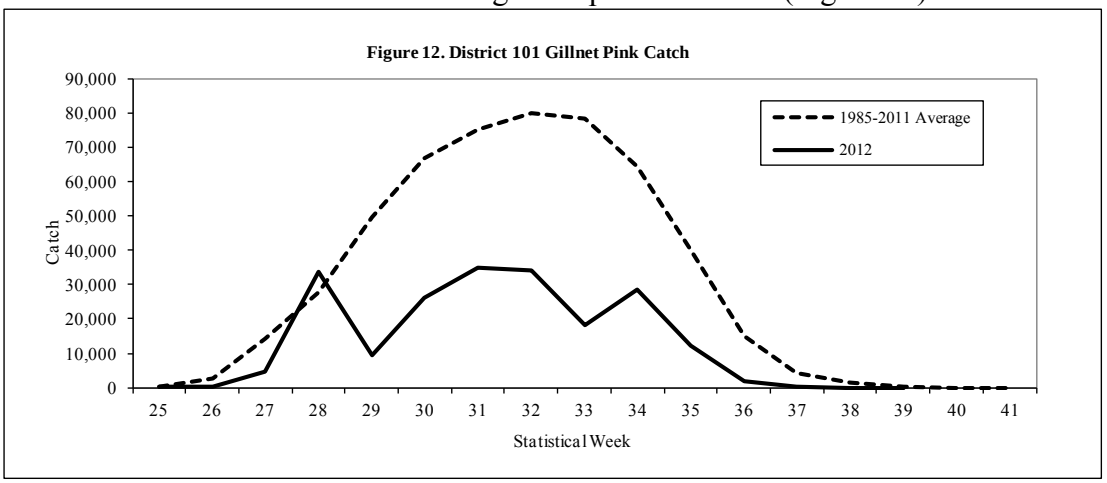
Except for the initial week, catches of sockeye were below treaty period averages for the season (Figure 10). Sockeye harvest prior to the initiation of the Pink Salmon Management Plan in Week 29 was 51,800 fish, or about 83% of the total.



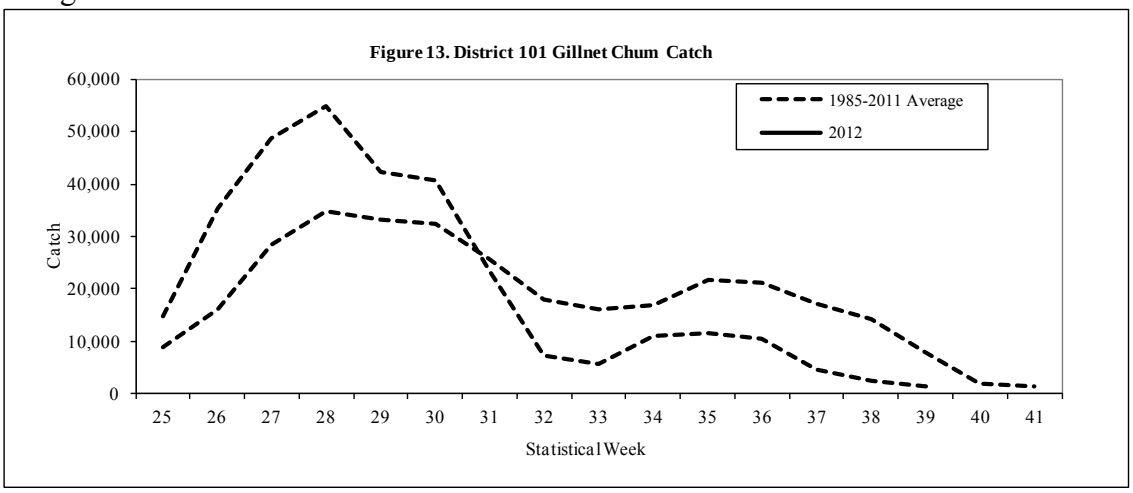
Coho catches were about average until early August after which they rose to above average (Figure 11).



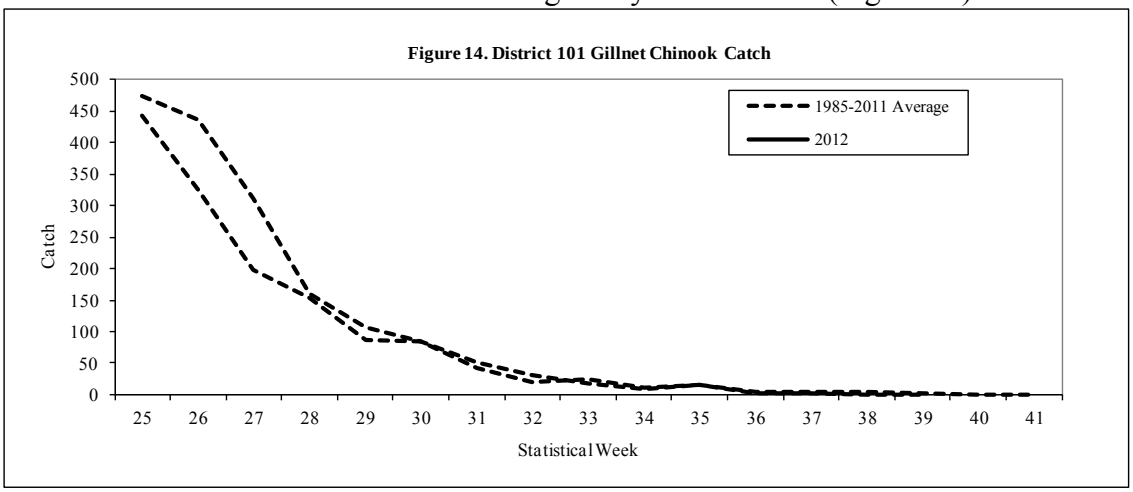
Pink salmon catches were below average except for week 28 (Figure 12).



Chum salmon catches were above average early in the season but fell below average beginning in late July (Figure 13). Beginning on September 2 (week 36) the fishery was managed on the strength of wild stock fall chum and coho salmon returns.



Chinook salmon catches were below average early in the season (Figure 14).



Pink, Sockeye, and Chum Salmon Escapements

The total 2012 Southeast Alaska pink salmon escapement index of 11.0 million index fish ranked 18th since 1960, and was 75% of the recent 10-year average of 14.7 million. Biological escapement goals are in place for three sub-regions in Southeast Alaska and escapement goals were met in two of the three sub-regions in 2012 (Table 5). On a finer scale, escapements met or exceeded management targets for 10 of 15 districts in the region and for 31 of the 46 pink salmon stock groups in Southeast Alaska. Pink salmon returns were generally weak throughout much of the Northern Southeast Inside sub-region in 2012. The Southern Southeast sub-region includes all of the area from Sumner Strait south to Dixon Entrance (Districts 101–108). The escapement index value of 6.5 million was well within the escapement goal range of 3.0 to 8.0 million index fish. The pink salmon harvest of 18.5 million in the Southern Southeast sub-region was near the recent 10-year average of 20.2 million fish.

Table 5. Southeast Alaska 2012 pink salmon escapement indices and biological escapement goals by sub-region (in millions). The total is slightly less than the sum of all three sub-regions due to rounding of numbers.

Sub-region	2012 Pink Salmon Index	Biological Escapement Goal Lower Bound	Upper Bound
Southern Southeast	6.5	3.0	8.0
Northern Southeast Inside	2.1	2.5	6.0
Northern Southeast Outside	2.5	0.75	2.50
Total	11.0		

Sockeye salmon returns throughout Southeast Alaska were generally strong in 2012. Escapement targets were met for 11 of the 13 sockeye salmon systems in Southeast Alaska with formal escapement goals. The Hugh Smith Lake adult sockeye salmon escapement was 13,400, which was within the optimal escapement goal range of 8,000 to 18,000 adult sockeye salmon. McDonald Lake sockeye salmon were de-listed as a "stock of management concern" at the 2012 Board of Fisheries meeting, based primarily on improved escapements since 2009. Based on the expanded peak foot survey count, the escapement of sockeye salmon into McDonald Lake was estimated to be 57,000 fish in 2012, which was near the lower bound of the sustainable escapement goal of 55,000 to 120,000 sockeye salmon.

For summer-run chum salmon, lower bound sustainable escapement goals were met for all three sub-regions in Southeast Alaska. In southern Southeast Alaska, runs are broken into summer and fall runs. The Southern Southeast chum salmon stock group is composed of an aggregate of 13 summer-run chum salmon streams on the inner islands and mainland of southern Southeast Alaska, from Sumner Strait south to Dixon entrance, with a sustainable escapement goal of 54,000 index spawners (based on the aggregate peak survey to all 13 streams). The index of 144,000 in 2012 was the sixth highest index value in the time series (Figure 15).

Fall chum salmon runs in Cholmondeley Sound, Prince of Wales Island, appeared to be strong overall and the escapement goal was easily met. Cholmondeley Sound is the only area in southern Southeast Alaska with a formal escapement goal for fall chum salmon. Fall chum salmon runs are monitored in Cholmondeley Sound through aerial surveys at Disappearance and Lagoon creeks. The escapement index of 54,000 was above the upper bound of the sustainable escapement goal range of 30,000 to 48,000 index spawners (based on the aggregate peak survey to both streams; Figure 16).

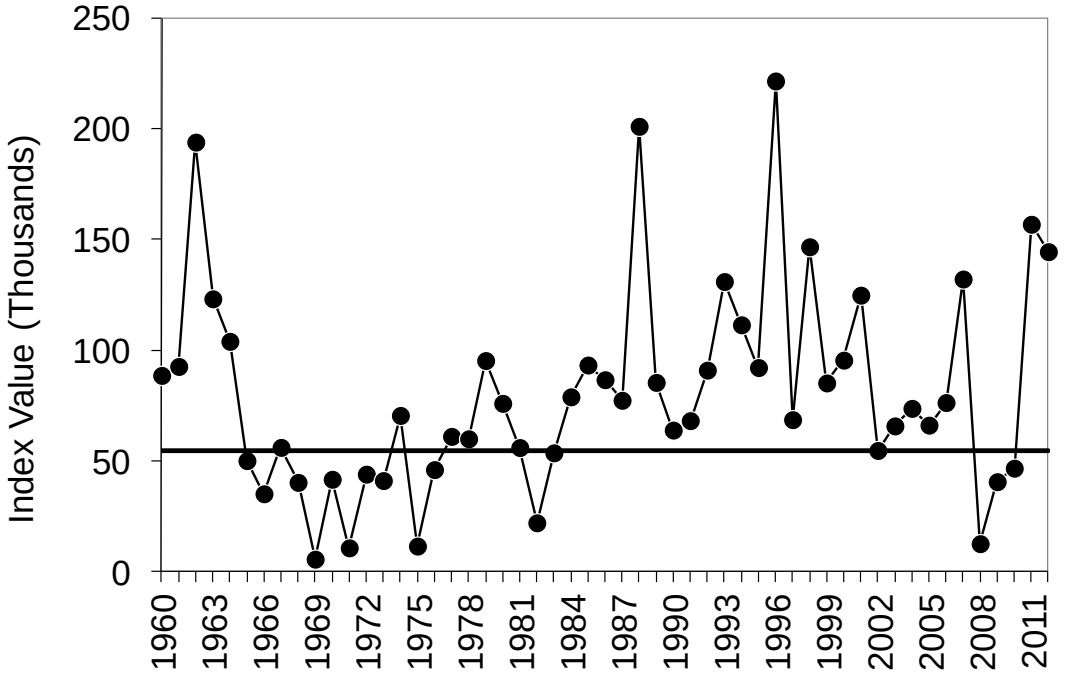


Figure 15. Observed escapement index value by year (solid circles) and the sustainable escapement goal threshold of 54,000 index spawners (horizontal line) for wild summer-run chum salmon in the Southern Southeast sub-region, 1980–2012.

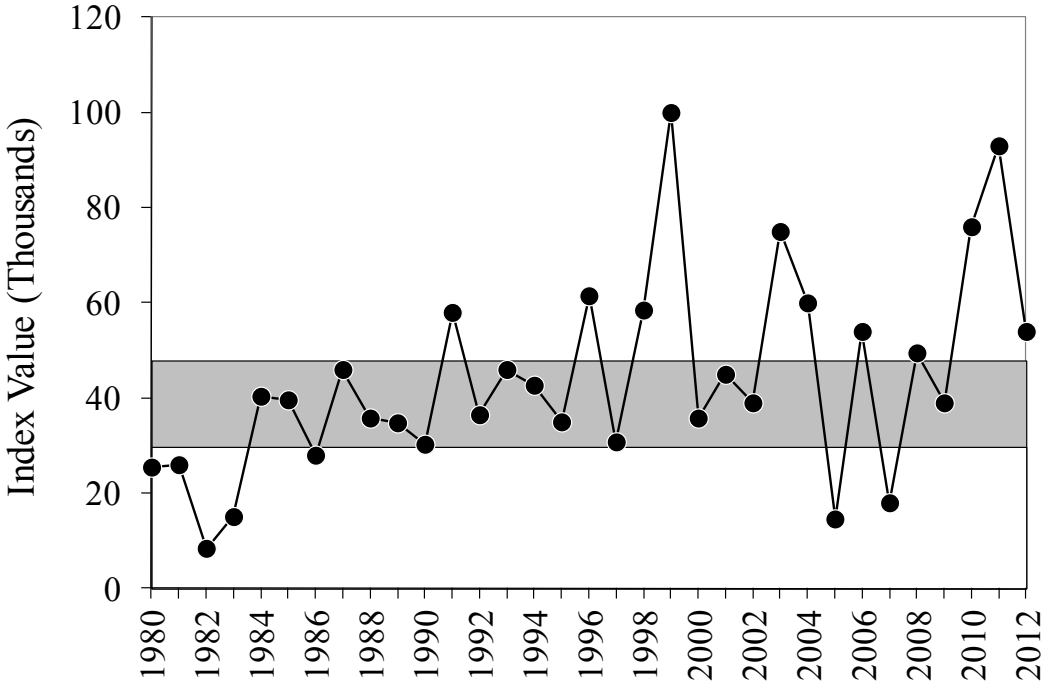


Figure 16.–Observed escapement index value by year (solid circles) and the sustainable escapement goal range of 30,000 to 48,000 index spawners (shaded area) for Cholmondeley Sound fall-run chum salmon, 1980–2012.

TRANSBOUNDARY AREA FISHERIES

Stikine River Area Fisheries

The preseason forecast for Chinook salmon returning to the Stikine River was approximately 40,800 fish. The resulting U.S. AC was 5,890 large Stikine Chinook salmon. This forecast was above the midpoint of the escapement goal range of 21,000 large Chinook upon which the preseason harvest allocations are based. A directed Stikine River Chinook salmon commercial fishery began May 7 in District 108 in 2012 and was the first directed commercial fishery for Chinook salmon since 2008. Additionally, enhanced Chinook salmon returning to Anita Bay Terminal Harvest area may be harvested in these fisheries and the expected return was 10,000 fish.

The directed Chinook salmon fishery in District 108 was open for one day each week in weeks 19-21, harvests were weaker than anticipated with a total catch for this period of 450 fish. The first in-season forecast of 29,300 Stikine River Chinook salmon was substantially less than the preseason forecast and resulted in a U.S. allowable catch too small to allow further directed commercial fisheries. Subsequent forecasts were also lower than the preseason forecast and highly variable ranging between 21,000 and 34,600 fish. As a result, directed commercial fisheries in District 108 closed until the beginning of the traditional sockeye salmon fishing season.

The 2012 Stikine River sockeye salmon return was expected to below the previous 10 year average. The preliminary forecast for total return to the Stikine River was 134,000 sockeye salmon. The 2012 forecast included approximately 51,700 Tahltan (39%), 32,600 enhanced Tuya (24%), and 49,700 wild mainstem (37%) sockeye salmon. Due to the near identical return timing of the Tahltan Lake and Tuya Lake stocks, any open fishing periods in District 108, and to a lesser extent in District 106, are determined by the in-season abundance estimate of the Tahltan Lake return. Typically, the Tahltan Lake and Tuya Lake sockeye salmon run timing peaks in statistical week 27 (July 1–7) through the District 106 and 108 fisheries. During an average Tahltan Lake run significant numbers of sockeye could be present as early as statistical week 24 (June 10–16) and as late as statistical week 31 (July 29–Aug 4).

The 2012 returns of local area sockeye salmon stocks were expected to be average to below average based on parent year escapements. Parent-year escapements to most local sockeye systems were near average with the exception of the Salmon Bay Lake return which was well below average. The sockeye salmon return to McDonald Lake may be below average based on low parent year escapements and rearing fry estimates. However, recent escapements have been stronger than anticipated and the number of 2-ocean fish in the 2011 escapement was the highest since 1990, indicating that survival rates have likely increased for McDonald Lake sockeye salmon.

Both District 106 and 108 opened for the directed sockeye salmon season with a two day opening on Monday, June 18 (week 25). Catch rates for sockeye salmon were average to above average with average effort in both districts. Due to the low expected return of Tahltan sockeye salmon, no

extra time occurred. The in-season assessment for Chinook salmon returning to the Stikine River at this time was 33,600 large adults. This latest forecast resulted in a U.S. Allowable Catch (AC) of Stikine River Chinook salmon of 3,400 fish. Escapement of Chinook salmon to Stikine River was expected to be within the goal range of 14,000 to 28,000 fish.

Both Districts 106 and 108 opened for a two day opening on Sunday June 24 (week 26). On the grounds surveys of the gillnet fleet did not indicate an abundance of sockeye salmon significantly above the preseason forecast. Therefore, no additional fishing time occurred.

Both districts opened on Sunday, July 1 (week 27) for two days. On the grounds surveys of the gillnet fleet indicated above or near average harvests with low effort and low overall harvest of Stikine River sockeye salmon. Therefore, a 24 hour extension occurred.

The District 106 and 108 drift gillnet fishery opened initially for two days on Sunday, July 8 (week 28). On the grounds surveys of the gillnet fleet indicated above or near average harvest rates with continued low effort. Therefore, a 24 hour extension occurred. The in-season Stikine River sockeye salmon forecast was similar to the preseason forecast of 134,500 fish.

The District 106 and 108 drift gillnet fishery opened initially for two days on Sunday, July 15 (week 29). On the grounds surveys of the gillnet fleet indicated above or near average sockeye salmon harvest rates. Effort remained low resulting in below average harvests. As a result of the good harvest rates and expected below average harvest, a 24 hour extension occurred.

The District 106 and 108 drift gillnet fishery opened for three days on Sunday, July 22 (week 30). On the grounds surveys of the gillnet fleet indicated above or near average sockeye salmon harvest rates. Effort remained low resulting in below average harvests.

Both districts opened for three days on Sunday July 29 (week 31). Effort was below average in District 106 but slightly above average in District 108. The majority of boats fishing in District 108 were targeting enhanced chum salmon returning to Anita Bay with very few boats targeting sockeye salmon. Sockeye and pink salmon catches were below average in both districts.

Both districts opened for three days on Sunday August 5 (week 32). Management focus for the Districts 106 and 108 gillnet fisheries transitioned to pink salmon abundance after the first of August. Effort increased in District 106 with above average pink salmon catches for the time of year. Catches were below average in District 108 with a decrease in effort. The low harvest in District 108 was a reflection of fishers targeting Anita Bay chum salmon, which are near the end of the run timing.

Management focus of the Districts 106 and 108 gillnet fishery for the opener on August 12 (week 33) was based on pink salmon abundance. Both districts opened for three days this week with a reported decrease in participants. Pink salmon catch rates dropped to below average in District 106, but improved to above average for District 108. Recent aerial surveys of Districts 106 and 108 pink salmon systems indicate lower than normal escapements for this time of year. With poor catch performance in District 106 and lagging escapements, time was+ reduced to two days for the next opener.

The final in-season Stikine River sockeye run size estimate was 120,000 fish. Sockeye escapement to Tahltan Lake was below goal, while escapements to the mainstem system were above goal. Sockeye salmon escapement to local island systems was good to excellent. Escapement of Chinook salmon to Stikine River is expected to be within the goal range of 14,000 to 28,000 fish.

Management of the Districts 106 and 108 gillnet fisheries continued to be based on pink salmon abundance in the two day opening beginning August 19 (week 34). Effort decreased in District 106 and remained steady in District 108. Recent aerial surveys of Districts 106 indicate that pink salmon abundance is lower than expected for this time of year in some of the systems in the Sumner Strait and Prince of Wales Island. With poor catch performance and some lagging escapements, management continued with conservative measures during the next opener.

Both districts opened for two days on August 26 (week 35). Harvest rates for wild coho salmon trended above average for most of the year to date. Initial harvest reports for coho salmon from week 35 were above average.

Management focus for the Districts 106 and 108 gillnet fisheries transitioned from pink salmon abundance to wild coho salmon abundance for the three day opening on September 2 (week 36). Harvest rates for wild coho salmon trended above average for the past couple of openers. Initial harvest reports for coho salmon were near average for both districts. The peak of the return for wild coho salmon was expected in the near future in Districts 106 and 108, which for the past ten years has occurred early or mid September. The hatchery component of the harvest was expected to increase steadily during the next few weeks.

Both districts opened for three days on September 9 (week 37). Effort remained the same in both districts. Catch rates for coho salmon were above average in District 108, while below average in District 106.

Management of the Districts 106 and 108 gillnet fisheries for the opening on September 16 (week 38) was based on wild coho salmon abundance. Both districts opened for 72 hours and effort continued to be below average. Harvest rates for coho salmon were average overall. The hatchery component was higher than average for much of the fall. During the past few weeks, the wild component was below average and that the trend was expected to continue. Both fisheries closed after a two day opening in week 39.

Table 6. Weekly salmon catch in the Alaskan District 106 commercial drift gillnet fisheries, 2012. Catches do not include Blind Slough terminal area harvests.

Week	Start Date	Chinook	Sockeye	Coho	Pink	Chum	Permits	Days	Permit Days
25	18-Jun	596	3,655	3,211	172	2,980	49	2	98
26	24-Jun	269	3,989	4,642	170	6,908	50	2	100
27	1-Jul	250	7,341	7,428	2,629	18,393	47	3	141
28	8-Jul	147	5,767	5,156	3,855	17,139	33	3	99
29	15-Jul	191	9,145	6,868	3,378	13,035	29	3	87
30	22-Jul	157	9,773	12,764	16,372	16,757	41	3	123
31	29-Jul	55	2,805	7,173	14,243	5,747	42	3	126
32	5-Aug	26	1,717	5,422	45,187	6,891	51	3	153
33	12-Aug	33	973	6,907	30,271	3,922	58	3	174
34	19-Aug	36	340	4,338	6,524	2,191	40	2	80
35	26-Aug	27	96	8,065	5,464	3,614	56	2	112
36	2-Sep	40	30	18,109	1,472	3,740	70	3	210
37	9-Sep	13	13	11,786	105	1,590	66	3	198
38	16-Sep	11	21	16,892	14	1,310	57	3	171
39	23-Sep	2	1	2,827	0	227	29	2	58
Total		1,853	45,666	121,588	129,856	104,444	133	40	1,929
2002-2011 Average		1,472	98,499	144,534	267,420	193,427	157	49	2,822
2011 as % of Average		126%	46%	84%	49%	54%	85%	82%	68%

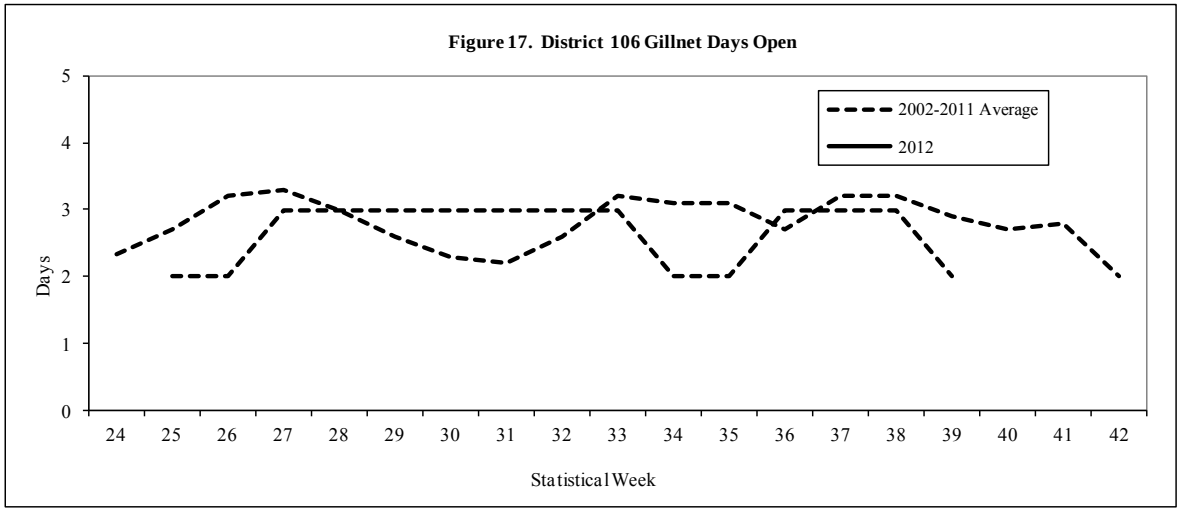


Figure 18. District 106 Gillnet Boats Fishing

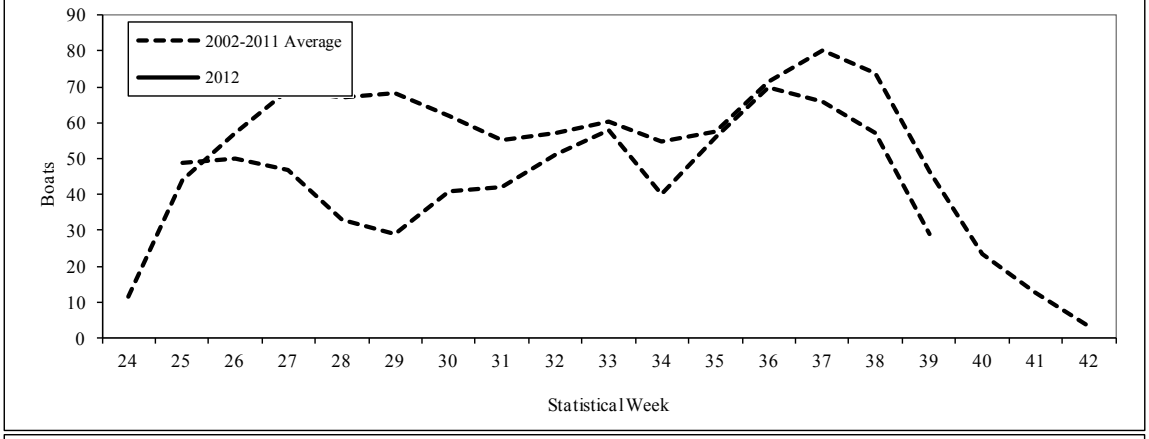


Figure 19. District 106 Gillnet Chinook Catch

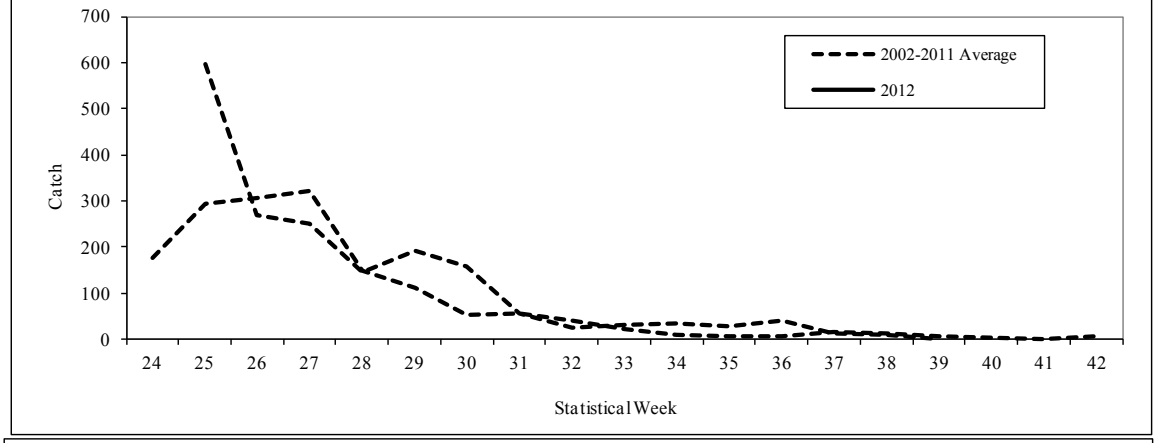


Figure 20. District 106 Gillnet Sockeye Catch

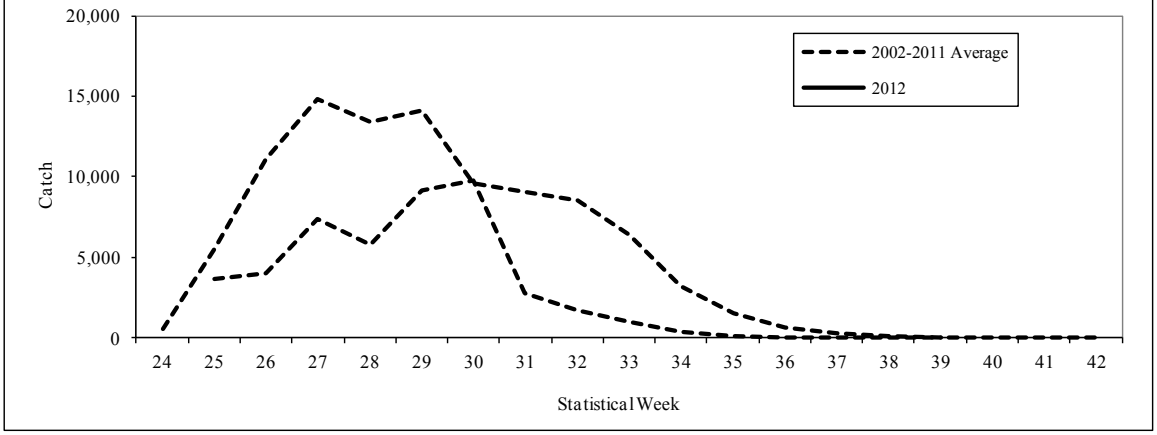


Figure 21. District 106 Gillnet Coho Catch

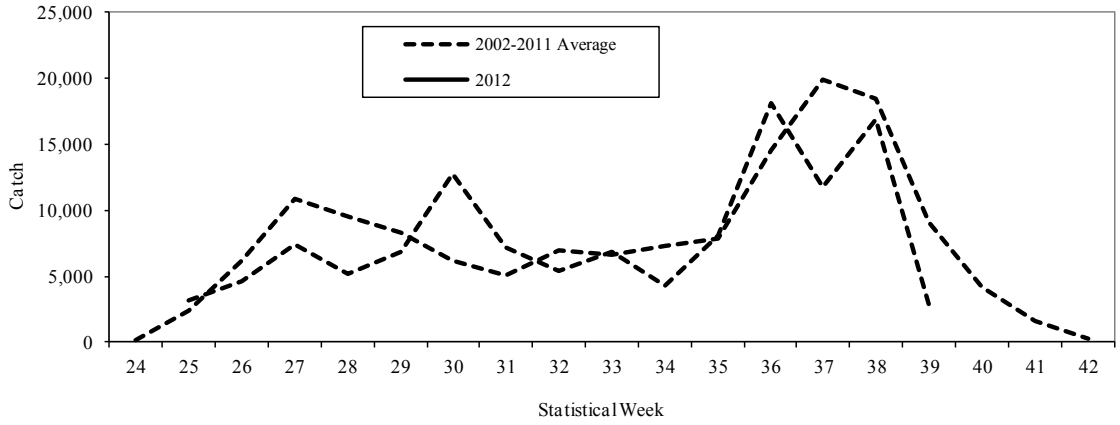


Figure 22. District 106 Gillnet Pink Catch

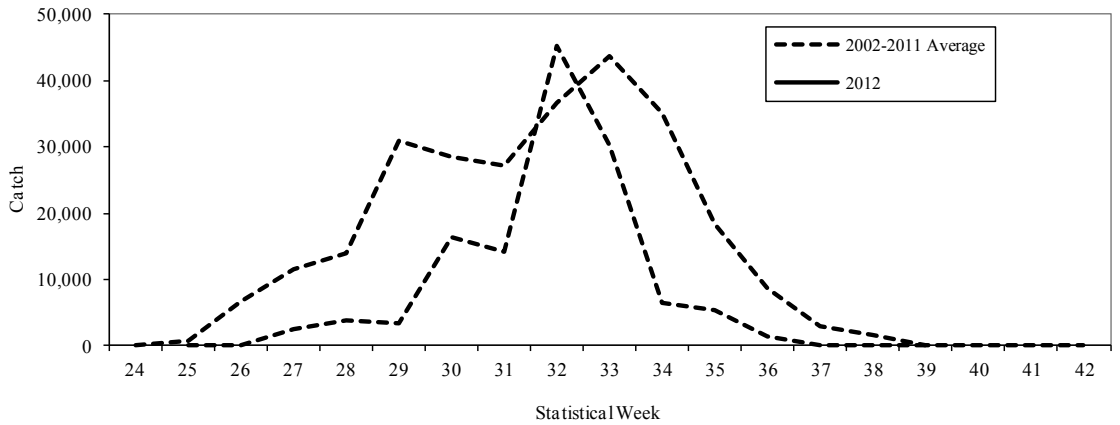


Figure 23. District 106 Gillnet Chum Catch

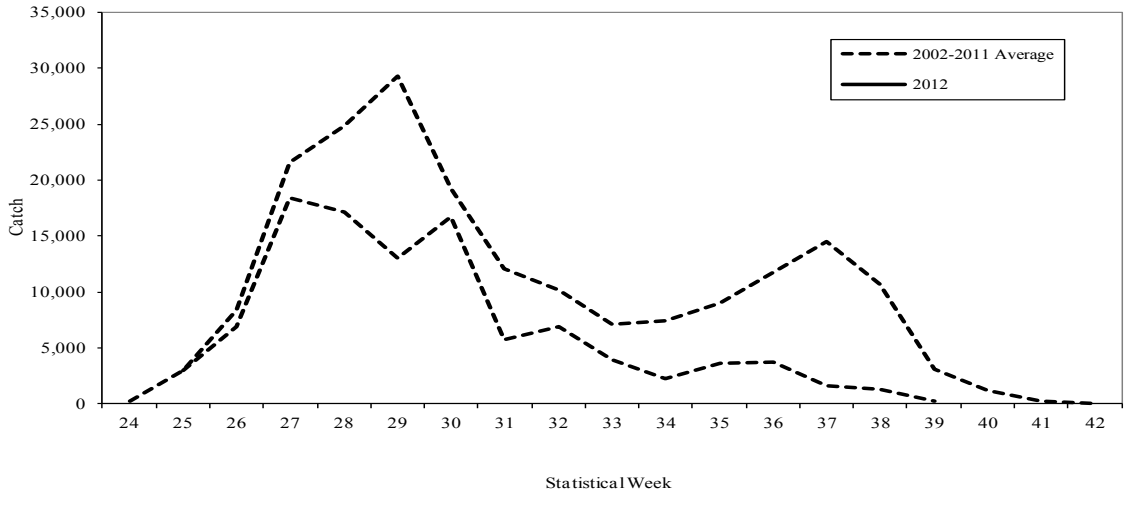


Table 7. Weekly salmon catch and effort in the Alaskan District 108 directed sockeye salmon commercial drift gillnet fishery, 2012[a]. The permit days are adjusted for boats that fished only the midweek openings.

Week	Start Date	Chinook	Sockeye	Coho	Pink	Chum	Permits	Days	Permit Days
25	18-Jun	2,602	3,182	173	1	555	49	2	98
26	24-Jun	2,509	2,763	101	8	2,330	48	2	96
27	1-Jul	1,133	4,176	306	196	15,276	37	3	111
28	8-Jul	706	3,866	998	386	48,811	53	3	159
29	15-Jul	309	3,443	464	541	68,334	62	3	186
30	22-Jul	96	3,115	392	1,884	50,534	64	3	192
31	29-Jul	31	846	686	3,876	40,485	65	3	195
32	5-Aug	21	307	915	5,044	9,539	39	3	117
33	12-Aug	16	171	1,710	3,035	2,233	20	3	60
34	19-Aug	27	50	1,841	544	1,258	26	2	52
35	26-Aug	30	61	3,337	805	609	34	2	68
36	2-Sep	61	5	3,248	53	290	30	3	90
37	9-Sep	27	4	2,102	1	259	27	3	81
38	16-Sep	9	0	3,517	0	47	19	3	57
39	23-Sep	0	0	310	0	6	9	2	18
Total		7,577	21,989	20,100	16,374	240,566	135	40	1,580
2002-2011 Average		4,328	53,333	31,185	47,295	122,914	130	48	2,391
2012 as % of Avg.		175%	41%	64%	35%	196%	104%	83%	66%

[a] The 2012 District 108 drift gillnet catch and effort, as well as the 2002-2011 averages, are for the directed sockeye salmon portion of the fishery only. In the 2012 directed Chinook salmon fishery, 44 drift gillnet boats harvested 450 Chinook salmon in one day openings in weeks 19-21 before the fishery was closed due to poor in-season indicators.

Figures 24-30 are for the directed sockeye salmon portion of the District 108 drift gillnet fishery only.

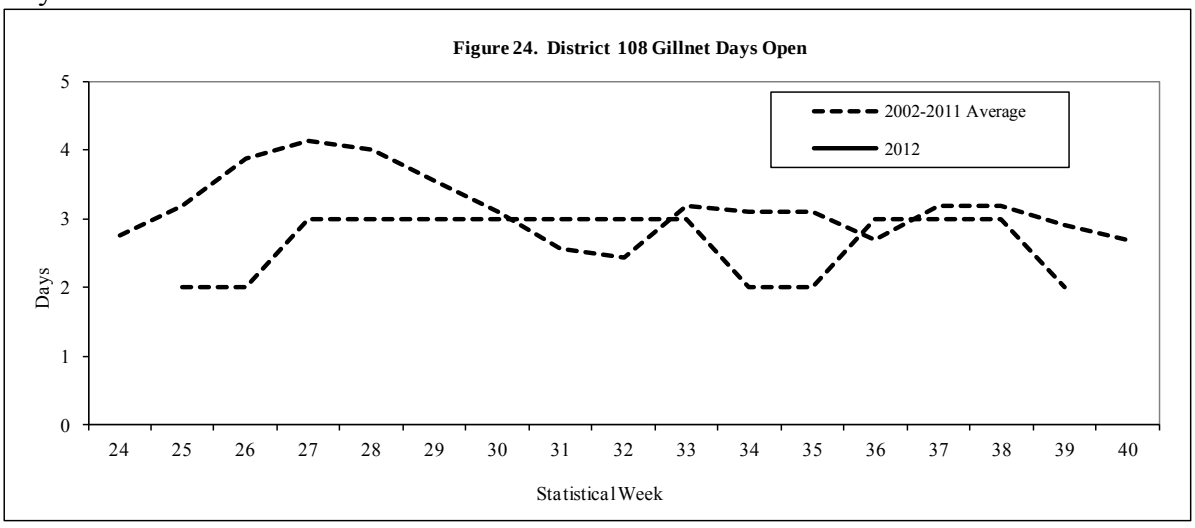


Figure 25. District 108 Gillnet Boats Fishing

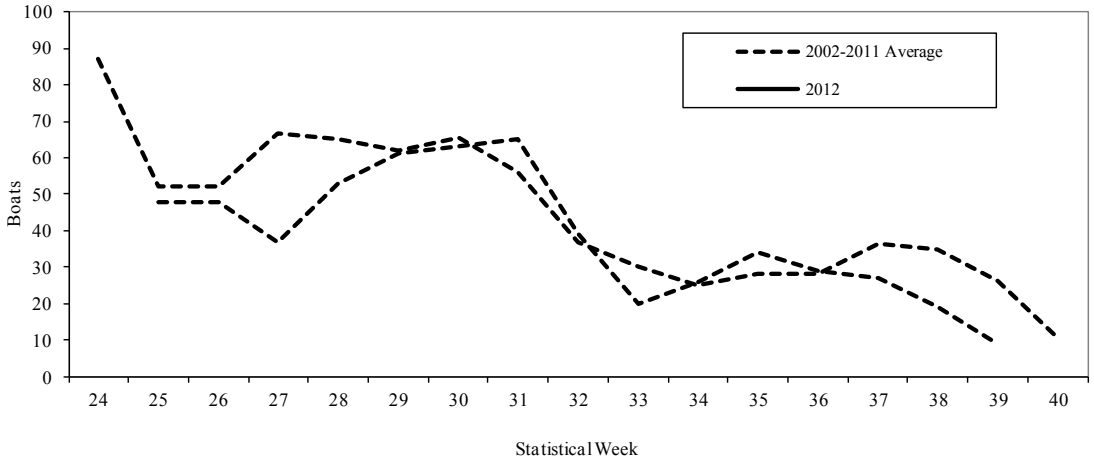


Figure 26. District 108 Gillnet Chinook Catch

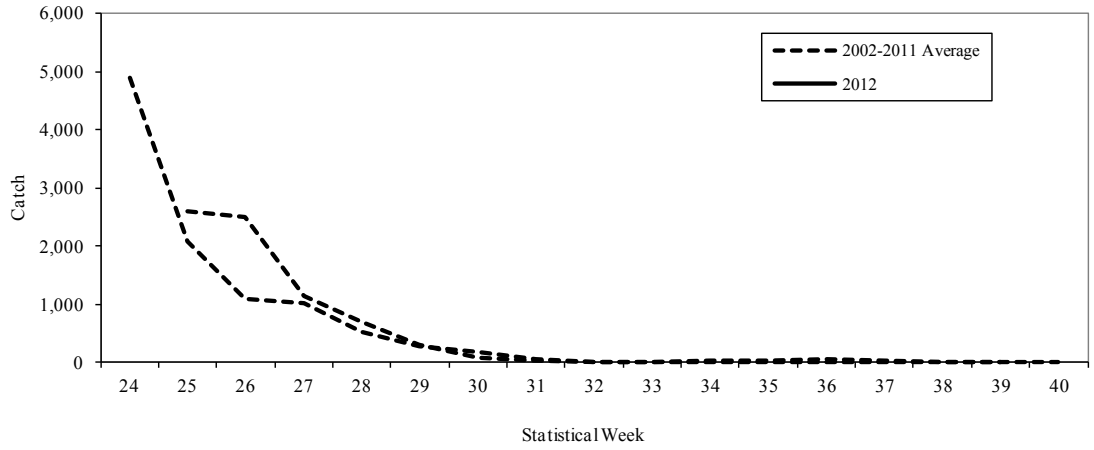


Figure 27. District 108 Gillnet Sockeye Catch

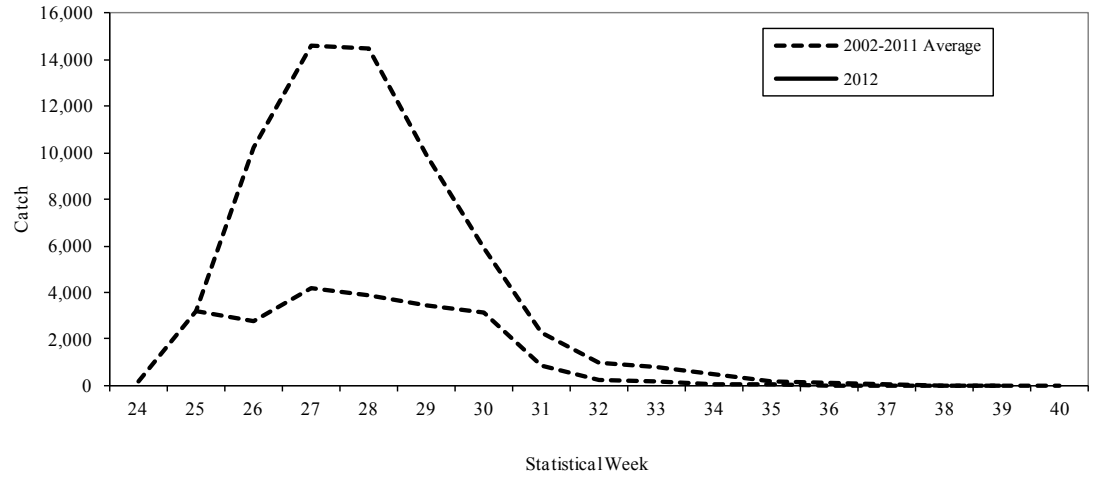


Figure 28. District 108 Gillnet Coho Catch

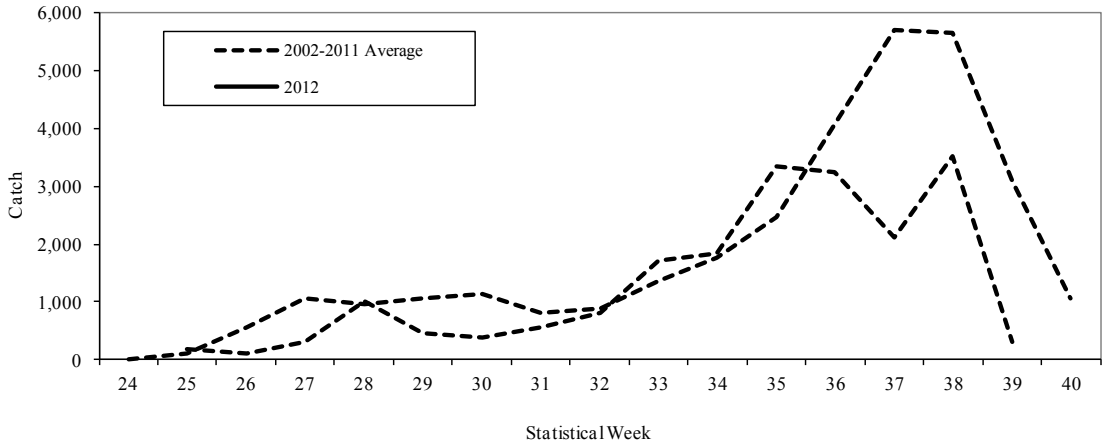


Figure 29. District 108 Gillnet Pink Catch

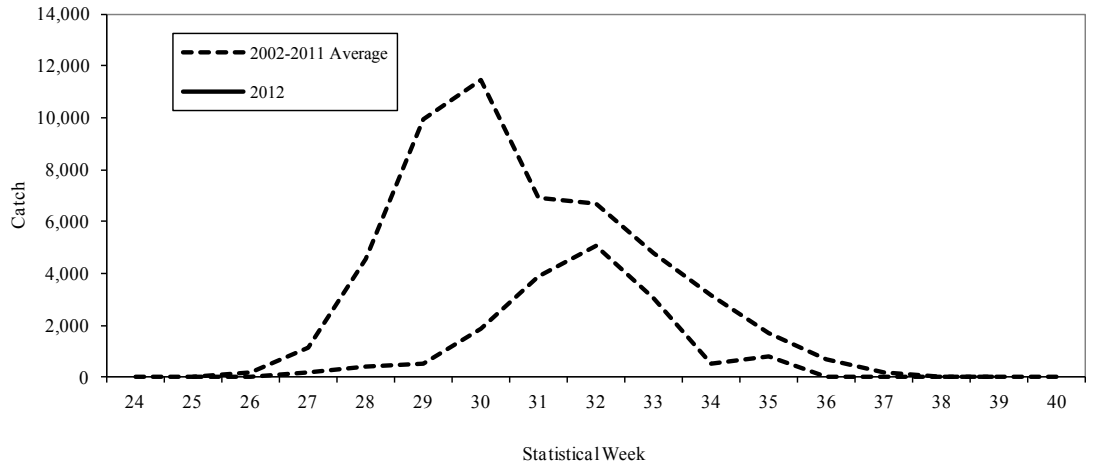
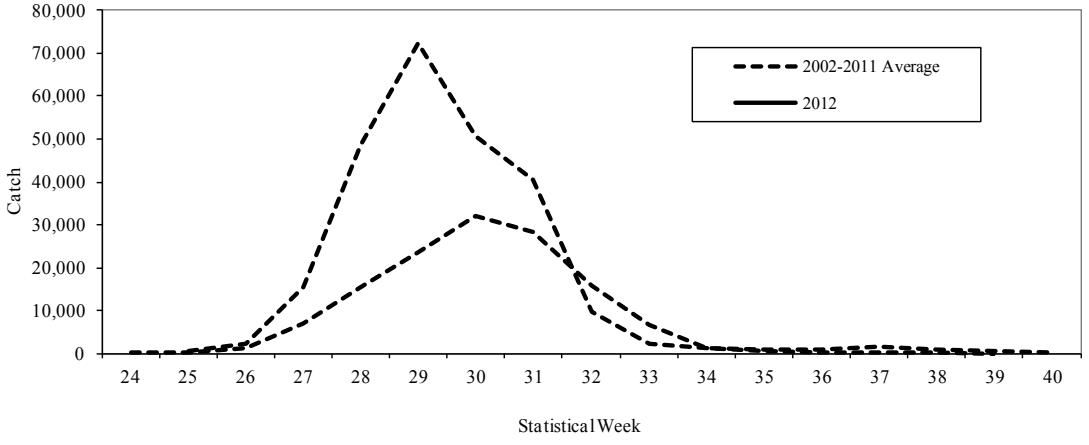


Figure 30. District 108 Gillnet Chum Catch



The weekly forecasts of run size and total allowable catch for Stikine River sockeye salmon as determined in-season by the Stikine Management Model, as well as the preliminary post season Stikine River sockeye salmon run reconstruction, were not available at the time this report was submitted.

Taku River Area Fisheries

The escapement goal range for large Taku River Chinook salmon is 19,000 to 36,000 fish with a point goal of 25,500 fish. The PST established base level catches of 1,500 and 3,500 large Chinook salmon for Canada and the U.S., respectively, that reflect the average harvests by each country between 1985 and 2003. In years of high abundance, directed fisheries can be implemented to harvest runs in excess of escapement needs.

For the Taku River, the 2012 preseason terminal run forecast was 48,036 large adult Chinook salmon allowing for a U.S. allowable catch (AC) of 6,703 fish. Drift gillnet fisheries were opened for 12 hours in both week 19 (May 6-12) and week 20 (May 13-19) and a total of 174 Chinook salmon were landed by 20 boats.

The AC is adjusted as in-season information on run strength becomes available. The first in-season estimate of Taku River Chinook salmon run strength was generated in week 20 and was considerably below the preseason forecast, providing no allowed catch for further fisheries. The third estimate of run strength was generated in week 22 and projected a terminal run size of 10,600 large Taku Chinook, well below forecast and the 19,000 fish minimum of the escapement goal range. The department continued to evaluate in-river stock assessment information as it became available. The traditional drift gillnet fishery in District 111 began on Sunday, June 17, 2012.

The preliminary District 111 harvest of Taku Chinook salmon was; 687 in the drift gillnet fishery, 8 in the troll fishery, 1,091 in the sport fishery, and 30 in the personal use fishery, for a total of 1,816, well below the base level catch of 3,500 fish.

Sockeye salmon returns to the Taku River in 2012 were expected to be slightly below the 10-year average terminal run size of approximately 218,000 sockeye salmon based on Canadian stock recruit and sibling forecasts Douglas Island Pink and Chum, Inc. (DIPAC) forecast 230,000 enhanced sockeye returning to Port Snettisham. DIPAC forecast a return of 1.2 million chum salmon to Gastineau Channel and Limestone Inlet, similar to recent seasons.

The initial District 111 opening directed on sockeye and chum salmon was for two days on Sunday September 17 (week 25) with area and gear restrictions in place to conserve Chinook salmon. Fishing effort was below average and harvests were below average for all species, with both sockeye and Chinook CPUE just over half the recent average. While chum CPUE was better, it was still below average. On the Taku River, the Canyon Island fish wheel cumulative sockeye catch was just over half of the ten year average to date, and daily catches were disappointing. The Canadian in-river fishery fished one day due to Chinook concerns, and their sockeye CPUE was close to the ten year average.

District 111 was open for 2 days in week 26 (beginning June 24) due to below average sockeye CPUE in the prior week fishery as well as mixed but weak in-river indicators. On the grounds surveys observed less than half of the average fleet size for the week. Catches for all species but chum salmon were below average, with the chum salmon harvest twice the average. CPUEs of Chinook and sockeye salmon were average, and the chum salmon CPUE was well above average for the week. The snowmelt driven high water on the Taku River hampered stock assessment activities, the Canyon Island fish wheel catches of sockeye salmon were well below the daily average, the Canadian in-river fishery was struggling with the high water as well resulting in insufficient data to generate an in-season estimate of sockeye salmon abundance.

District 111 opened for 2 days on July 1 (week 27). Effort was less than average and catches and CPUE for all species were below average as well. Water levels on the Taku River declined to levels optimal for fish wheel performance at Canyon Island but the sockeye catch, though improving, remained below the daily average.

District 111 was open for 2 days in week 28 (beginning July 8) effort as well as catches and for all species were below average. CPUE was below average for all but Chinook salmon which were average, and chum salmon which were nearly twice the average. Water levels on the Taku were good for fish wheel performance, yet the sockeye salmon catch remained about two thirds of the daily average. The weekly preliminary in-season estimate of above border sockeye abundance was still below average but had improved over the prior week.

District 111 was open for two days in week 29 (July 15), less than the average three day opening for this week. Fleet size was estimated equal to the average of 110 boats. Catches of coho and pink salmon were below average, catches of sockeye salmon were average, and the chum salmon catch was well above average. Catch per unit effort (CPUEs) were above average for sockeye, coho, and chum salmon, and below average for pink salmon. Water levels on the Taku continued at optimal levels for fish wheel performance yet the fish wheel sockeye catch remained below average. Preliminary analysis of otoliths from Taku Inlet suggested a strong presence of enhanced Snettisham sockeye in the catch.

With weak Taku sockeye indicators, uncertainty about wild Port Snettisham stocks, and a strong fleet in the area and nearby, District 111 opened for two days in statistical week 30 (July 22). A slightly above average sized fleet harvested twice the average number of sockeye salmon. No extension was given in Taku Inlet due to the uncertainty in the origin of the catch as the in-river indicators did not reflect the surge of sockeye salmon in the Taku River until the day the fishery closed. Indicators pointed to a stronger than recent years sockeye return to Port Snettisham, so the area south of Circle Point was extended an extra day with the mesh restriction in place to conserve wild Speel Lake sockeye. Chinook and coho catches were a third of average, chum catches were nearly twice average, and the pink catch was 150% of the average. A good show of sockeye salmon was observed in Crescent Lake and the high percentage of enhanced thermal marks in the otolith samples from Taku Inlet indicated good returns developing to Port Snettisham, but it was too early to tell if Speel Lake would also see a strong wild sockeye salmon return as both main parent years escapements were below the minimum of the escapement goal range.

With much improved Taku River and Port Snettisham sockeye indicators, District 111 was open for three days in statistical week 31 (July 29) with mesh restrictions south of Circle Point due to uncertainty regarding wild Speel Lake sockeye salmon. Pink salmon returns were developing adequately. Sockeye and pink harvests were about average while chum harvest was well above average.

In week 32 (August 5) the fishery was open for three days with a less than average sized fleet redistributed between sub-districts this week with 2/3s of the fleet now fishing south of Circle Point. Catches of sockeye salmon for the district were average with above average catch per unit effort (CPUE) driven by the good return of Snettisham Hatchery enhanced fish. Catches and CPUE of Chinook, coho and chum salmon were below average, and pink salmon continue strong with catches and CPUE well above average. Taku in-river sockeye salmon indicators continued to be close to average. The Speel Lake weir count was nearing 600 fish with a steady trickle of fish across each day. Jumps and schools of fish observed in Port Snettisham suggest a good build up of fish holding in those waters. Preliminary otolith analysis pointed to a high percentage of enhanced sockeye salmon in the catch.

With below average effort, average Taku river sockeye salmon indicators, adequately developing escapements to wild Port Snettisham sockeye systems, District 111 was open for three days in statistical week 33 (August 13), with the waters of Port Snettisham closed to protect wild sockeye salmon holding in the area. A less than average 70 boats had fairly good sockeye salmon catches for this time of the season, and preliminary otolith analysis suggested over 40% of the sockeye harvest in Taku Inlet were Snettisham hatchery fish. The fleet shrank over the course of the fishery with 9 boats fishing at the time of the closure. Coho salmon catches were starting to pick up in Taku Inlet after being very poor for the early run. Canyon Island fishwheel catches of sockeye salmon were above average the last few days, but coho salmon catches remained below average, with a cumulative fishwheel count near 45% of the ten year average. Due to the Golden North Salmon Derby taking place in Juneau area waters the opening in both District 111 and District 115 were delayed until Monday noon. The Canadian in-river fishery had above average catch per unit effort (CPUE) for sockeye and slightly above average for coho salmon, enhanced by the lower water levels in the Taku River. A strong push of sockeye salmon at the Snettisham Hatchery alleviated broodstock concerns, and a similar push at Speel Lake brought the escapement up to half of the 4,000 fish minimum.

District 111 shifts to coho salmon management in statistical week 34 (August 19) and with poor fishwheel catches and mixed in-river fishery indicators the fishery was open for a conservative two days. An above average fleet harvested average numbers of sockeye salmon and below average numbers of the other species of salmon. Catch per unit effort (CPUE) were average for sockeye salmon, near average for coho and chum salmon and below average for pink salmon. With the achievement of the minimum sockeye salmon escapement goal to Speel Lake, the Speel Arm Special Harvest Area opened to harvest returning Snettisham Hatchery sockeye salmon, with below anticipated catches. The small number of boats that began in Taku Inlet enjoyed decent coho salmon catches the first day, rapidly dropping off as the fleet leaving Port Snettisham moved in. The Canyon Island fish wheel coho salmon catches were improving and the first in-season estimate of coho salmon abundance projected an in-river run of 99,000 fish, approximately equal to the preseason forecast, and above the Pacific Salmon Treaty mandated minimum of 38,000 coho salmon be passed above border.

In week 35 (August 26) effort was about half of average for this week, with only a tiny fleet in Port Snettisham hoping for a good buildup of hatchery sockeye salmon. With very modest catches in Speel Arm, the sockeye salmon harvest and catch per unit effort (CPUE) was well below average. For the fleet fishing for coho salmon in Taku Inlet catches were decent. Total harvest was below average, but the small fleet's CPUE was over 150% of average for the week. Pink salmon have all but vanished with well below average harvest and CPUE, and the fall chum salmon are making a promising show with an average harvest and nearly twice the average CPUE. In-river indicators were mixed with fish wheel counts running below average, but that is expected with low water levels in the Taku River. The Canadian in-river fishery showed average CPUE for the week. At this point the Speel weir had passed 5,400 sockeye salmon with escapements within the 4-13 thousand fish escapement goal range. The weirs on the main Taku sockeye salmon lakes showed a variety of results, with the early timed Kuthai very poor, the mainstay Trapper nearly at the ten year average, and the later run Tatsamenie experiencing what appeared to be a robust return.

In week 36 (September 2) effort was again below average during the three day opening in District 111. With the low effort, catches of all species were below average, but the catch per unit effect (CPUE) of both coho and chum salmon were above average. Taku in-river coho salmon indicators continued to be mixed with Canyon Island fish wheel catches below average, but the Canadian in-river fishery coho salmon CPUE well above average. Both of these values were influenced by the low water levels in the Taku River which depress fish wheel catches and enhance in-river fishery catches.

In week 37 (September 9) District 111 was open for a below average three days. Effort was low, District 111 coho harvest rates were average, and in-river coho indicators continued to be mixed.

In week 38 District 111 (September 16) was open for three days. Effort, which was below average in the prior week declined further with most boats fishing only the first two days. Catches of both coho and chum salmon were below average, with coho catch per until effort (CPUE) below average and chum CPUE average. The Canyon Island fish wheels were demobilized for the season and only the Canadian test fishery remained as an in-river indicator, with CPUE above average. The most recent estimate of Taku coho salmon run strength indicated the Pacific Salmon Treaty (PST) mandated minimum passage of 38,000 coho salmon above border had been achieved, and projected an adequate escapement for the Taku River.

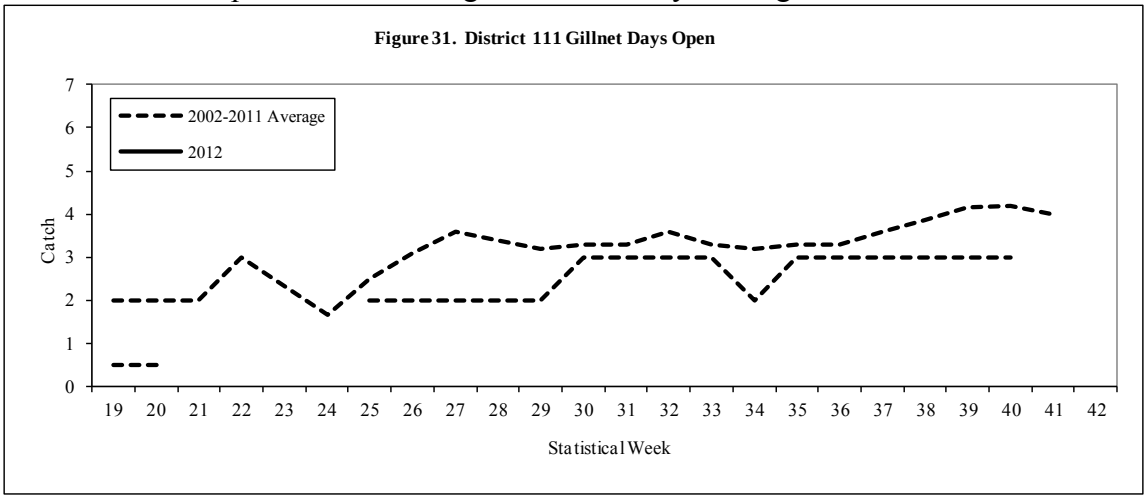
Below average three day a week openings of District 111 continued through week 40. The number of boats fishing, as well as the catch of coho salmon were below average for the remainder of the season.

Table 8. Weekly salmon harvest in the Alaskan District 111 traditional commercial drift gillnet fishery, 2012[a].

Stat. Week	Start Date	Chinook	Sockeye	Coho	Pink	Chum	Boats	Days	Boat Days
25	17-Jun	376	1,222	0	1	848	32	2	64
26	24-Jun	168	1,442	3	7	22,599	29	2	58
27	1-Jul	253	3,257	118	349	17,299	61	2	122
28	8-Jul	95	5,063	56	2,377	88,973	82	2	164
29	15-Jul	72	19,631	345	9,484	210,857	130	2	260
30	22-Jul	39	32,799	256	29,634	165,270	126	3	378
31	29-Jul	60	17,074	1,150	60,415	40,839	117	3	351
32	5-Aug	26	31,837	1,343	54,924	11,555	98	3	294
33	13-Aug	17	10,689	6,133	32,223	5,407	102	3	306
34	19-Aug	1	2,058	2,095	2,585	1,108	54	2	108
35	26-Aug	0	352	3,306	101	612	35	3	105
36	2-Sep	0	126	5,082	14	768	32	3	96
37	9-Sep	2	5	1,493	0	131	19	3	57
38	16-Sep	0	4	1,395	0	51	15	3	45
39	23-Sep	0	0	704	0	10	8	3	24
40	30-Sep	0	0	187	0	8	5	3	15
Total		1,109	125,559	23,666	192,114	566,335	201	42	2,446
2002-2011 Average		1,548	129,882	37,509	142,478	444,515	180	57	3,226
2012 as % of average		72%	97%	63%	135%	127%	112%	74%	76%

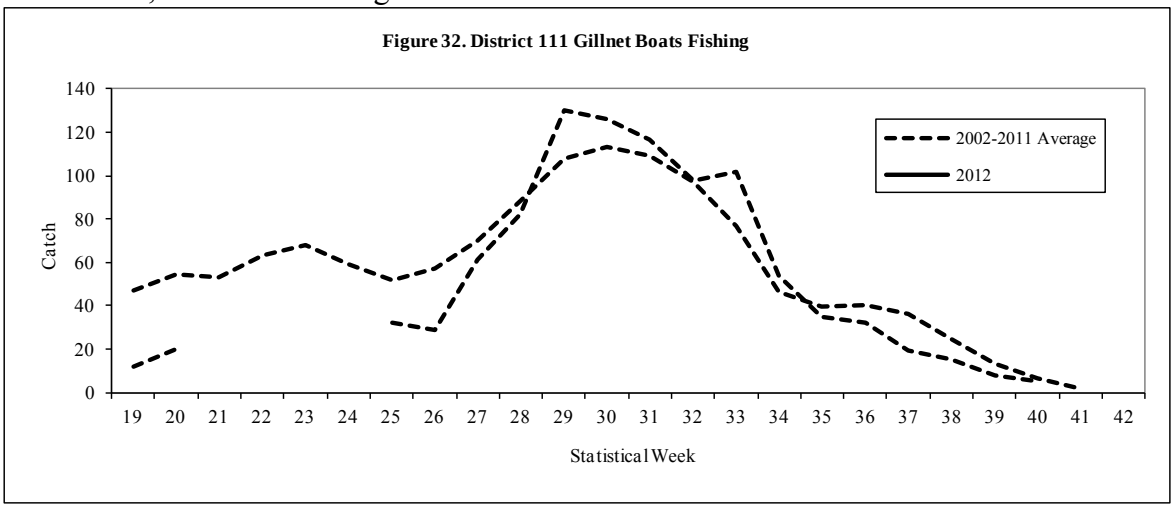
[a] The 2012 District 111 drift gillnet catch and effort, as well as the 2002-2011 averages, are for the directed sockeye salmon portion of the fishery only. In the 2012 directed Chinook salmon fishery, 25 drift gillnet boats harvested 174 Chinook salmon in 12-hour openings in weeks 19 and 20 before the fishery was closed due to poor in-season indicators.

District 111 was open a below average number of days throughout the season.



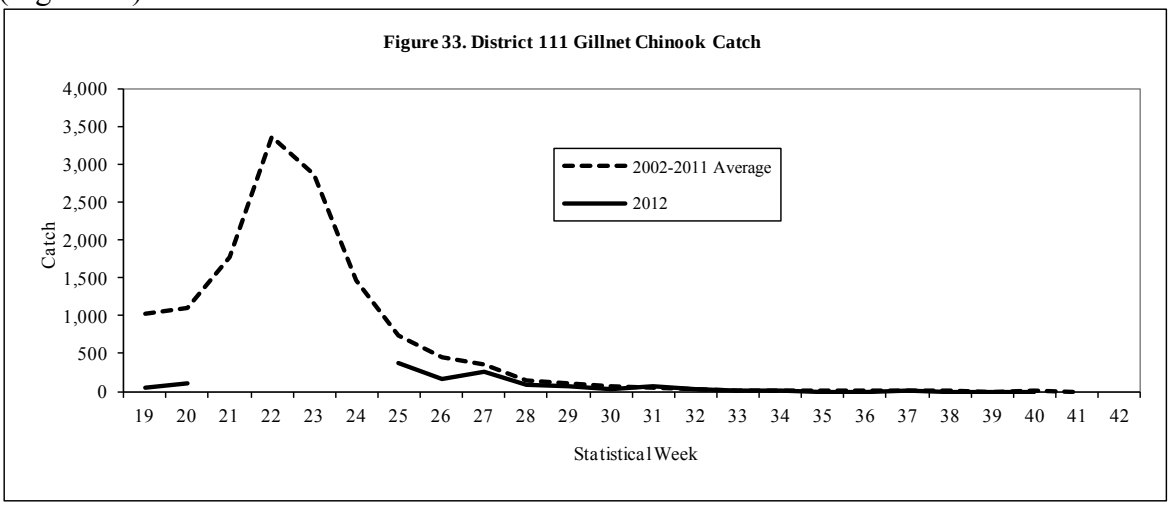
The number of boats fishing was below average through week 28 (July 15), above average from week 29-34, and below average for the remainder of the season.

Figure 32. District 111 Gillnet Boats Fishing



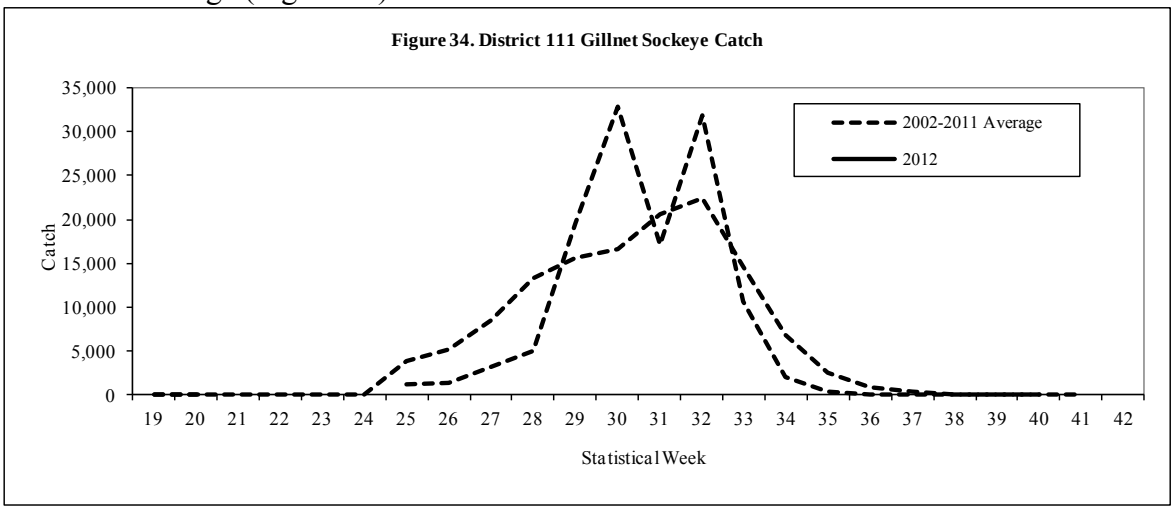
There were two directed Chinook openings in 2012 with a total catch of 174 fish prior to the first in-season forecast which did not allow directed fisheries to continue. In the directed sockeye portion of the fishery the catches of Chinook, including hatchery fish, was a below average 1,109 (Figure 33).

Figure 33. District 111 Gillnet Chinook Catch

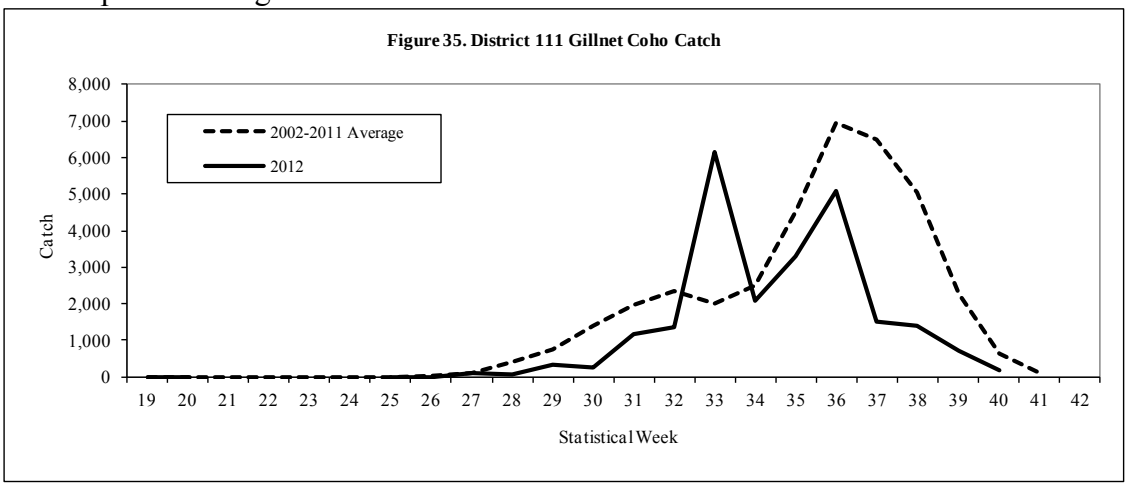


The 2012 wild Taku River sockeye salmon run reconstruction was not available at the time this report was submitted.

The 2012 sockeye catch in the District 111 drift gillnet fishery was 125,559 which is 97% of the 2002-2011 average (Figure 34).

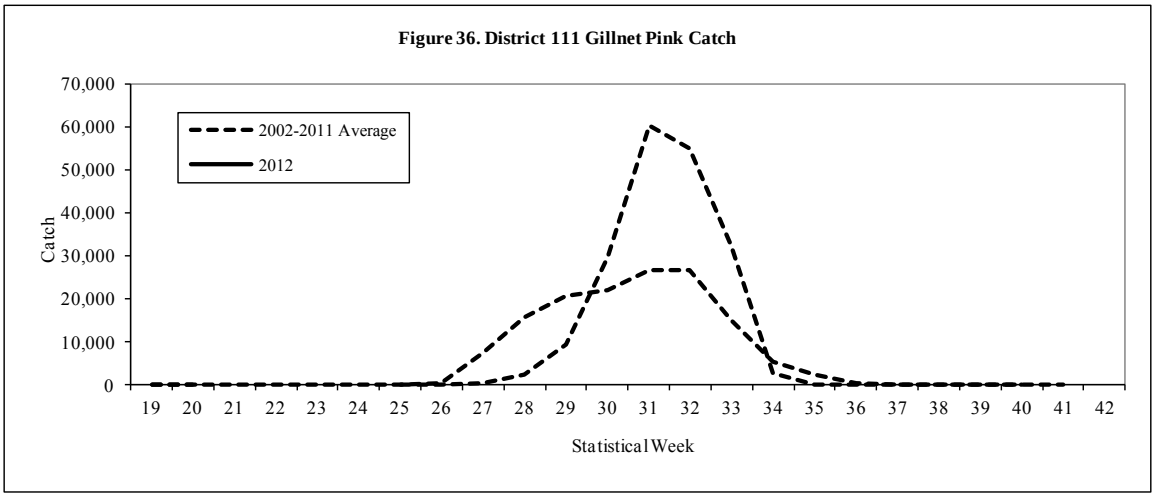


Coho stocks harvested in District 111 include runs to the Taku River, Port Snettisham, Stephens Passage, and local Juneau area streams as well as Alaskan hatcheries. The 2012 coho harvest of 23,666 fish was 63% of the 10-year (2002-2011) average (Figure 35). With the exception of week 33, coho catches were below average throughout the season. Approximately 78% of the coho were harvested in Taku Inlet, below the ten-year average of 82%); and 22% were harvested from Stephens Passage.

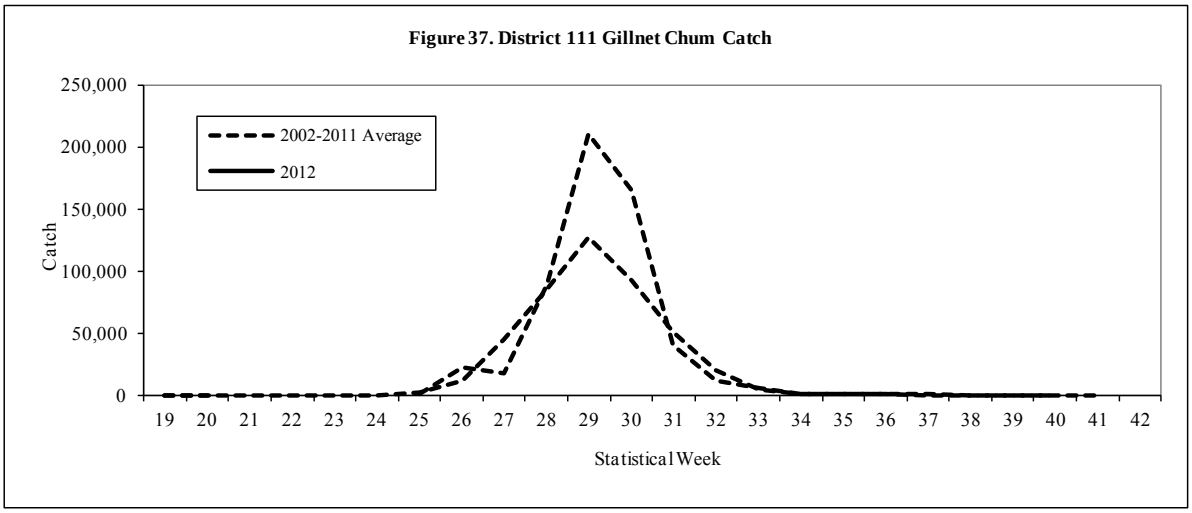


The 2011 District 111 pink salmon harvest of 192,114 fish was 135% of the ten-year (2002-2011) average (Figure 36).

The 2012 pink salmon escapement to the Taku River was unknown; however, the number of pink salmon passing through the fish wheels at Canyon Island is used as an index of escapement. The 2010 (parent year) Canyon Island pink salmon fish wheel catch was 8,868 fish. The 2012 Canyon Island pink salmon fish wheel catch of 5,826 was 60% below the 1992-2010 even-year average of 13,725.



The catch of 556,335 chum salmon was 127% of the ten-year (2002-2011) average, and was comprised almost entirely of summer run fish (Figure 37). The summer chum run is considered to last through mid-August (week 33) and is comprised mostly of domestic hatchery fish and small numbers of wild stocks. Chum salmon returning both to DIPAC hatcheries in Gastineau Channel and to the DIPAC remote release site at Limestone Inlet contributed a major portion of the harvest, but quantitative contribution estimates are not available. Approximately 58% of the District 111 chum harvest was taken in Taku Inlet, and 42% in Stephens Passage.



Chum salmon escapement numbers to the Taku River are unknown; however, the numbers of fall chum passing through the fish wheels at Canyon Island were used as an index of escapement. The index number for 2012, 224 chum salmon, is 106% of the 2002-2011 average for the same time period. Due to budget limitations, the Canyon Island fish wheel project ceased 2012 operations in mid-September, the earliest end date since 1986. Fall chum passage on the Taku River typically continues into October and historically, 26% of the Canyon Island chum salmon fish wheel catch occurs after the 2012 end date.

The harvest of 2,688 fall chum salmon (i.e. chum salmon caught after week 33) was 65% of the ten-year (2002-2011) average. Most of these chums are probably of wild Taku and Whiting River origin.

A number of Chinook salmon stocks are known to contribute to the Juneau area sport fishery, including those from the Taku, Chilkat, and King Salmon rivers, and local hatchery stocks, but the major contributor of large, wild mature fish is believed to be the Taku River. Preliminary estimates indicate that approximately 1,091 of the Chinook salmon harvested in the Juneau sport fishery were of Taku River origin (based on coded wire tag analysis and maturity data from onsite survey data).

Transboundary River Joint Enhancement

The transport of sockeye fry from the Snettisham Hatchery facility back to the Canadian lakes took place between May 25 and June 21, 2012. Spring, ice-out conditions and fry transport timing for the lakes was on-par with the past several years, with the exception of Tuya Lake, which was ten days later than the previous five-year average. Slightly over 5.6 million fry were released in the Canadian Tahltan, Tuya, and Tatsamenie Lakes.

All fry transported to Tahltan Lake were held in net pens for 24 hours prior to being released into the lake. Fry transported to the other two lakes (with the exception of the Tatsamenie "extended rearing group") were released directly from the aircraft into the lakes. Release of all Tatsamenie Lake fry occurred at the north end of the lake.

The Tatsamenie Lake extended rearing fry group was incubated and reared on heated water to achieve a 0.60 g weight goal. The heated water accelerated development during the incubation period facilitated early ponding as well as increased growth during the start-up rearing period. Growth and survival was good.

There were seven Tahltan Lake stock incubators of brood year 2011 fry lost to the IHN virus this season; resulting in a loss of 1.42 million fry. This is the fourth year in a row with IHNV losses and, while mildly disturbing; the losses due to this virus are consistent with Alaska's experience with sockeye culture.

Table 9. Summary of numbers and survival rates of Brood Year 2011 sockeye salmon fry released May-June 2012. Fish were raised at Snettisham Hatchery as part of the Transboundary River Salmon Enhancement Project.

Brood stock	Release site	Number of trips	Survival rate to eyed stage	Survival rate to release	Number released
Tahltan	Tuya Lk	4	86.4%	51.5%	1,596,000
Tahltan	Tahltan Lk	4	85.4%	62.8%	2,126,000
Tatsamenie	Upper Tats Lk	3	90.9%	85.5%	1,649,000
Tatsamenie	Extended rearing	2	93.5%	93.1%	244,000
	Average/Totals	13	87.2%	64.8%	5,615,000

Brood year 2012 TBR egg takes were initiated on August 31 at Tahltan Lake, September 15 at King Salmon Lake, and September 17 at Tatsamenie Lake. An estimated total of 7.5 million green eggs were collected from the three donor lakes.

Tahltan Lake egg takes were completed on September 28 with an estimated 5.24 million eggs in 12 egg lots. Based on assumed fecundities, the egg take goal for brood year 2012 was not met. Two lots of Tahltan eggs were delayed by one day and of another four lots by two days.

Tatsamenie Lake egg takes were completed on October 6 with an estimated 2.02 million eggs. A total of four lots were received at Snettisham Hatchery. The arrival of the Tatsamenie eggs was delayed by one day due to poor weather conditions.

Egg collection for the newly added King Salmon Lake program was conducted on September 15, and an estimated 234,000 eggs were received.

During the 2012 season, the ADF&G Thermal Mark Lab processed 19,085 sockeye otoliths collected by ADF&G and DFO staff as part of the U.S./Canada fry-planting evaluation program. These collections came from commercial and test fisheries in both U.S. and Canadian waters on the Taku and Stikine Rivers over an 11-week period. In addition, several escapement samples were examined. The laboratory provided estimates on hatchery contributions for 79 distinct sampling collections. Estimates of the percentage of hatchery fish contributed to commercial fishery catches were provided to ADF&G and DFO fishery managers 24 to 48 hours after samples arrived at the lab.

Alsek River Area Fisheries

Although harvest sharing arrangements of Alsek salmon stocks between Canada and the U.S. have not been specified, Annex IV of the Pacific Salmon Treaty does call for a cooperative attempt to rebuild depressed Chinook and early-run sockeye stocks.

Because the bottom end of the Chinook salmon escapement goal of 1,100 fish in place at the time of the fisheries was not attained in 2005 through 2008 the test fishery was suspended in 2009 and 2010 to facilitate Chinook salmon escapement. Escapements improved in the past three years and were within the desired objectives. The test fishery for Chinook salmon was conducted

again in 2012. The 2012 test fishery opened on May 21 (week 21) and closed on June 30 (week 26). A total of 251 Chinook salmon were harvested (harvest quota maximum of 500 fish).

The 2012 Chinook salmon run was expected to produce fish surplus to the Klukshu River escapement goal. The 2012 overall Alsek drainage sockeye salmon run was expected to be approximately 71,000 fish; this is well below the recent 10-year average of 80,500 fish. Recent sockeye and Chinook salmon returns have been below average, primarily due to poor marine survival, and this forecast was viewed with some caution. The principle contributing brood years were 2007 (Klukshu escapement of 8,956 sockeye salmon) and 2008 (Klukshu escapement of 2,731 sockeye salmon).

Both the early and late run segments of the Alsek sockeye run were above average in 2012. The current data pertinent to the escapement goal of 7,500 to 15,000 sockeye salmon through the Klukshu weir was recently re-examined and a new BEG was adopted in 2011. As a result of this analysis, Canadian and U.S. managers have set a spawning escapement goal range of 7,500 to 11,000 sockeye salmon. The Department of Fish and Game will manage the Alsek River commercial set gillnet fishery to achieve the agreed upon escapement goal range plus 3,000 sockeye salmon in accordance with the 2009–2018 agreement reached during the U.S./Canada Pacific Salmon Treaty (PST) negotiations in February 2008.

In 2012 the Alsek River commercial set gillnet fishery was managed traditionally by monitoring fishery performance data and comparing it to historical CPUE for a given opening to adjust time and area openings. The duration of weekly fishing periods were based on fishery performance data (CPUE) and Klukshu weir data. Historically, gillnets have been restricted to a maximum mesh size of 6 inches through July 1 to minimize Chinook salmon harvest. In 2012 there was no mesh restriction. Adjustments to in-season fishing regimes in the fisheries would be made if deemed necessary. Fishing times could be extended when CPUE warrants. The Alsek River surf fishing area is expected to be open during the same periods as the in-river fishery. The surf fishing area includes the shoreline, 0.75 of a mile in each direction, from the river mouth to the outermost bar where the surf breaks.

The Alsek River opened on June 3 (week 23) with a fishing period of one day. Nine permits harvested 59 Chinook and 110 sockeye salmon. The sockeye salmon CPUE of slightly over 13 fish per net is exactly average for statistical week 23.

The Alsek River opened on June 10 (week 24). Sockeye salmon CPUE was well above the historical average, and the fishing period was extended from one to two days. Thirteen permits harvested 123 Chinook and 1,508 sockeye salmon.

In week 25, for the second week in a row, sockeye salmon CPUE was well above average for the Alsek River, and the fishing period beginning June 17 was extended to two days. Twelve permits harvested 234 Chinook and 2,393 sockeye salmon.

In week 26 the sockeye salmon CPUE continued to be well above average for the Alsek River, and the fishing period was again extended to two days. Eleven permits harvested 52 Chinook and 2,563 sockeye salmon. The river was experiencing a major flood event.

In week 27 (July 1) the sockeye salmon CPUE continued to be well above average for the Alsek River, and the fishing period was extended to two days. Thirteen permits harvested 32 Chinook and 4,163 sockeye salmon. The Alsek remained in flood stage.

In week 28, for the fifth week in a row sockeye salmon CPUE was well above average for the Alsek River, and the fishing period was extended for one day. 13 permits harvested 9 Chinook and 4,755 sockeye salmon. The Alsek remained in flood stage.

In week 29 (July 15) sockeye salmon catch per unit effort (CPUE) was below average for the Alsek River for the first time since the first week of the season, and the fishing period was limited to one day this week. Eleven permits harvested 1 Chinook and 979 sockeye salmon. No Chinook salmon were harvested after week 29.

In week 30 (July 22) sockeye salmon catch per unit effort (CPUE) remained below average for the Alsek River for the second week in a row, and the fishing period remained at one day this week. Nine permits harvested 930 sockeye salmon.

For the remainder of the season the number of permits fishing on the Alsek River declined as did the catch of sockeye salmon. The season total catch of coho salmon was 24% of the 2002-2011 average (Table 10). The number of permits fishing, days open, and permit-days were all below average.

Table 10. Weekly fishing effort and salmon harvest for Alsek River, 2012.

							Effort		
Statistical	Start	Catch							Permit
Week	Date	Chinook	Sockeye	Coho	Pink	Chum	Permits	Days	Days
23	3-Jun	59	110	0	0	0	9	1	9
24	10-Jun	123	1,508	0	0	0	13	2	26
25	17-Jun	234	2,393	0	0	0	12	2	24
26	24-Jun	52	2,563	0	0	0	12	2	24
27	1-Jul	32	4,163	4	0	0	13	2	26
28	8-Jul	9	4,755	0	0	0	13	2	13
29	15-Jul	1	979	1	0	0	11	1	11
30	22-Jul	0	1,082	0	0	0	10	1	10
31	29-Jul	0	210	0	0	0	4	1	4
32-34	5-Aug	0	448	89	0	0	5	7	13
35-36	26-Aug	0	6	442	0	1	5	6	15
Total		510	18,217	536	0	1	16	26	175
2002-2011 Avg.		506	16,441	2,370	0	5	19	36	242
2012 as % of Avg.		101%	110%	24%	0%	22%	86%	74%	72%

*Weeks with fewer than three permits, confidential information so data combined in catch table.

SOUTHEAST ALASKA CHINOOK SALMON FISHERY

All Gear Harvest

The Chinook Technical Committee (CTC) of the PSC determined that the Chinook abundance index for Southeast Alaska for 2012 is 1.52. This abundance index equated to an all gear quota of 266,800 Treaty Chinook salmon, which is about 28,000 fish fewer than the 2011 quota.

This was the fourth year that the Annex IV, Chapter 3 provisions of the 2009 PST agreement were implemented. Therefore, the harvest allocation for SEAK reflects a 15% reduction in allowable catch from that allowed under the 1999 PST Agreement. The preliminary estimated total Chinook salmon harvest, including Alaskan hatchery fish, by all Southeast Alaska commercial fisheries was 249,022 fish, and the preliminary sport fish harvest was 46,520, for an all-gear total harvest of 295,542 (Table 11). The preliminary all-gear treaty harvest was 241,118 fish, 9.6% below the all-gear treaty quota of 266,800.

Table 11. Preliminary estimated all-gear Chinook salmon harvests in 2012**.**

2012 Preliminary Estimated All-Gear Chinook Salmon Harvests								
Gear	**Total Harvest**	**AK Hatchery Harvest**	**Wild Terminal Exclusion**	**Alaska Hatchery Add-on**	**Treaty Harvest**	**Quota**	**O/U**	**% O/U**
Troll	209,366	21,237	343	17,184	191,839	197,272	-5,433	-2.75%
Purse Seine	21,107	15,264	0	15,113	5,994	11,472	-5,478	-47.75%
Drift Gillnet	18,309	12,232	968	10,750	6,591	7,737	-1,146	-14.81%
Set Net	240	0	0	0	240	1,000	-760	-76.00%
Total Net	39,656	27,496	968	25,863	12,825	20,209	-7,384	-36.5%
Total All Commercial Gear	249,022	48,733	1,311	43,047	204,664	217,481	-12,817	-5.9%
Sport	46,520	11,700	0	10,066	36,454	49,318	-12,864	-26.08%
Total All Gear	***295,542***	***60,433***	***1,311***	***53,113***	***241,118***	***266,799***	***-25,681***	***-9.63%***

Note: Annette Island and terminal area harvests are included

Table 12. Chinook all-gear harvests[1] in Southeast Alaska, 1987 to 2012, and deviation from the ceiling for years for which there were ceilings. Harvests are in thousands.

Year	Total Harvest	Add-on and Exclusion Harvest	Target Treaty Harvest	Treaty Harvest	Deviation Number	Deviation Percent
1987	282.4	17.1	263	265.3	2.3	0.9%
1988	279.3	22.5	263	256.8	-7.8	-3.0%
1989	291	21.5	263	269.5	6.5	2.5%
1990	366.9	45.9	302	321	19	6.3%
1991	359.5	61.5	273	298	25	9.2%
1992	258.8	36.8	227.4	222	-5.4	-2.4%
1993	304.1	32.9	263	271.2	8.2	3.1%
1994	264.4	29.2	240	235.2	-4.8	-2.0%
1995	235.7	58.8		176.9		
1996	236.3	81.3		155		
1997	343	56.3		286.7		
1998	270.6	27.4	260	243.2	-16.8	-6.5%
1999	251	52.2	184.2	198.8	14.6	7.9%
2000	263.3	76.8	178.5	186.5	8	4.5%
2001	265.7	78.8	250.3	186.9	-63.4	-25.3%
2002	426.5	69.4	371.9	357.1	-14.8	-4.0%
2003	439.4	59.3	439.6	380.2	-59.5	-13.5%
2004	506.2	82.2	418.3	417	-1.3	-0.3%
2005	469.6	105.8	416.4	390.8	3.4	0.9%
2006	438.5	75.8	354.5	362.7	8.1	2.3%
2007	406.9	77.5	259.2	329.4	70.2	27.1%
2008	247.3	74	170	173.3	20.5	13.4%
2009	299.3	68.9	218.8	230.5	11.7	5.3%
2010	287.5	55.9	221.8	231.6	9.8	4.4%
2011	358.4	68.1	294.8	290.3	-4.5	-1.5%
2012	295.5	54.4	266.8	241.1	-25.7	-9.6%

[1] The actual target harvest and deviation cannot be calculated until the CTC completes the postseason calibration.

[2] The 2007-2011 exclusion harvests are still preliminary pending genetic stock composition estimates of the District 108 and District 111 fisheries.

Troll Fishery

The accounting of treaty Chinook salmon harvested by trollers begins with the winter fishery and ends with the summer fishery. The winter troll fishery is managed for a guideline harvest level (GHL) of 45,000 Chinook salmon established by the Alaska Board of Fisheries. The 2011-2012 winter troll fishery was open from October 11, 2011 through April 27, 2012 and harvested a total of 47,902 Chinook salmon. Of these, 12.3% (5,897) were of Alaska hatchery origin, of which 4,822 counted toward the Alaska hatchery add-on, resulting in a treaty catch of 43,080 (Table 13). The 2011-2012 winter fishery closed three days early, on April 27, due primarily to increased catch rates and effort during the last three weeks of the fishery.

The spring troll fisheries target Alaskan hatchery-produced Chinook salmon and are conducted along migration routes or close to hatchery and release sites. Terminal area fisheries, which begin during the spring, occur directly in front of hatcheries or at remote release sites. While there is no ceiling on the number of Chinook salmon harvested in the spring fisheries, the take of treaty Chinook salmon is limited according to the percentage of the Alaskan hatchery fish taken in the fishery. In 2012, spring troll fisheries were conducted from May 1–June 30 in a total of 31 spring areas and six terminal area fisheries. The combined spring and terminal troll harvest was 25,549 Chinook salmon, the Alaska hatchery catch was 10,358 (41%) of which 8,446 counted toward the Alaska hatchery add-on, resulting in a treaty harvest of 16,760 (Table 13).

The 2012 summer troll fishery included two Chinook salmon retention periods. From July 1–9, a total of 61,667 Chinook salmon were harvested, of which 1,814 (3%) were of Alaskan hatchery origin with 1,457 counted toward the Alaska hatchery add-on, resulting in a treaty catch of 60,210 fish.

In the second summer retention period, from August 11 to September 8, a total of 74,249 Chinook salmon were harvested, of which 3,169 (4%) were of Alaskan hatchery origin and 2,545 counted toward the Alaska hatchery add-on, resulting in a treaty harvest of 71,704 fish.

The total of 135,927 Chinook salmon were harvested in the summer troll fishery, of which 4,983 were of Alaskan hatchery origin and 4,002 counted toward the Alaska hatchery add-on, resulting in a treaty harvest of 131,839. A total of 1,012 permits participated in the summer fishery,

The total harvest for all troll fisheries in the 2012 accounting year was 209,366 Chinook salmon, with 191,839 counting as treaty harvest.

Table 13. Preliminary 2012 troll fishery Chinook salmon harvest by season.

Gear/Fishery	Total Harvest	Alaska Hatchery Harvest	Alaska Hatchery Add-on	Terminal Exclusion Harvest	Total Term. Exclusion/ Alaska Hatchery Add-on	Treaty Harvest
Winter Troll	47,888	5,897	4,736	0	4,736	43,153
Spring Troll	25,549	10,358	8,446	343	8,789	16,760
Summer Troll						
First Period	61,667	1,814	1,457	0	1,457	60,210
Second Period	74,249	3,169	2,545	0	2,545	71,704
Summer Total	135,927	4,983	4,002	0	4,002	131,839
Total Traditional Troll	209,364	21,237	17,184	343	17,527	191,837
Annette Is. Troll	2	0	0	0	0	2
Total Troll Catch	**209,366**	**21,237**	**17,184**	**343**	**17,527**	**191,839**

Note: The Alaska hatchery add-on and treaty numbers will be revised when 2012 sport catch estimates are received.

Net Fisheries

With the exception of directed gillnet harvests of Chinook in SEAK terminal area regulatory Districts 108 and 111 targeting Chinook as provided in the Transboundary river agreement (Chapter 1), harvests of Chinook salmon in the net fisheries are primarily incidental to the harvest of other species and only constituted a small fraction (<1.0%) of the total net harvest of all species.

For the Taku River, the 2012 preseason terminal run forecast was 48,036 large adult Chinook salmon allowing for a U.S. allowable catch (AC) of 6,703 fish. Drift gillnet fisheries were opened for 12 hours in both week 19 (May 6-12) and week 20 (May 13-19) and a total of 174 Chinook salmon were landed by 20 boats. The AC was adjusted as in-season information on run strength became available. The first in-season estimate of Taku River Chinook salmon run strength was generated in week 20 and was considerably below the preseason forecast, providing no allowed catch for further fisheries. The third estimate of run strength was generated in week 22 and projected a terminal run size of 10,600 large Taku Chinook, well below forecast and the 19,000 fish minimum of the escapement goal range.

The preseason forecast for Chinook salmon returning to the Stikine River was approximately 40,800 fish. The resulting U.S. AC was 5,890 large Stikine Chinook salmon. This forecast was above the midpoint of the escapement goal range of 21,000 large Chinook upon which the preseason harvest allocations are based. A directed Stikine River Chinook salmon commercial fishery began May 7 in District 108 in 2012 and was the first directed U.S. commercial fishery for Stikine River Chinook salmon since 2008.

The directed Chinook salmon fishery in District 108 was open for one day each week in weeks 19-21, harvests were weaker than anticipated with a total catch for this period of 450 fish. The first in-season forecast of 29,300 Stikine River Chinook salmon was substantially less than the preseason forecast and resulted in a U.S. allowable catch too small to allow further directed commercial fisheries and the district was closed until the beginning of the sockeye salmon fishing season.

Preliminary harvest of treaty Chinook salmon in the Southeast Alaska seine fisheries was 5,994 fish.

Recreational Fisheries

The preseason abundance index generated for the SEAK AABM fishery in spring 2012 was 1.52, resulting in a preseason sport allocation of 48,318 treaty Chinook under the harvest management plan adopted by Alaska Board of Fisheries. Based on this pre-season AI and the SEAK King Salmon Management Plan, a sport fish angler was allowed to use two rods from October through March, the bag and possession limit for residents was three fish 28 inches or over in length and no annual limit, and for non-residents the bag and possession limit was two fish 28 inches or greater in length in May 2012 and one fish 28 inches or greater in length during April 2012 and from June 2012 through April 2013, with a 4 fish annual limit.

The 2012 recreational fishery had an estimated preliminary harvest of 46,520 Chinook salmon of which 36,681 counted as Treaty harvest. The final total and Treaty harvest in the sport fishery for 2012 will be available in late fall of 2013. Comparisons of the 2012 recreational fishery harvest with recent years indicate that the preliminary harvest of 46,520 fish is 26% below the recent five-year average and 33% below the recent ten-year average. The 2012 freshwater recreational fishery for Chinook salmon 20 inches or greater in length in the Situk River near Yakutat was closed all season due to low abundance of large fish, and Chinook salmon 20 inches or greater could not be removed from the water if incidentally caught. Onsite creel surveys indicated no large Chinook were harvested and a small number (<50 total) of Chinook less than 20 inches were harvested in 2012.

During 2012, genetic samples were collected from 3,752 large Chinook salmon (28 inches of greater in Total Length), 66 genetic samples from small Chinook salmon (under 28 inches in TL) in Terminal Harvest Areas (THAs), and 12 genetic samples were collected from small Chinook salmon harvested outside of THAs.

SOUTHEAST ALASKA COHO SALMON FISHERIES

Attachment B of the June 30, 1999 U.S.-Canada Agreement relating to the Pacific Salmon Treaty specifies provisions for in-season conservation and information sharing for northern boundary coho salmon. In 2012, troll CPUE in Area 6 in the early weeks of the fishery averaged 54, which was well above the highest boundary area conservation trigger of 22. The mid-July projection of region-wide total commercial harvest was greater than the 1.12 million trigger for an early region-wide troll closure, specified in Alaska Board of Fisheries regulation and the PST conservation agreement.

The 2012 all-gear catch of coho salmon totaled 2.06 million fish of which 1.88 million (91%) were taken in commercial fisheries (Table 14). The troll catch of 1.20 million fish was 81% of the 10-year average of 1.48 million fish and accounted for 64% of the commercial catch. Average weekly power troll wild coho CPUE was 2% below the 10-year average while overall region wild stock abundance was estimated at 5% below the 1982–2011 average. The purse seine harvest of coho salmon (280,100 fish) was 9% below the 10-year average while the drift gillnet harvest of 303,000 fish was 17% below average. The set gillnet harvest of 98,700 fish in the Yakutat area was 24% below the 10-year average, with 49% of the catch taken in the Situk-Ahrnklin Lagoon and 46% in the Tsiu River system. A very preliminary estimate of the Southeast Alaska sport catch (176,800 fish) was 35% below the 10-year average and accounted for 9% of the combined region catch (below the 10-year average of 11%).

Wild production accounted for 1.44 million fish (76%) in the commercial catch compared with a recent 10-year average of 1.84 million fish (80%). The hatchery percentage of the commercial catch (24%) was the 3rd highest on record after 2011 and 2002. Of the estimated hatchery contribution of 443,100 fish, over 99% originated from facilities in Southeast Alaska. Escapement counts and estimates were within or above goal in nearly all cases throughout the region. The combined peak count in the 14 surveyed streams in the Ketchikan area of 11,950 spawners was well above the goal of 4,250-8,500 spawners. The total escapement of 1,908 spawners to Hugh Smith Lake was the 5th consecutive annual escapement above the biological

goal range (500-1,600 spawners). The strong escapement to Hugh Smith Lake resulted from a low-to-moderate exploitation rate (preliminary estimate = 53%) on a total run estimated at 4,034 adults that was almost exactly equal to the historical (1982–2011) average. The estimated return was the product of slightly above-average smolt production (32,300 smolts) and slightly below-average marine survival (12.1%).

Marine survival was far below average for northern Southeast stocks. Survival for Auke Creek, the Berners River and the Chilkat River averaged 7.7% (range 5.3–10.3%) compared with a 10-year mean-average of 14.3%. Ford Arm Creek presmolts survived at a rate of 7.2% compared with a 10-year average of 11.5%. Exploitation rate estimates were low to moderate for all indicator stocks. The Ford Arm Creek stock was exploited at an estimated rate of 63%, slightly above the long-term average of 61%, with a below-average Alaska troll exploitation rate (47%) offset by the 3rd highest seine exploitation rate on record (14%). In contrast, the estimated all-gear exploitation rate on the Hugh Smith Lake stock of only 53% continued the trend toward lower all-gear exploitation rates for that system, from an average of 75% in the 1990s to 52% during 2000–2011. The Alaska troll fishery exploitation rate on the stock was only 20%, the 3rd lowest rate on record and well below the historical average of 35% during 1982–2011 and the decade peak average of 41% in the 1990s. The Alaska troll fishery exploitation rate on the Auke Creek stock was estimated at only 20% in 2012 compared with a 10-year average of 25% and a long-term average of 29%. The all-gear exploitation rate on that stock was estimated at 22% compared with a long-term average of 40%.

The 2012 region-wide summer troll coho fishery began on July 1. There was a mid-season closure during August 7-10 and the fishery was extended for 10 days past the September 20 in all areas except the northern inside migration corridor (to protect a weak wild coho returns to Lynn Canal streams).

Table 14. Coho salmon harvest in Southeast Alaska in 2012 by gear type (preliminary).

Gear Type	Harvest
Troll	1,200,900
Purse Seine	280,100
Drift Gillnet	303,000
Set Gillnet	98,700
Sport (marine and freshwater)	176,800
Total	2,059,500

PRELIMINARY 2012
CHINOOK AND COHO SALMON CATCHES IN WASHINGTON AND OREGON FISHERIES

Introduction

This report describes the conduct of United States (U.S.) fisheries of interest to the Pacific Salmon Commission (PSC) that occurred during 2012 in the area north of Cape Falcon, Oregon and south of the U.S./Canada border. These fisheries were conducted under pre-season management plans that were consistent with Annex IV of the Pacific Salmon Treaty (PST, 2008) including obligations defined within Chapter 3 for Chinook individual stock based management regimes (ISBM) and Chapter 5 for Southern Coho Management.

An overview of the Chinook and coho salmon conservation challenges facing managers during the 2012 pre-season planning process in this region is provided. The conduct of major fisheries is described, and estimates of landed catch, where available, are compared to pre-season catch limits or expectations for Chinook (Table 1) and Coho (Table 2). For perspective, catches for those fisheries since 2007 are also presented. Catch estimates for the 2012 fisheries are preliminary and subject to change. Estimates of spawning escapements and abundance of Coho and Chinook stocks are not available at this time.

Pre-season Planning

Pre-season planning for southern U.S. fisheries of interest to the PSC is a coordinated activity involving Tribal, State and Federal management entities, with the involvement of conservation and fishing interests. The Pacific Fisheries Management Council (PFMC) conducts a series of public meetings to consider options for ocean fishery season structures while the Tribes and States conduct government-to-government and public, open meetings throughout the region to construct and analyze season options for fisheries in the inside waters of the Columbia River, coastal Washington and Puget Sound. Participants in these various planning sessions evaluate the biological and socio-economic consequences of options for the outside (ocean) and inside (marine and freshwater) fisheries, including the anticipated impacts on U.S. southern origin stocks in fisheries conducted under the PST in Canada and Southeast Alaska. The final product is a complete set of fishery plans constructed to achieve conservation goals, domestic fishery objectives, and legal obligations including the PST, assuming fisheries are conducted as planned and pre-season abundance estimates are accurate.

Chinook Salmon Management:

Under the 2008 Pacific Salmon Treaty Agreement, southern U.S. fisheries are subject to the Individual Stock Based Management provisions of Annex IV, Chapter 3. These provisions require the non-ceiling index for aggregated Southern U.S. fisheries on Chinook stocks not achieving their management objectives to be no greater than 60% of the levels estimated for the 1979 – 1982 base period.

Conservation obligations associated with the U.S. Endangered Species Act (ESA) for threatened and endangered Chinook salmon stocks originating from Puget Sound and the

Columbia River have been more constraining to southern U.S. fisheries than PST obligations. Catch quotas for the 2012 U.S. ocean fisheries in the area north of Cape Falcon, Oregon, were defined by the impact limits on ESA-listed lower Columbia River natural tule fall Chinook stocks and the abundance of other healthy, harvestable stocks in the area. Puget Sound fishing seasons were structured to provide fishing opportunity on healthy salmon species or stocks within the impact limits defined for ESA-listed Puget Sound Chinook.

Coho Salmon Management:

During the pre-season planning process of 2012, Canadian fishery managers informed the U.S. that the Interior Fraser management unit was again expected to be in the *low* categorical abundance status, and U.S. fisheries were constrained to ensure that the exploitation rate on this management unit did not exceed 10.0% as defined by the PST Southern Coho Management Plan. All U.S. natural spawning Coho management units specified by the PST Southern Coho Management Plan were forecasted to be in moderate or abundant status.

The impact on natural Coho stocks of seasons and catch limits adopted for southern U.S. fisheries were predicted using the Fisheries Regulation Assessment Model (FRAM). The total exploitation rate on the Interior Fraser management unit was predicted to be 9.9% in Southern U.S. fisheries. Seasons and Coho quota levels for U.S. ocean fisheries were constrained primarily by the management objectives of ESA-listed lower Columbia River natural Coho, while limits to fisheries in northern Puget Sound and the Strait of Juan de Fuca were primarily constrained by management objectives for the Interior Fraser Coho management unit.

North of Cape Falcon Ocean Fisheries

Fisheries in this area are managed to meet conservation objectives for ESA listed stocks, natural stocks and brood stock goals for hatchery stocks. Within these stock management objectives, ocean fishing seasons are defined that meet legal requirements of Tribal treaties and allocations between Non-Tribal troll and sport fisheries. Ocean fishery seasons are also constructed to ensure a balance of opportunity for harvest with the inside fisheries. Lower Columbia River hatchery Coho and Columbia River hatchery fall Chinook have historically been the major stocks contributing to catches of ocean fisheries in the North of Cape Falcon area.

Chinook and Coho salmon catch quotas were defined for the 2012 ocean Tribal, Non-Tribal troll and sport fisheries. Ocean fishery quotas for Chinook salmon were defined by the total exploitation rate limit of 41% on ESA-listed lower Columbia River natural tule fall Chinook stocks in all fisheries. Ocean fishery quotas for Coho salmon were defined by the impact limits of ESA-listed lower Columbia River natural Coho, Interior Fraser Coho management units, and agreements that allocated the total allowable impacts between ocean and inside fisheries.

Non-Tribal Troll Fishery

Pre-season quota levels for the non-Tribal troll fisheries were 47,500 Chinook and 13,300 Coho (with healed ad-clip, hereinafter referred to as marked). The preliminary estimates of non-Tribal harvest in the 2012 North of Falcon troll fishery are 47,400 Chinook, (99% of the coast-wide quota), and 2,400 Coho (18% of the coast-wide quota). Trollers harvested 30,758 Chinook in the May 1 – June 30 Chinook-only fishery and the remaining 16,615 Chinook were

harvested in the all-species fishery between July 1 and September 15. The Coho catch represents harvest in a mark-selective fishery.

Tribal Troll Fishery

The Tribal troll fishery (also known as the Treaty troll fishery) was restricted due to conservation concerns for ESA listed Lower Columbia River tule Chinook and Mid-Hood Canal Chinook, setting the Chinook quota at 55,000. The Coho quota was constrained by management objectives for Interior Fraser Coho, creating a Coho quota of 47,500. The season was comprised of a May/June Chinook-directed fishery and a July 1 through September 15 all species fishery. The Chinook quota was split 50:50 between the two fisheries. The Chinook-directed fishery ran through all of May and June and took 96% of the 27,500 Chinook sub-quota. The Tribal trollers made 415 landings during this fishery. The all species fishery had an impact neutral transfer from the Chinook-directed fishery of 902 Chinook. This increased the sub-quota to 28,402 Chinook. The all-species fishery ran the entire period, taking 99% of the Chinook quota and 78% of the Coho quota. The season concluded with a total catch of 54,467 Chinook (99% of the quota) and 37,021 Coho (78% of the quota). The Tribes made 933 landings during the ocean Tribal troll season.

Sport Fisheries

Pre-season quotas for the sport fishery were 51,500 Chinook (non mark-selective equivalent of 47,500) and 69,720 marked Coho. The 51,500 Chinook quota included 8,000 in the June mark-selective fishery and 43,500 in the non-selective fishery. Preliminary total catch estimates for the ocean sport fisheries north of Cape Falcon were 35,300 Chinook (69% of the coast-wide quota) and 33,000 Coho (76% of the coast-wide quota). A description of the resulting season structure and catches by management area follows.

U.S./Canada border to Cape Falcon

Sport salmon fishing was open for all species except Coho from June 16 – 30 from the U.S./Canada border to the Queets River, from June 9 – 23 between the Queets River and Leadbetter Point, and from June 9 – 22 from Leadbetter Point to Cape Falcon operating under a coastwide quota of 8,000 marked Chinook. The catch estimate for the coastwide mark-selective sport fishery is 7,600 Chinook (95% of the quota). The Chinook minimum size limit was 24 inches.

Preliminary estimates of Chinook retained and the percentage of legal size Chinook encountered that were retained and released in the Chinook mark-selective sport fishery, June 9 – 30, 2012, for Areas 1-4 combined.

Chinook retained	Retained %	Released
7,600	69%	3,400

A detailed report of this fishery, including catch, effort and results of sampling and monitoring programs, will be available from the Washington Department of Fish and Wildlife in early 2013.

Columbia Ocean Area (including Oregon)

All-species salmon sport fishing opened in Ocean Area 1 (Columbia Ocean Area) on Saturday, June 23 with a quota of 34,860 marked Coho and a guideline of 11,100 Chinook. Beginning September 3, the fishery was non-selective for Coho (remaining sub-area Coho quota – 25,000 fish – was converted at an impact neutral rate to a non-selective Coho quota of 9,500). The fishery closed on its automatic closure date, September 30. The catch estimates for Area 1 are 7,500 Chinook (68% of the guideline) and 10,000 Coho during the selective portion of the fishery (27% of the mark-selective quota). An additional 1,300 Chinook were harvested

in the spring mark-selective fishery. The Chinook minimum size limit was 24 inches, with a sub-area closure in the Columbia Control Zone.

Preliminary estimates of Coho encounters (retained and released), and mark rate in the Area 1 Coho mark-selective sport fishery, June 23 – September 2, 2012.			
Coho retained	Coho released	Total encounters	Mark %
10,000	16,100	26,100	38%

Westport

Ocean Area 2 (Westport) opened for all-species salmon sport fishing on Sunday, June 24 with a quota of 25,800 marked Coho and a guideline of 25,600 Chinook. Beginning September 1, the fishery was non-selective for Coho (remaining sub-area Coho quota – 19,000 fish – was converted at an impact-neutral rate to a non-selective quota of 9,000). The fishery closed on its automatic closure date, September 23. The catch estimates for Area 2 are 14,000 Chinook (55% of the guideline) and 6,700 Coho during the selective portion of the fishery (26% of the mark-selective quota) and 5,200 Coho during the non-selective portion of the fishery (58% of the non-selective quota). An additional 5,400 Chinook were harvested in the spring mark-selective fishery. The Chinook minimum size limit was 24 inches.

Preliminary estimates of Coho encounters (retained and released), and mark rate in the Area 2 Coho mark-selective sport fishery, June 24 – August 31, 2012.			
Coho retained	Coho released	Total encounters	Mark %
6,700	15,200	21,900	31%

La Push

Ocean Area 3 (La Push) opened for all-species salmon sport fishing on Sunday, July 1 with a quota of 1,810 Coho (revised in-season to 2,360 following impact-neutral transfers of Coho from the Neah Bay sub-area quota and the Non-Tribal troll fishery to the La Push sub-area quota) and a guideline of 2,100 Chinook. The fishery closed on its automatic closure date, September 23, and reopened September 29 through October 14. The catch estimates for Area 3 during the all-species fishery are 1,200 Chinook (58% of the guideline) and 2,200 Coho (95% of the revised quota). An additional 100 Chinook were harvested in the spring mark-selective fishery. The Chinook minimum size limit was 24 inches.

Preliminary estimates of Coho encounters (retained and released), and mark rate in the Area 3 Coho mark-selective sport fishery, July 1 – October 14, 2012.			
Coho retained	Coho released	Total encounters	Mark %
2,200	5,700	7,900	28%

Neah Bay

Ocean Area 4 (Neah Bay) opened for all-species salmon sport fishing on Sunday, July 1 with a quota of 7,250 marked Coho (revised in-season to 8,200 following impact-neutral transfers from the Non-Tribal troll fishery to the Neah Bay sub-area, and from the Neah Bay sub-area quota to the La Push sub-area quota) and a guideline of 4,700 Chinook. The fishery closed on its automatic closure date, September 23. The catch estimates for Area 4 are 4,700 Chinook (100% of the guideline) and 7,600 coho (92% of the quota). An additional 800 Chinook were harvested in the spring mark-selective fishery. The Chinook minimum size limit was 24 inches.

Preliminary estimates of Coho encounters (retained and released), and mark rate in the Area

4 Coho mark-selective sport fishery, July 1 – September 23, 2012.			
Coho retained	Coho released	Total encounters	Mark %
7,600	14,000	21,600	35%

North of Cape Falcon Inside Fisheries

Washington Coastal River Fisheries

North Washington Coastal Rivers

Net and sport fisheries directed at salmon in this region were implemented based upon pre-season, Tribal-State agreements and subject to in-season adjustments. The north coastal rivers net harvest (all by Tribal fisheries that are non-selective) includes catch from the Quillayute system, Hoh, Queets, and Quinault Rivers. In 2012 the Copalis, Moclips, Ozette, and Sooes Rivers were removed from this report. The catch from these rivers is not a part of the pre-season modeling process. The 2012 commercial Tribal net fisheries in north coastal rivers have harvested an estimated 12,300 Chinook and 37,600 Coho through November 15, 2012.

Recreational fisheries conducted in the Quillayute, Hoh and Queets river systems, included mark-selective fisheries for hatchery Chinook salmon. Recreational fisheries for Coho salmon conducted in the Quillayute River system included mark-selective components. Harvest or impact estimates for these fisheries are unavailable at this time.

Grays Harbor

Harvest for Grays Harbor includes catch from both the Humptulips and Chehalis Rivers through November 15, 2012. The non-selective Tribal net fisheries in Grays Harbor, and including fisheries in the Humptulips and Chehalis rivers, harvested an estimated 4,000 Chinook salmon and 30,000 Coho salmon. Non-Tribal commercial fisheries conducted in the northern portion of Grays Harbor near the Humptulips River (2C) harvested 1,100 Chinook salmon and 400 Coho salmon. An additional 80 Chinook salmon (mark selective) and 9,900 Coho were harvested in the Non-Tribal commercial gillnet fishery in Areas 2A & 2D. Sport fisheries conducted in the Chehalis and Humptulips Rivers included mark-selective components for Coho salmon. Recreational fisheries harvest or impact estimates are unavailable at this time.

Columbia River Fisheries

Tribal and Non-Tribal net and sport salmon fisheries in 2012 occurred during the winter/spring (January – June 15), summer (June 16 – July) and fall (August – October) periods. All fisheries were constrained by impacts on ESA listed stocks. Winter/spring fisheries were primarily constrained by impacts on ESA listed upper Columbia River spring Chinook, Snake River spring/summer Chinook and wild winter Steelhead. Summer fisheries were constrained by impacts to ESA listed Snake River Sockeye. Fall fisheries were mainly constrained by impacts to ESA listed wild lower Columbia tule fall Chinook and wild lower Columbia River

Coho as well as Group B Steelhead which are part of the Snake River Steelhead distinct population segment (DPS). Snake River wild fall Chinook can be a constraint to fall season fisheries, but impacts to other listed stocks generally limit fisheries first.

Columbia River salmon fisheries are developed and regulated to meet conservation standards. Fisheries are managed to operate within the impact limits set for ESA listed stocks, meet the objectives for healthy Columbia River natural stocks, and ensure brood stock needs are met for hatchery salmon. Mainstem Columbia River fisheries are also developed and managed to remain within the requirements of the 2008 – 2017 *US v. Oregon* Management Agreement which include Tribal/Non-Tribal sharing agreements.

Winter-Spring Fisheries

Non-Tribal Net

The mainstem Winter/Spring commercial fishery has operated under mark-selective fishery regulations since 2002. Winter Sturgeon fisheries consisted of three fishing periods conducted during January 30 through February 7 in the area downstream of Bonneville Dam. A total of one hatchery Chinook was landed. The winter/spring salmon season consisted of two fishing periods (18 hours total) on April 3 and April 10. Tangle nets (4¼-inch minimum mesh) were required for both openings. The fishery occurred downstream of Bonneville Dam, with time, area, and gear restrictions in place for both openings. Landings included 6,200 hatchery spring Chinook.

Sport

Columbia River mark-selective sport fisheries began in 2001. The area below Bonneville Dam was open January 1 – April 22 and May 26-27 for hatchery Chinook retention. Catch estimates include 13,300 hatchery Chinook. Mark-selective recreational fisheries also occurred during March 16 – May 6 and May 19 – 20 in the area from Bonneville Dam upstream to McNary Dam (Zone 6). Zone 6 catch estimates total 900 hatchery spring Chinook. Recreational fisheries in Washington waters of the Snake River harvested an estimated 2,400 adult hatchery Chinook.

Tribal

Tribal mainstem fisheries are not mark-selective. Tribal fisheries are conducted in the mainstem Columbia River from Bonneville Dam upstream to McNary Dam (Zone 6). Platform and hook and line fisheries also occur in accordance with MOUs in the area immediately below Bonneville Dam. No spring Chinook were harvested in the commercial winter season set-line Sturgeon fishery (January 1 – 31). Two chinook were harvested in the winter gillnet fishery (February 1 – March 21). Ceremonial and subsistence (C&S) fisheries include harvest from platform, hook and line, and gillnet fisheries through Tribal permits. Commercial sales were allowed for platform and hook and line caught fish beginning May 14. Harvest estimates from C&S and commercial fisheries total 17,690 spring Chinook. Fisheries are also conducted in Zone 6 tributaries and in Columbia and Snake River Tributaries upstream from McNary Dam. Tributary harvest (including Snake Basin harvest) is not reported in this document.

Summer Fisheries

Non-Tribal Net

Summer season fisheries are not mark-selective. One fishing period (8 hours total) occurred on June 17 – 18 in the area below Bonneville Dam. Time, area, and gear restrictions were in

place for all summer season commercial fisheries. Landings are estimated at 1,700 upper Columbia summer Chinook.

Sport

Summer season Chinook fisheries were mark-selective. The area below Bonneville Dam was open for adult Chinook retention from June 16 – July 1. An estimated 2,900 hatchery Chinook were kept during the summer season below Bonneville Dam. The area from Bonneville Dam upstream to Priest Rapids Dam was open for adult hatchery Chinook retention from June 16 – July 31. Retained catch from this area was estimated at 300 adult hatchery upper Columbia summer Chinook. Harvest data for Wanapum Tribal fisheries downstream of Priest Rapids Dam and for Colville Tribal fisheries and the sport fishery in the Columbia upstream of Priest Rapids Dam are not available at this time. Harvest allocation and impacts by these Tribal fisheries were shared with the Non-Tribal fisheries.

Tribal

Tribal fisheries are not mark-selective. Tribal fisheries are conducted in mainstem Columbia River from Bonneville Dam upstream to McNary Dam (Zone 6). Platform and hook and line fisheries also occur in accordance with MOUs in the area immediately below Bonneville Dam. In 2012, four weekly commercial gillnet fishing periods were conducted June 18 – July 11. Platform and hook and line fisheries also occurred through July 12, and fish were sold commercially or retained for subsistence use. Harvest estimates total 7,800 upper Columbia summer Chinook from mainstem fisheries. Minor summer season fisheries were also conducted in some Zone 6 tributaries and in tributaries upstream of McNary dam. Tributary harvest is not reported in this document.

Fall Fisheries

Non-Tribal Net

Fall season fisheries are not mark-selective. The mainstem fisheries consisted of 24 fishing periods (251 hours total) during August 5 – 29 and September 19 – October 22. Time, area, and gear restrictions were in place. Harvest estimates total 37,600 fall Chinook.

Sport

Fall season fisheries were mark-selective for Coho salmon with a short pilot mark-selective period conducted for Chinook in an 80-mile stretch in the lower Columbia River. The Buoy 10 fishery was open August 1 through December 31; Chinook retention was prohibited September 4-30. Catch estimates include 19,100 Chinook and 7,500 hatchery Coho. The mainstem sport fishery from the Rocky Point – Tongue Point line upstream to Bonneville Dam was open August 1 – December 31. Mark selective rules for Chinook were in effect September 10-16 and Chinook retention was prohibited entirely during the September 17-30 from the Rocky Point – Tongue Point line upstream to the Lewis River. Catch estimates from this fishery include 25,100 Chinook. The mainstem sport fishery from Bonneville Dam to the Highway 395 Bridge (near Pasco, Washington) was open August 1 – December 31. Catch estimates include 5,300 fall Chinook.

Tribal

Tribal fisheries are not mark-selective. Tribal fisheries are conducted in mainstem Columbia River from Bonneville Dam upstream to McNary Dam (Zone 6). Platform and hook and line fisheries also occur in accordance with MOUs in the area immediately below Bonneville Dam. Platform and hook and line fisheries were open and allowed commercial sales throughout the fall season. The commercial gillnet fishery consisted of seven weekly fishing periods August 20

– October 7. Preliminary harvest estimates total 85,600 fall Chinook. Fisheries are also conducted in some Zone 6 tributaries and in the Snake and Clearwater Rivers. Harvest in tributary fisheries is not reported in this document.

Puget Sound Fisheries

Puget Sound marine fisheries of interest to the Pacific Salmon Commission in 2012 were regulated to meet conservation and allocation objectives for Chinook, Coho, Chum, and Sockeye salmon stocks, per Tribal-State agreement. For Puget Sound Chinook listed under the ESA, fisheries were managed according to the Puget Sound Chinook Harvest Management Plan. This management plan defines limits to total exploitation rates for natural stocks and was determined by the National Marine Fisheries Service (NMFS) to be consistent with requirements specified under the ESA 4(d) Rule.

Release requirements were applied to many sport and net fisheries for Chinook, Coho and Chum salmon, the latter to protect ESA-listed Hood Canal and Strait of Juan de Fuca summer Chum.

Puget Sound marine fisheries were constrained by the need to meet management objectives for ESA listed Puget Sound Chinook, including mid-Hood Canal, Skokomish, Nooksack Early, Skagit Summer/Falls, and Green River Chinook. Interior Fraser Coho was the primary Coho management unit of concern with managing fisheries in the Strait of Juan de Fuca and northern Puget Sound.

Strait of Juan de Fuca Sport

Chinook retention (non-selective) was allowed for sport fishing in Marine salmon Management Areas 5 and 6 from February 16 – April 10, 2012. Sport fishing regulations allowed retention of marked Chinook and marked Coho beginning July 1. Chinook mark selective fishing opportunity was limited to the period through August 15. The sport fishery remained open to a Coho mark selective opportunity through September 14 in Area 5 and through September 30 in Area 6. Wild Coho retention was legal September 15 – October 31 in Area 5 and October 1 – 31 in Area 6. Chinook retention was legal in Area 5 and 6 from October 1 – 31. An additional mark-selective fishery for Chinook was open from December 1 – 31, 2012 in Area 6. The preliminary estimate for Area 5 Chinook retained for the entire opened fishing period July 1 – October 31 was 6,015. A preliminary estimate of Coho retained for the mark-selective and non-selective opened periods was 44,496.

Preliminary estimates of Chinook retained, released (legal and sub-legal size), and the legal-size mark rate in the Area 5 sport mark-selective fishery, July 1 – August 15, 2012.

Chinook retained	Chinook released	Total encounters	Mark % (legal size)
5,656	14,039	19,695	55%

Preliminary estimates of Coho retained, released and the mark rate in the Area 5 Coho mark-selective sport fishery, July 1 – September 14, 2012.

Coho retained	Coho released	Total encounters	Mark %
14,566	34,146	48,712	34%

A detailed report of this summer period sport fishery, including catch, effort and results of sampling and monitoring programs, will be available from the Washington Department of Fish and Wildlife in early 2013.

Strait of Juan de Fuca Tribal Troll (Area 4B, 5, and 6C)

During the winter Tribal troll fishery in Areas 4B, 5, and 6C (November 1, 2011 – April 15, 2012), 1,309 Chinook and 2 Coho were caught. Both the catch and the effort in this fishery were below the recent twenty-year average. The summer Tribal troll fishery in Areas 5 and 6C only (Jun 17 – September 30), 1,176 Chinook and 39 Coho were caught. The Tribal catch estimates from this area do not include catches from Area 4B during the May-September PFMC management period, which have been included in the North of Cape Falcon Tribal troll summary.

Strait of Juan de Fuca Net

Preliminary estimates of the 2012 catch in the Strait of Juan de Fuca Tribal net fisheries (no non-Tribal net fisheries in the Strait of Juan de Fuca) are 1,551 Chinook and 3,539 Coho salmon.

San Juan Islands Net (Areas 6, 7, and 7A)

Preliminary estimates of the 2012 catch in the San Juan Island net fishery directed at Sockeye or Chum salmon total 15 Chinook and 1,045 Coho salmon for the Non-Tribal fishery. Tribal fishery landings from this area total 421 Chinook and 9,452 Coho.

San Juan Islands (Area 7) Sport

Marked Chinook retention was allowed in the entire area for the period December 1, 2011 – April 30, 2012. The numbers of Chinook retained and released by anglers during this fishery were estimated by an intensive sampling program and are presented in the table below. A detailed report of this fishery, including catch, effort and results of sampling and monitoring programs, is available from the Washington Department of Fish and Wildlife. The southern and southeastern (Rosario Strait) portions of this catch area were again closed July 1 – September 30 to protect Puget Sound Chinook salmon. The remaining area was open for retention of Chinook and Coho salmon from July 1 – October 31. Release of unmarked Coho salmon was required for the months of August through September. Additional sub area closures are described in the Washington State Sport Fishing Rules Pamphlet. Catch estimates and sampling information for this area for the period May 1 – November 30 are not available at this time.

Estimated Chinook retained, released (legal and sub-legal size) and the legal size mark rate in the Area 7 sport mark-selective fishery, December 1, 2011 – April 30, 2012.

Chinook retained	Chinook released	Total encounters	Mark % (legal size)
2,412	4,409	6,821	65%

Inside Puget Sound (Areas 8-13) Sport

Mark-selective sport fisheries directed at hatchery Chinook were conducted in Area 8.1 (Skagit Bay & Saratoga Passage), Area 8.2 (Port Susan & Port Gardner), Area 9 (Admiralty Inlet), Area 10 (Seattle – Bremerton), Area 11 (Tacoma), and Area 12 (Hood Canal) during the winter (October, 2011 – April, 2012) period, and in Areas 9, 10, 11, 12, and 13 (South Puget Sound) during the summer (May – September, 2012) period.

Detailed reports of these fisheries, including retained and released encounters, effort and mark rates from sampling and monitoring programs, will be available from the Washington Department of Fish and Wildlife in the spring of 2013.

Mark-selective sport fisheries directed at hatchery Coho were conducted in Area 13 for the period July 1 to October 31, 2012.

Puget Sound Chinook mark-selective sport fisheries conducted during the winter and summer periods, 2011-2012.	
Areas	Season
8.1 & 8.2	November 1, 2011 – April 30, 2012
9	November 1-30, 2011; Jan 16 – April 15, 2012; and July 16 – August 31, 2012
10	October 1, 2011 – January 31, 2012, and July 16 – August 31, 2012
11	February 1, 2011 – April 30, 2012 and June 1 – September 30, 2012
12	February 1 – April 30, 2012 and July 1 – October 15, 2012
13	May 1 – September 30, 2012

Puget Sound Marine Net (Areas 8-13)

To achieve conservation objectives for Puget Sound Chinook and coho, very limited net fishing opportunities directed at abundant returns of hatchery Chinook and both hatchery and natural returns of coho were planned for 2012.

Puget Sound Rivers Fisheries

Tribal net and non-Tribal sport fisheries directed at salmon in this region were implemented based upon pre-season, Tribal-State agreements and subject in part to in-season adjustment. The Net harvest (in Puget Sound rivers by Tribal fisheries) included catch from river systems in the Strait of Juan de Fuca, Hood Canal, and Puget Sound.

Mark selective fisheries directed at Chinook salmon were also conducted in the following Puget Sound rivers with PSC Chinook CWT exploitation rate indicator stocks or DIT groups:

Chinook mark-selective sport fisheries conducted in Puget Sound rivers, 2011-2012.	
River	Season
Nooksack River	September 1 - 30
Cascade River (Skagit)	June 1 – July 15
Skagit River	June 1 – July 15
Nisqually River	July 1 – December 31
Skokomish River	August 1 – September 15

No mark-selective sport fisheries were conducted in 2012 in any Puget Sound rivers with PSC Coho CWT exploitation rate indicator stocks or DIT groups.

Table 1. Preliminary 2012 Landed Chinook Catches for Washington and Oregon Fisheries of Interest to the Pacific Salmon Commission (rounded to the nearest 100). [9/]

FISHERIES	2012 Preseason Total Mortality [1/]	2012 Preseason Landed [2/]	2012 Preliminary Landed	2011	2010	2009	2008	2007
OCEAN FISHERIES								
Troll								
Neah Bay and La Push (Areas 3,4,4B)[3/]	81,200	72,300	79,100	44,800	39,600	15,700	23,000	28,600
Columbia Ocean Area and Westport (Area 1&2)	39,000	30,200	16,600	16,300	49,000	9,600	11,900	10,200
Sport (see text for quota information)								
Neah Bay (Area 4) [4/]	5,900	5,200	5,500	3,000	3,300	2,400	1,400	1,500
La Push (Area 3) [4/]	2,600	2,300	1,300	1,500	1,200	700	700	600
Westport (Area 2) [4/]	36,800	32,200	19,400	19,000	27,000	5,000	9,600	5,200
Columbia Ocean Area (Area 1) [4/]	13,100	11,800	9,100	7,200	7,200	5,200	3,700	2,200
INSIDE FISHERIES								
Sport [10/]								
Juan De Fuca (Areas 5&6) [5/]	13,000	8,200	6,015	11,100	11,500	10,200	4,800	6,200
San Juan Is. (Area 7)	9,200	5,600	n/a	6,100	3,200	4,200	5,800	5,000
Puget Sound (Area 8-13)	36,700	25,700	n/a	14,700	17,000	16,900	21,700	37,600
Puget Sound Rivers [12/]	16,700	15,900	n/a	19,000	15,600	14,400	15,300	19,400
North WA Coastal Rivers	n/a	n/a	n/a	2,300	1,300	900	800	700
Grays Harbor [7/]	n/a	n/a	n/a	3,500	2,200	900	0	1,700
Columbia R. (Spring) [6/]	n/a	n/a	16,600	14,000	32,600	17,200	22,100	7,800
Columbia R. (Summer) [6/]	n/a	n/a	3,200	5,400	2,600	2,500	3,200	2,700
Columbia R. (Fall) (incl. Buoy 10) [6/]	n/a	n/a	49,500	43,300	27,100	24,200	22,200	14,600
Commercial[11/]								
Strait Juan de Fuca (Areas 4B,5,6C) net and troll	11,700	10,000	4,000	4,200	4,400	3,600	6,400	4,500
San Juan Island (Areas 6,7, 7A)	6,200	6,200	500	5,800	6,800	1,000	100	2,600
Puget Sound Marine (Areas 8-13;7B-D)	51,600	50,500	75,000	65,500	43,300	44,700	61,000	64,200
Puget Sound Rivers[12/]	43,300	43,300	30,400	33,200	36,000	33,100	40,800	55,700
North WA Coastal Rivers	n/a	n/a	12,300	11,800	9,000	10,500	7,800	5,500
Grays Harbor (Area 2A-2D) [7/]	n/a	n/a	4,000	8,000	4,600	3,400	2,600	3,000
Columbia R. Net (Wint/Spr.) [8/]	n/a	n/a	23,900	20,100	52,000	17,300	27,100	8,500
Columbia R. Net (Sum) [8/]	n/a	n/a	9,500	25,600	20,500	14,100	10,400	6,500
Columbia R. Net (Fall) [8/]	n/a	n/a	123,200	165,700	163,800	133,600	134,700	49,000

Table 1 Footnotes:

[1/] Nominal total mortality is not adjusted for adult equivalents (AEQ) and does include non-retention mortality. Total Mortality is estimated by FRAM as catch + incidental mortality, where incidental mortality = drop off + non-retention mortality.

[2/] For the ocean fisheries, this column shows the Chinook troll and recreational quotas used for 2012 pre-season fishery planning as distributed by ocean area. Pre-season total troll quota is 102,500 and recreational Chinook quota 51,500. See text for any in-season adjustments.

[3/] Includes Area 4B catch during the PFMC management period (May 1 – September 15); Area 4B Treaty troll catch outside PFMC period included under Strait Juan de Fuca net and troll.

[4/] Includes catches from the spring mark selective fishery.

[5/] 2012 catch represents July 1 – October 31 in Area 5 only, since Catch Record Card (CRC) annual estimates are not yet available.

[6/] Mainstem retained sport catch only (upstream to McNary Dam for spring, Priest Rapids Dam for summer and to Hwy 395 for fall). See tables 22 – 23 in the annual Joint Staff Report regarding spring and summer Chinook and tables 29 – 31 in the annual fall report. http://wdfw.wa.gov/fishing/crc/staff_reports.html.

[7/] Includes Grays Harbor catch, as well as catch from the Chehalis and Humptulips Rivers and their tributaries for sport and Lower Chehalis and Humptulips River for net estimates.

[8/] Mainstem retained catch only (Columbia River mouth upstream to McNary Dam). Catch data from annual Joint Staff Reports. Winter and spring catch T7 and T18. Summer catch is from T10. Fall catch from annual fall report T20, 24 and 26.

[9/] Includes catches from mark-selective fisheries where estimates are available.

[10/] Sport catch after March 2009 is preliminary.

[11/] Includes Non-Tribal and Tribal commercial, as well as Tribal Ceremonial and Subsistence for all gear types. Starting in 2012, the Copalis, Moclips, Ozette, and Sooes Rivers have been removed from the landed catch.

[12/] Chinook fisheries in Puget Sound Rivers are modeled using the Terminal Area Management Module (TAMM), based upon FRAM output of terminal run sizes. Total Mortality is estimated in TAMM as catch + non-retention mortality.

Table 2. Preliminary 2012 Landed Coho Catches for Washington and Oregon Fisheries of Interest to the Pacific Salmon Commission (rounded to the nearest 100). [6/]

FISHERIES	2012 Preseason Total Mortality [1/]	2012 Preseason Landed [2/]	2012 Preliminary Landed	2011	2010	2009	2008	2007
OCEAN FISHERIES								
Troll								
Neah Bay and La Push (Areas 3,4,4B) [3/]	55,700	49,100	38,300	14,800	9,600	64,200	14,000	41,700
Columbia Ocean Area and Westport (Area 1&2)	22,000	11,700	2,400	2,200	5,000	29,200	2,400	16,700
Sport (see text for quota information)								
Neah Bay (Area 4)	9,400	7,300	7,600	3,000	3,700	13,300	2,200	10,600
La Push (Area 3)	2,300	1,800	2,200	2,100	1,200	6,900	500	2,800
Westport (Area 2)	34,100	25,800	12,000	13,800	12,600	53,900	7,500	23,000
Columbia Ocean Area (Area 1)	43,100	34,900	11,200	26,700	24,900	83,800	10,800	65,800
INSIDE FISHERIES								
Sport [7/]								
Juan De Fuca (Areas 5&6) [4/]	47,700	40,900	44,500	32,700	20,600	32,900	11,400	33,900
San Juan Islands (Area 7)	800	700	n/a	900	600	800	200	600
Puget Sound (Area 8-13)	26,400	25,000	n/a	42,500	6,400	42,000	9,700	30,800
Puget Sound Rivers	24,300	23,100	n/a	40,400	9,600	41,200	15,000	32,100
North WA Coastal Rivers	6,400	6,100	n/a	7,400	5,500	6,600	1,500	1,700
Grays Harbor [5/]	21,000	20,000	n/a	14,400	12,300	15,900	3,300	4,400
Columbia River Buoy 10	10,300	8,300	7,500	7,600	8,000	48,100	8,600	8,400
Commercial [8/]								
Strait Juan De Fuca (Areas 4B,5,6C) net and troll	3,400	3,300	3,600	2,800	3,300	3,300	1,200	2,600
San Juan Islands (Area 6,7,7A)	7,000	6,400	10,500	11,400	4,800	6,400	200	1,900
Puget Sound Marine (Area 8-13, 7B-D)	178,000	174,600	230,600	138,300	102,400	173,600	147,400	132,700
Puget Sound Rivers	75,900	74,400	104,300	103,900	64,400	92,800	85,400	85,400
North WA Coastal Rivers	99,200	97,200	37,600	84,500	97,100	126,500	50,200	26,800
Grays Harbor (Areas 2A-2D) [5/]	61,000	59,800	30,000	31,400	31,000	28,200	19,400	11,800

Table 2 Footnotes:

[1/] Estimates of total mortality include non-retention mortality. Total Mortality is estimated by FRAM as catch + incidental mortality, where incidental mortality = drop off + non-retention mortality.

[2/] For ocean fisheries this column shows the coho troll and recreational quotas used for 2012 pre-season fishery planning as distributed by ocean area. Pre-season total troll quota is 60,780 and recreational marked Coho quota is 69,720. See text for any in-season adjustments.

[3/] Includes area 4B catch during the PFMC management period (May 1 – September 15); area 4B Treaty troll catch outside PFMC period included under Strait Juan de Fuca net and troll.

[4/] 2012 catch represents selective fisheries July 1 – October 31 in area 5 only, since CRC annual estimates are not yet available.

[5/] Includes Grays Harbor catch, as well as catch from the Chehalis and Humptulips Rivers and their tributaries for sport estimates and Lower Chehalis and Humptulips Rivers for net estimates.

[6/] Includes catches from mark-selective fisheries where estimates are available.

[7/] Sport data after March 2009 are preliminary.

[8/] Includes Non-Tribal and Tribal commercial, as well as Tribal Ceremonial and Subsistence for all gear types. Starting in 2012, the Copalis, Moclips, Ozette, and Sooes Rivers have been removed from landed catch.

Table 3. Mark-Selective non-Tribal Chinook and Coho Fisheries by Area and Year. [1/]

Selective Coho	2012	2011	2010	2009	2008	2007	2006
Ocean Troll							
Cape Flattery & Quillayute (Areas 3,4)	yes	yes	yes	yes	yes	yes	yes
Columbia R & Grays Harbor (Areas 1,2)	yes	yes	yes	yes	yes	yes	yes
Ocean Sport							
Neah Bay (Area 4)	yes	yes	yes	yes	yes	yes	yes
LaPush (Area 3)	yes	yes	yes	yes	yes	yes	yes
Grays Harbor (Area 2)	yes	yes	yes	yes	yes	yes	yes
Col. R. (Leadbetter Pt. to Cape Falcon)	yes	yes	yes	yes	yes	yes	yes
Inside Fisheries							
Sport							
Juan de Fuca (Areas 5,6)	yes	yes	yes	yes	yes	yes	yes
San Juan Islands (Area 7)	yes	yes	yes	yes	yes	yes	yes
Puget Sound Sport (Areas 8-13 all year)	yes	yes	yes	yes	yes	yes	yes
Puget Sound Rivers	yes	yes	yes	yes	yes	yes	yes
North WA Coastal Rivers	yes	yes	yes	yes	yes	yes	yes
Grays Harbor (marine & freshwater)	yes	yes	yes	yes	yes	yes	yes
Columbia River Buoy 10	yes	yes	yes	yes	yes	yes	yes
Commercial							
North WA Coastal Rivers	no	no	no	no	no	no	no
Grays Harbor (Areas 2A-2D)	no	yes	yes	yes	no	no	no
Strait of Juan de Fuca (Areas 4B,5,6C) Net & Troll	no	no	no	no	no	no	no
San Juan islands (Areas 6,7,7A)	yes	yes	yes	yes	yes	yes	yes
Puget Sound Marine (Areas 8 – 13)	no	no	no	no	yes	no	no
Puget Sound Rivers	no	no	no	no	no	no	no
Selective Chinook	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**
Ocean Troll							
Cape Flattery & Quillayute (Areas 3,4,4B)	no	no	no	no	no	no	no
Columbia. R & Grays Harbor (Areas 1,2)	no	no	no	no	no	no	no
Ocean Sport							
Neah Bay (Area 4)	yes	yes	yes	no	no	no	no
La Push (Area 3)	yes	yes	yes	no	no	no	no
Grays Harbor/Westport (Area 2)	yes	yes	yes	no	no	no	no
Col. R./Ilwaco (Leadbetter Pt. to Cape Falcon)	yes	yes	yes	no	no	no	no
Inside Fisheries							
Sport							
Juan de Fuca (Area 5,6)	yes	yes	yes	yes	yes	yes	yes
San Juan Islands (Area 7)	yes	yes	yes	yes	yes	no	no
Puget Sound Sport (Areas 8-13)	yes	yes	yes	yes	yes	yes	yes
Puget Sound Rivers	yes	yes	yes	yes	yes	yes	yes
North WA Coastal Rivers	yes	yes	yes	yes	yes	yes	yes
Grays Harbor (marine & freshwater)	yes	yes	no	no	no	no	no
Columbia River Sport - Winter/Spring	yes	yes	yes	yes	yes	yes	yes
Columbia River Sport - Summer	yes	yes	yes	no	no	no	no
Columbia River Sport - Fall	yes	no	no	no	no	no	no
Commercial							
North WA Coastal Rivers	no	no	no	no	no	no	no
Grays Harbor (Areas 2A – 2D)	yes	no	no	no	no	no	no
Columbia River Net - Winter/Spring	yes	yes	yes	yes	yes	yes	yes

Columbia River Net - Summer	no	no	no	no	no	no	no
Columbia River Net - Fall	no	no	no	no	no	no	no
Strait of Juan de Fuca(4B,5,6C) Net & Troll	no	no	no	no	no	no	no
San Juan Islands (Areas 6,7,7A)	yes	yes	yes	yes	yes	no	no
Puget Sound Marine (Areas 8 – 13)	no	yes	yes	no	no	no	no
Puget Sound Rivers	yes	yes	no	no	no	no	no

Table 3 Footnotes:

[1/] "Yes" denotes that a mark selective fishery occurred, even if it only occurred in a subset of the fishing area, season, gear type, or user group.

PRELIMINARY REVIEW OF THE 2012 WASHINGTON CHUM SALMON FISHERIES OF INTEREST TO THE PACIFIC SALMON COMMISSION

December 13, 2012

This summary report provides a preliminary review of the 2012 U.S. Chum salmon fisheries conducted in the Strait of Juan de Fuca (Salmon Catch Areas 4B, 5 and 6C), the San Juan Islands (Areas 6 and 7) and the Point Roberts area (Area 7A), conducted in compliance with provisions of Chapter 6 of Annex IV of the Pacific Salmon Treaty. The harvest and abundance information provided are based on preliminary data reported through November 15 and is subject to correction and revision as additional information becomes available.

MIXED STOCK FISHERIES

Areas 4B, 5 and 6C

As in previous years, the Chum salmon fishery in Areas 4B, 5 and 6C was restricted to Treaty Indian fishers using gill nets. The fall Chum salmon fishery opened the week of October 7, with a schedule of six days per week and continued through November 10. A total of 348 Chum salmon were harvested. Including incidental catches of Chum salmon prior to the Chum-directed fishing season, 474 Chum salmon were harvested (Table 1). During the fall Chum fisheries in Areas 4B, 5, and 6C, there was a reported by-catch of 21 Steelhead; 3,749 Coho; and one Chinook.

Areas 7 and 7A

Chum salmon fisheries in Areas 7 and 7A are regulated to comply with a base harvest ceiling of 130,000 Chum salmon, unless a critically low level of abundance (< 1,000,000) is identified for those stocks migrating through Johnstone Strait ("Inside" Chum Salmon). Chapter 6 of the Annex specifies that Chum-directed fishing is not allowed in Areas 7 and 7A before October 10. Paragraph 10 (a-b) specifies run sizes below 1.0 million as defined by Canada as critical. For run sizes below the critical threshold, the U.S. catch of Chum salmon in Areas 7 and 7A will be limited to those taken incidentally to other species and in other minor fisheries, and shall not exceed 20,000.

Paragraph 10 (d) says that if Canada provides an estimate of Fraser River run sizes below 900,000, then the U.S. will limit its fishery impacts to not exceed catch of 20,000 Chum salmon from the day following notification. U.S. commercial fisheries were initiated as scheduled on October 10.

An estimated Fraser River Chum salmon run size was provided by Canada on October 16, with an estimate of 1,900,000. The fishery was therefore continued without restriction through November 14. The U.S. catch between October 10 and November 14 in Areas 7 and 7A was 70,986 Chum salmon. The Non-Treaty gill net and purse seine fleets were open daily October 11, 14, 15, 17, 18, and then continuously October 21 through November 10. The Treaty Indian

gill net and purse seine fisheries were opened on October 10, 12, 13, 16, 19, 20, and then ran continuously from October 22 through November 14. Catches per vessel and effort were good throughout the fishery.

Non-Indian reef net fisheries targeting adipose-marked Coho salmon were conducted from the end of Fraser Panel control (September 2), until September 30, with Chum salmon retention prohibited. From October 1 through November 12, reefnets were open daily with Chum salmon retention allowed. Chum salmon catch in this fishery, between October 1 and October 10, was 2,804 fish. There was no reef net fishing effort after early October.

There were 14 Chum salmon reported caught in Areas 7 and 7A during Fraser Panel approved Sockeye and Pink salmon fisheries in August and early September. The total 2012 Chum salmon catch by all gears in Areas 6, 7, and 7A, reported through November 15, was 73,617. Catch distribution, between Areas 7 and 7A, was 68% and 32% respectively. However, it should be noted that these catch reports may be incomplete as of the date of this report (Table 2).

During the fall Chum salmon fisheries in Areas 6, 7 and 7A, there was a reported by-catch of 9,637 Coho salmon and zero Steelhead.

PUGET SOUND TERMINAL AREA FISHERIES AND RUN STRENGTH

Preseason forecasts for Chum salmon returns to Puget Sound were for a fall Chum run totaling approximately 932,000 fish. In-season estimates as of the date of this report indicate that the returns to Puget Sound are mixed with some stocks above and some below forecast. South/Central Puget Sound and Hood Canal were above forecast. Estimates are not yet available for other areas (Skagit, Stillaguamish/Snohomish, Nooksack, Strait of Juan de Fuca tributaries). Some Puget Sound Chum fisheries are still underway and additional in-season estimates of abundance may occur. As of the date of this report, spawning escapement surveys are in the early stages for most Puget Sound stocks and therefore escapement estimates are not yet available.

TABLE 1. PRELIMINARY 2012 CHUM SALMON HARVEST REPORT FOR WASHINGTON CATCH REPORTING AREAS 4B, 5, 6C

Areas 4B, 5, 6C	
Treaty Indian, Gill Net Only	
Time Periods	GN
Through 9/15	115
9/16-10/1	11
10/2–10/6	0
10/7–10/13	174
10/14–10/20	128
10/21–10/27	0
10/28–11/3	0
11/4–11/10	46
11/11 – 11/12	0
Total	474

TABLE 2. PRELIMINARY 2012 CHUM SALMON HARVEST REPORT FOR WASHINGTON CATCH REPORTING AREAS 6, 7, 7A

	Area 6	Area 7				Area 7A			Area 6,7,7A
Time Periods	GN	PS	GN	RN	Area total	PS	GN	Area total	Total
Through 9/15	2	8	1	0	9	1	2	3	14
9/16–10/1	0	0	0	335	335	0	0	0	335
10/2–10/6	0	0	0	2282	2282	0	0	0	2282
10/7–10/13	0	18,270	686	540	19,496	9,984	945	10,929	30,425
10/14–10/20	0	15,883	1,013	0	16,896	6,355	4,257	10,612	27,508
10/21–10/27	0	8,097	706	0	8,803	775	1,099	1,874	10,677
10/28–11/3	0	902	711	0	1,613	0	85	85	1,698
11/4–11/10		382	89	0	471	0	112	112	583
11/11 – 11/12	0	95	0	0	95	0	0	0	95
Total	2	43,637	3,206	3,157	50,000	17,115	6,500	23,615	73,617
Gear Type Abbreviations: GN = Gill net; PS = Purse Seine; RN = Reef net									
10/10–11/15 Period By-catch	Coho: 9,637; Steelhead: 0								

Preliminary Review of 2012 United States Fraser River Sockeye Salmon Fisheries

Introduction

The 2012 Fraser River Panel fishing season was implemented under Annex IV of the Pacific Salmon Treaty (PST), and guidelines provided by the Pacific Salmon Commission to the Fraser River Panel. The treaty establishes a bilateral (U.S. and Canada) Fraser River Panel (Panel) that develops a pre-season management plan and approves in-season fisheries within Panel Area waters directed at sockeye and pink salmon bound for the Fraser River (Figure 1). In partial fulfillment of Article IV, paragraph 1 of the PST, this document provides a season review of the 2012 U.S. Fraser River salmon fisheries as authorized by the Panel. Catch and abundance information presented is considered preliminary.

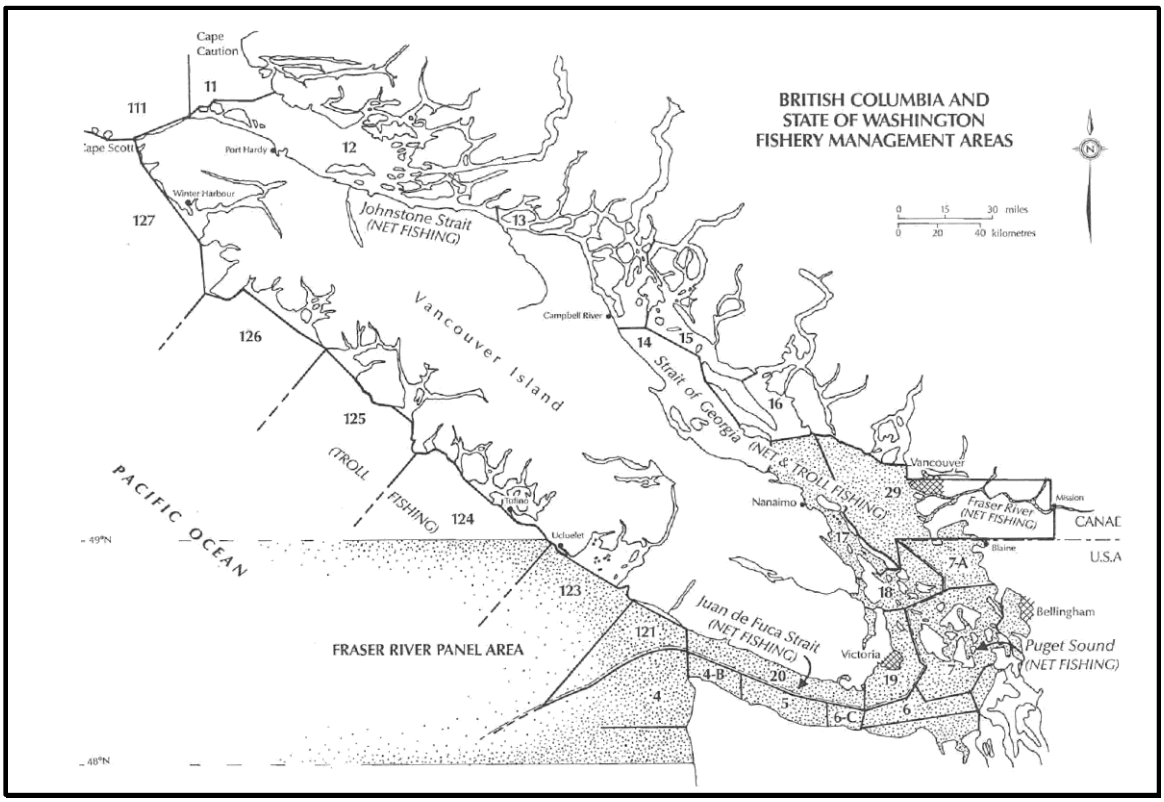


Figure 1. British Columbia and State of Washington Fishery Management Areas, 2012. The shaded area in the figure represents the marine waters managed by the Fraser River Panel.

Preseason Expectations and Plans

Forecasts and Escapement Goals

Pre-season run size forecasts and escapement goals by stock group (run) at various probability levels were provided to the Panel by the Department of Fisheries and Oceans, Canada (DFO). Table 1 shows the 2012 agreed pre-season sockeye forecasts based on the 50 percent probability level forecasts, which represent the mid-point of the range of possible run sizes for all the stock management groups. Table 1 also provides the escapement goals for the sockeye management groups based on the pre-season forecasted abundance. The escapement goals for all timing groups can change in-season as the run size estimates change.

Table 1. 2012 Pre-season Fraser River Sockeye Forecasts and Escapement Goals, by Stock Group.

	Early Stuart	Early Summer	Summer	Late	Total
Forecast of Abundance	99,000	277,000	1,585,000	158,000	2,119,000
Escapement Goal	52,000	166,000	651,000	158,000	1,027,000

Diversion

Diversion is defined as the percentage of Fraser sockeye salmon migrating through Johnstone Strait (rather than the Strait of Juan de Fuca) in their approach to the Fraser River. Diversion through Johnstone Strait was forecasted pre-season to be 43% for 2012. Diversion was modeled in the Panel's fishery planning model on a daily basis starting at 0% (100% migration through the Strait of Juan de Fuca) in late June and climbing to 55% in steady increments by early August.

Management Adjustment (MA) and Environmental Conditions

Management Adjustments for sockeye salmon reflect the expected difference between escapement estimates at Mission (minus catch above Mission) and actual spawning escapements. If the adjustments are adopted by the Panel, they are added to the gross escapement goal, effectively increasing the goal for an impacted run. For 2012, Management Adjustments were modeled using forecasts of environmental conditions and return timing or median historical differences between estimates. Table 2 provides the pre-season projected MA's that were used for planning fisheries. In-season management adjustments use MA models that are based on both measured and forecasted temperatures and discharges or, for late runs, upstream migration timing.

Table 2. 2012 Pre-Season Management Adjustments

Early Stuart		Early Summer		Summer		Lates	
Proportional Management Adjustment	**Management Adjustment**	**Proportional Management Adjustment**	**Management Adjustment**	**Proportional Management Adjustment**	**Management Adjustment**	**Proportional Management Adjustment**	**Management Adjustment**
1.95	101,400	0.32	53,100	.06	39,100	0.97	153,000

Run Timing

Run timing is temporal information about the presence of a salmon stock in a specific area during the time the stock is migrating through that area. Run timing is an important variable when planning fisheries and predicting run size in-season. The following Area 20 50% dates (the dates when 50% of the stock or run group is forecasted to have passed through Canadian catch Area 20) were predicted pre-season for the major Fraser sockeye run groups.

Table 3. 2012 Area 20 Pre-Season 50% Run Timing Dates

Run Group	Area 20 50% Run Timing Date
Early Stuart	June 29
Early Summers	July 16
Summers	August 1
Lates	August 11

U.S. Total Allowable Catch (TAC)

Pre-season, the U.S. TAC was established at 92,500 sockeye salmon. This TAC was virtually all from the Summer run management group, presenting a management challenge to limit the impact of the fisheries on the other management groups.

Preseason Management Plans

During the preseason planning process the Fraser Panel evaluates and adopts management approaches for Fraser sockeye and salmon that address conservation and harvest objectives for each major stock group. The Fraser River Panel develops fishing plans and in-season decision rules with the objective of meeting management goals. Managing Fraser River sockeye salmon involves a trade-off between catching abundant stocks and meeting escapement objectives for less abundant stock groups.

In 2012 the Panel was faced with a situation where fishing opportunities would be constrained by Early Summer runs at the beginning of the season and Late Run stocks later in the season. There was no international TAC predicted to be available for Early Stuart sockeye in 2012, and commercial fisheries were not contemplated on this timing group.

The early entry behavior of Late Run sockeye, observed in recent years, which results in an apparent high loss of fish prior to reaching the spawning grounds, was expected to continue in 2012, resulting in a proportional management adjustment of 97%.

Given the constraints around Early Summer and Late runs, the U.S. Section structured its fishery to focus its harvest when the peak of the Summer runs were migrating through U.S. waters, consistent with the Commission Guidance of February 17, 2011 ("… the Panel, to the extent practical, shall strive to concentrate the U.S. fishery on the most abundant management group (or groups), i.e., those that provide the largest percentage of the TAC."). For the major U.S. fisheries this meant that sockeye openings would likely be constrained to about a week of fishing during the first week of August.

In-Season Management

In-season, the Pacific Salmon Commission staff analyzes a variety of information to produce best estimates of diversion, management adjustments, run-timing, abundance, and harvest by stock group. These estimates are created using stock ID information, test fishing data, counts of escapements past Mission, harvest data and environmental information.

Run Assessment

The final in-season abundance estimates for 2012 (Table 4) indicate that the Early Stuart, Early Summer and Late run sockeye stock groups returned in numbers significantly greater than pre-season expectations (186%, 191% and 165% of forecast, respectively). However, the Summer run management group, which was the largest component of the 2012 return, was lower than the preseason forecast (82% of forecast).

Run timing was variable among management groups (Table 5), with the Early Stuart run returning 5 days later than predicted preseason, and the Late runs returning 6 days earlier than expected preseason. Early Summer and Summer runs return timing was about as expected.

Table 4. Comparison of Pre-season vs. In-season Abundance Estimates for Fraser River Sockeye Salmon by Stock Group (run).

Stock Group	Pre-Season 50% Probability Forecast	In-Season Run Size Estimate	Comparison: In-Season vs. Pre-Season Forecast
Early Stuart	99,000	185,000	186%
Early Summer	277,000	530,000	191%
Summer	1,585,000	1,300,000	82%
Late	158,000	260,000	165%
Total	2,119,000	2,275,000	107%

Table 5. 2012 Preliminary 50% Run Timing Dates in Area 20

Run Group	Pre-season 50% Run Timing Date	In-season 50% Run Timing Date
Early Stuart	June 29	July 4
Early Summers	July 16	July 16
Summers	August 1	August 2
Lates	August 11	August 5

Season Description

Prior to July 22:

In-season assessments of abundance indicated a significantly larger run size for the Early Stuart Run and later timing. The Early Stuart run size was updated to 180,000 sockeye. High river discharge levels resulted in an increase in the proportional management adjustment for the Early Stuart run from 1.95 to 3.79. No TAC was available on this management group.

Week ending July 28:

Indications this week were that the summer runs were showing up in the test fisheries and were returning several days later than expected pre-season or lower in abundance. The Panel decided to open the Treaty Indian fishery in areas 4B, 5, and 6C from July 25 to July 28. The diversion rate was estimated to be 28%. The Early Summer run size was increased from 277,000 to 420,000 sockeye. The Panel adopted an increase in the proportional management adjustment for Early Summer runs from 0.32 to 1.12.

Week ending August 4:

The run timings still looked to be about 3 days late for Summer runs. The Early Summer run size was increased from 420,000 to 510,000 sockeye. The diversion rate was now running only about 18%. The Panel adopted a decrease in the proportional management adjustment for Early Summer runs from 1.12 to .58. The Treaty Indian fishery in areas 4B/5/6C reopened on July 30 and remained open the rest of the week. The fisheries in areas 6/7/7A opened the latter part of the week, similar to the preseason plan. Treaty Indian fisheries in areas 6/7/7A were open on August 2nd and August 4th. Non-Indian fisheries in areas 7/7A were open for one day on August 1st.

Week ending August 11:

Summer run timing still appeared to be running a few days late. The sockeye diversion rate had now climbed to 28%. Abundance for the Summer runs remained at the pre-season forecast level, but abundance appeared stronger for the other management groups. The Panel approved run size updates for Early Summer runs from 510,000 to 550,000 sockeye and for Late runs from 158,000 to 200,000 sockeye. The Panel approved a decrease in the management adjustment for Early Summer runs from 0.58 to 0.49. With these run size updates the U.S. still had enough sockeye TAC to mount additional sockeye fisheries. Treaty Indian fisheries in areas 4B/5/6C were open August 5 through August 10. Treaty Indian fisheries in areas 6/7/7A were open on August 8. Non-Indian fisheries in areas 7/7A were open, with shortened hours, for gillnet gear on August 9, for purse seine gear on August 10, and for reef net gear on August 11.

Week ending August 18:

The Panel updated the Summer run size estimate from 1,585,000 to 1,300,000 sockeye and the Late run size estimate from 200,000 to 250,000 sockeye. The diversion rate was running between 21 and 31%. The Panel also adopted a slightly higher management adjustment of 0.09 for the Summer run stock group. With the reduction in the Summer run size, and the resultant decrease in TAC, the U.S. fisheries had no remaining TAC and all fisheries remained closed.

Remainder of the season:

Only small adjustments to the run size estimates were made for the remainder of the season, and final in-season run size estimates are shown in Table 4. No additional fisheries were scheduled by the Panel. The Panel relinquished control of all U.S. fishing areas on September 2nd.

Harvest

Between July 25 and August 11 the United States caught a total of 110,700 Fraser River sockeye salmon in Panel area waters (Table 6)[1]. During this time period the Treaty Indian fisheries in Areas 4B/5/6C were open for a total of 14 days, and in Areas 6/7/7A for 3 days. The Non-Indian fishery in Areas 7/7A was open for a total of 2 days for each gear type. The Non-Indian fishery caught 32,400 Fraser sockeye salmon. The Treaty Indian fishery caught 78,300 Fraser sockeye salmon.

Table 6. Preliminary estimates of 2012 U.S. catches of Fraser River sockeye salmon in Panel area waters.

	Treaty Indian	Non-Indian
Ceremonial and Subsistence (all areas)	5,500	0
Commercial Catch in Areas 4B/5/6C	13,700	0
Commercial Catch in Areas 6/7/7A	59,100	32,400
Total Catch	78,300	32,400
% of U.S. Catch	70.7%	29.3%

[1] Catch data reported by PSC staff as of 11/1/12.

January 11, 2013

Pacific Salmon Commissioners:

We would like to introduce you to the Salish Sea Marine Survival Project and report on progress toward developing a joint, US-Canada research program to determine the factors limiting salmon production in the Salish Sea.

The survival of many stocks of wild and hatchery Chinook, coho, steelhead, and sockeye salmon entering the Salish Sea has declined dramatically since the 1980's and remains low, despite greater variation and recovery in other areas. The declines of Fraser River sockeye have been the focus of both a PSC workshop and the recently concluded Cohen Commission. These investigations combined with evaluations of the other salmon species conclude that the Salish Sea is an essential area of study for salmon recovery and sustainable fisheries.

Working with scientists, managers, and funders from the public and private sectors, Long Live the Kings and the Pacific Salmon Foundation are facilitating the development of a joint United States and Canada research program, utilizing intellectual and capital resources from both countries to evaluate salmon and steelhead marine survival in an ecosystem context. The objective of this effort is to identify the primary factors affecting the survival of salmon in the Salish Sea marine environment. The project includes three phases: 1) comprehensive research planning; 2) coordinated, systematic research; and 3) dissemination and application of the research results to management. In 2009, through the Pacific Salmon Foundation, participating Canadian scientists developed a research plan for Chinook and coho to restore their production in the Strait of Georgia. In the winter of 2011, a US marine survival Technical Team was formed. The Team is in the process of developing a research plan for Puget Sound and the Strait of Juan de Fuca.

To facilitate the program's development, LLTK and PSF sponsored a three-day workshop in Bellingham in November of 2012. This workshop was well attended (>90 participants), including many members of the PSC family. The main conclusions of the workshop were:

- A collaborative, US-Canada research program will have significant ecological and operational merit and will increase the likelihood that management and the public will accept its results.
- The program should be driven by what the fish are telling us but be multifaceted to account for ecosystem interactions and identify the fundamental mechanisms determining survival.
- Understand where/when bottom-up and top-down processes prevail and then use this as a framework for evaluating the primary factors affecting survival.
- Prioritize retrospective analyses and modeling to consolidate existing data, combine the effects of multiple factors, better identify information gaps, help narrow the field of likely survival drivers, and provide a framework for future data inputs. Simultaneously, implement field sampling and assessment activities to improve our understanding of prey availability and to better evaluate the salmon themselves.

- Consider large-scale and targeted experiments as a method of isolating factors and evaluating their influence on survival and growth of salmon.

Our next steps toward developing a joint research program are:

- Incorporate the workshop recommendations into the research planning effort.
- Establish US-Canada workgroups to flesh out the research components that will benefit from transboundary collaboration (e.g., Modelling workgroup, Sampling methods and standards, etc.)
- Work with research developers and agency leads to develop a fundraising strategy that aligns the research components with appropriate funding sources.

We ask the Pacific Salmon Commission to consider supporting this project through the Southern Endowment Fund. The objective of this project is consistent with the Southern Fund's Strategic Plan, indicating a need to gain a better understanding of the relationship between salmon and the marine ecosystem and to incorporate that into science and management processes. Through the project's business model, we intended to team your support with private and corporate funds, foundation funds, endowments, and other federal, state, and tribal government support.

Enclosed is the draft report summarizing the results and recommendations of the Salish Sea Marine Survival Research Planning and affiliated Ecosystem Indicators Development workshops. Please contact Michael Schmidt and Brian Riddell for more information.

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Pacific Salmon Foundation
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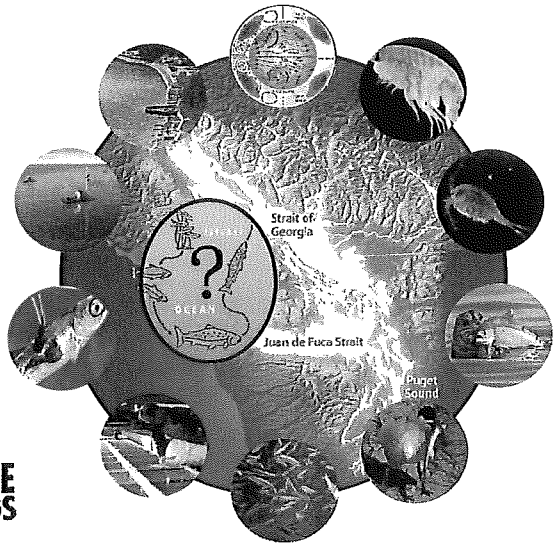
Project Partners:

Canada Department of Fisheries and Oceans	US Fish and Wildlife Service
NOAA Fisheries	University of Victoria
Washington Department of Fish and Wildlife	University of British Columbia
Northwest Indian Fisheries Commission	University of Washington
Nisqually Indian Tribe	Port of Seattle
Tulalip Tribes	Port Metro Vancouver
Lummi Nation	Washington Sea Grant
Puget Sound Partnership	National Fish and Wildlife Foundation
US Geological Survey	Puget Sound Salmon Recovery Council

Salish Sea Marine Survival Project



LONG LIVE THE KINGS

PACIFIC SALMON FOUNDATION

Salish Sea Marine Survival Project

A fully integrated, multi-disciplinary program to understand the determination of early marine survival of salmon in the Salish Sea ecosystem. Ultimately, for the restoration of salmon production, sustainable fisheries, and increased benefits to local communities.

The Salish Sea Projects builds from past efforts of PSF's Strait of Georgia proposal (2009), PSC's Fraser Sockeye workshop (June 2010), Salish Sea Ecosystem Conference (2011), development of the Strait of Georgia Data Centre (PSF/UBC/Sitka Foundation, 2012), and the Salish Sea Marine Survival Workshop (PSF/LLTK, Nov. 2012)

Salish Sea Marine Survival Project Process

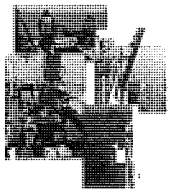
Comprehensive research planning (1-1.5 years – done spring 2013)

Canada

US

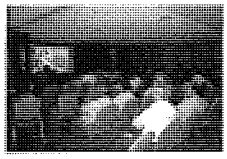
Workshop + New Information

Coordinated, systematic research (5 years)



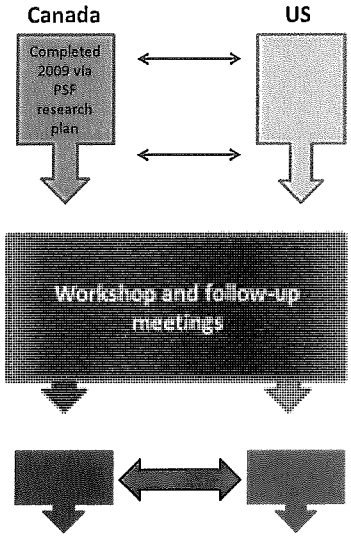
Universities, First Nations/Tribes, Government, NGOs, Communities

Dissemination and application of the research results to management.



Salish Sea Marine Survival Research Planning Process

- Develop operational structure, conceptual framework, hypotheses and preliminary research recommendations
- US- Canada Salish Sea Marine Survival Workshop
- Complete workshop summary report identifying critical elements of collaborative US-Canada research program
- Develop coordinated research plans. Draft US Puget Sound research plan and build upon existing Canadian SOG plan.



Operational Structure - US

Nonprofit Support

- Project management, coordination and facilitation
- Fundraising and Communications
- Support integration with other programs

LONG LIVE THE KINGS

Coordinating Committee
(Management)

- Program guidance
- Fundraising
- Respond to research outcomes

Technical Team
(Science)

- Plan and implement research

Supporting Experts
(Science - Affiliated research)

- Assist w/ research planning and implementation

NWIFC

SUQUALLY INDIAN TRIBE

PugetSoundPartnership

USGS

LUMMI NATION

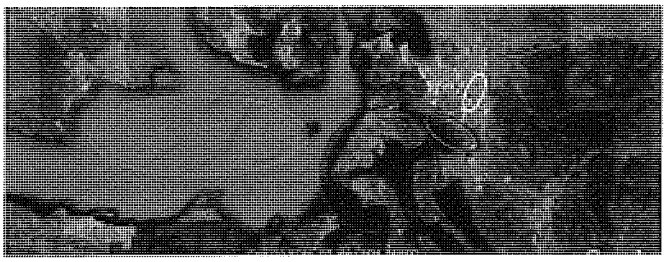
US Technical Team

Dave Beauchamp	U. Washington / USGS	Ecology: food web, bioenergetics
Barry Berejikian	NOAA NWFSC	Ecology: behavior, life history, hatcheries
Josh Chamberlin	NOAA NWFSC	Ecology
Alan Chapman	Lummi Nation	Harvest, Hatcheries, Biology
Mike Crewson	Tulalip Tribes	Hatcheries, Harvest, Biology
Chris Elings	Nisqually Tribe	Ecology and habitat
Correigh Greene	NOAA NWFSC	Ecology
Paul Hershberger	USGS	Disease
Julie Keister	U. Washington	Zooplankton ecol./ oceanography
Nate Mantua	U. Washington	Climate, ecology, oceanography
Jan Newton	U. Washington	Phys/biological oceanography
Sandi O'Neill	NOAA NWFSC	Toxics
Ken Warheit	WDFW	Genetics
Mara Zimmerman	WDFW	Ecology: wild salmon prod. eval.

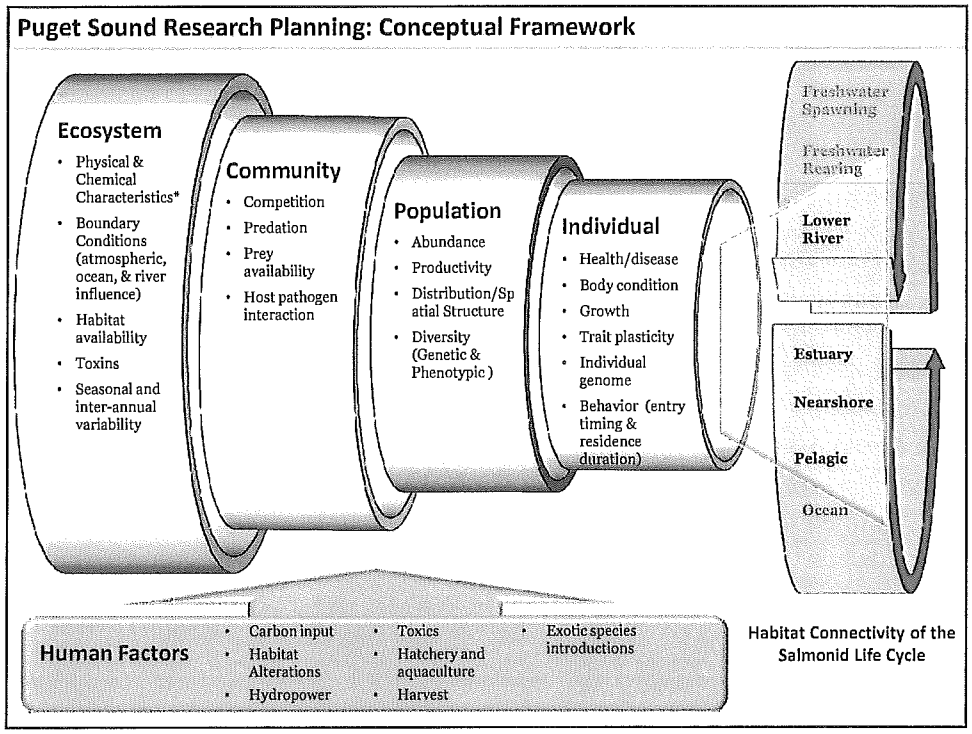
Other Contributing Scientists

Neil Banas	U. Washington	Biological oceanography/modeling
Chris Harvey	NOAA NWFSC	Ecosystem modeling
Sayre Hodgson	Nisqually Indian Tribe	Ecology and habitat
Lyndal Johnson	NOAA NWFSC	Toxics
Parker MacCready	U. Washington	Physical oceanography/modeling
Paul McElhany	NOAA NWFSC	Ocean acidification
Jack Rensel	Rensel Assoc.	Harmful algae

Puget Sound Research Planning: Scope

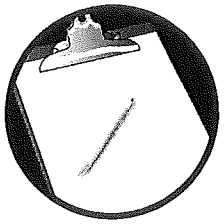


- Juvenile **Chinook, coho, steelhead,** chum, pink, and sockeye (inc. resident forms)
- Geographic areas: lower river, estuary, nearshore, pelagic
- Inc. health/condition of fish as they enter & leave the Salish Sea



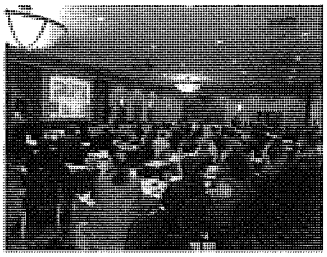
Puget Sound Preliminary Research Recommendations

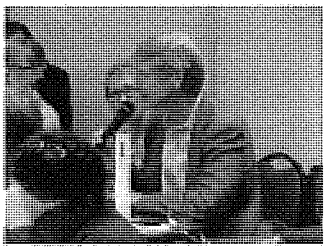
- 14 primary hypotheses w/ some sub-hypotheses designed to determine primary factors affecting survival.
- Categorized based upon a conceptual framework.
- Preliminary research recommendations for retrospective analyses, modeling, intensive field work and diagnostic studies.
- Larger scale experimentation not strongly considered, and recommendations for comprehensive modeling and cumulative effects analyses incomplete.



Marine Survival Workshop

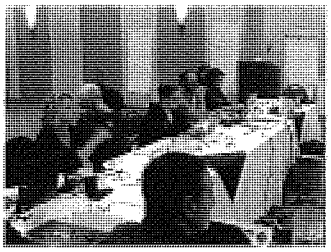
- 3-day workshop in November 2012.
- Over 90 participants, representing multiple disciplines (salmon biology/genetics/ecology, physical and biological oceanography, prey, predators, disease, toxins, toxics, and habitat)
- 15 member Advisory Panel provided recommendations for critical elements of US-Canada joint research program.
- Ecosystem Indicators for adult return abundance workshop followed w/ over 50 participants.

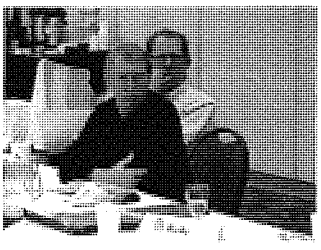




Marine Survival Workshop - Recommendations

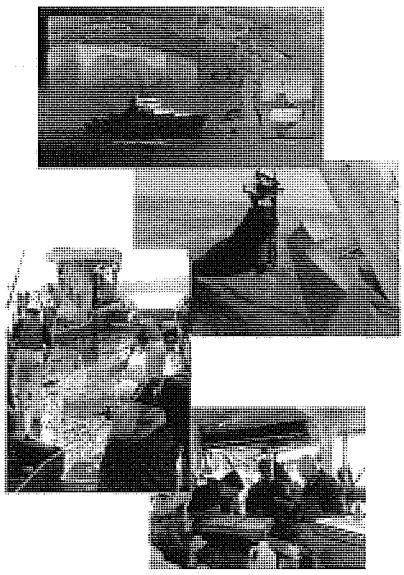
- US-Canada research program has ecological and operational merit.
- Focus on the fish but be multi-faceted to account for ecosystem interactions.
- Build around an understanding of bottom-up and top-down processes.
- Use retrospective analyses and modeling to provide a framework for data inputs, ID information gaps, consolidate data, evaluate cumulative effects, narrow field of drivers.
- Implement field work to eval. prey availability and assess salmon.
- Consider large-scale experiments to isolate factors.





Next Steps

- Finish research planning
  (goal = spring 2013)
- Pilot studies in 2013
- Integrate with existing research, monitoring, & planning activities
- Fundraise (Private/Corp., User groups, Foundations, PSC, Government, ?)
- Implement, target 2014



The Results and Recommendations of the Salish Sea Marine Survival Research Planning and Ecosystem Indicators Development Workshops

DRAFT Summary Report – January 11, 2013

Overview

In November 2012, two international workshops were held in Bellingham, Washington over the course of 5 days to discuss the causes of salmon and steelhead mortality in the Salish Sea region: the inland sea shared by US and Canada that consists of the Strait of Georgia, Puget Sound and the Strait of Juan de Fuca. The workshops were called for based upon two concerns:

- Observed marine (juvenile outmigrant to adult) survival rates for many stocks of wild and hatchery Chinook, coho and steelhead have declined significantly since the 1970's and 80's, in some cases to less than one tenth of the levels experienced then, while pink salmon abundance has increased substantially since the 1990's, indications that substantial changes are occurring in the marine environment. The survival trends among Salish Sea stocks are strongly correlated and differ from the survival trends of stocks outside the region, suggesting that overall survival is heavily impacted when salmon and steelhead are in the Salish Sea.
- The total number of adults returning has varied by orders of magnitude for most Salish Sea salmon species and stocks, even from year to year**.**

The uncertainty surrounding the causes of salmon and steelhead mortality, especially in the marine environment, poses a significant risk to wild salmon and steelhead recovery as well as the management of sustainable hatchery and wild stock fisheries; and to the preservation of associated tribal treaty rights. The outcomes of these workshops are contributing to ongoing US-Canada research and assessment efforts that will:

a) identify or help prioritize hatchery, harvest, habitat and ecosystem management actions to increase the survival of Salish Sea wild and hatchery salmon and steelhead (including ESA listed populations);

b) improve the accuracy of adult salmon and steelhead return forecasting and, thusly, natural spawning, harvest, and hatchery management; and

c) help us more accurately evaluate the success of freshwater habitat restoration and hatchery activities by reducing uncertainty around the role of the marine environment in overall productivity.

Ultimately, the research and assessment results and subsequent management actions may also benefit other Salish Sea marine life, such as ESA-listed southern resident killer whales.

The first of the two workshops was a three-day effort convened by Long Live the Kings and the Pacific Salmon Foundation to determine the critical elements for a joint US-Canada research program focused on identifying the primary factors affecting the survival of salmon (mainly Chinook and coho) and steelhead in the Salish Sea. The second workshop, led by NOAA Fisheries staff, was held immediately following the marine survival workshop to discuss ecosystem indicators for adult salmon return

abundance forecasting. There was a large degree of cross-participation by organizers, speakers, and attendees.

The 90 participants of the **Salish Sea Marine Survival** research planning workshop, and subsequently a 15 member Advisory Panel, reviewed the presentations and background materials and provided recommendations for a US-Canada research program. They are summarized as follows:

- Development of a collaborative international research program would have significant ecological and operational merit, and the approach would increase the likelihood management and the public will accept its results.
- Don't try to "explain" the entire ecosystem. The program should be driven by what the fish are telling us, but be adequately multifaceted to identify ecological stressors and survival drivers.
- Design the research carefully so that short and long-term research efforts will inform management. Perform short-term experiments and process/diagnostic studies in a larger monitoring and assessment framework. Focus on narrowing the field of factors affecting survival and provide a mechanistic context for their influence on survival in the short-term. These studies will contribute data to longer time series and help refine the monitoring and assessment design. Use long-term time series analyses to evaluate the utility of the mechanistic relationships over longer periods of environmental variability, and to determine whether changes to certain factors explain salmon and steelhead survival trends.
- Understand where/when bottom-up (e.g., physical environment and prey resources) and top-down (e.g., predation and disease) processes prevail and then use this as a framework for evaluating other factors that may affect survival. Build from primary hypotheses based on existing evidence; however, don't discount the other factors presented at the workshop given the complexity of the salmon-marine environment relationship and the limited data available. Evidence of size-selective mortality in **Chinook and coho** suggests factors affecting size and growth are most important to their early marine survival, with food supply as the strongest likely mediator. However, **juvenile steelhead** mortality may be associated with predation, given their larger size at outmigration, very short residence time in the Salish Sea marine environment, evidence of high and rapid mortality in the marine environment, and no compelling evidence of size-selective mortality.
- Prioritize retrospective analyses and modeling to consolidate existing data, combine the effects of multiple factors/stressors, refine/increase the defensibility of hypotheses, better identify information gaps, potentially narrow the field of likely survival drivers, and provide a framework for future data inputs.
- Look for obvious and significant data gaps (e.g., zooplankton and ichthyoplankton prey availability), and implement specific monitoring activities immediately, most importantly a bottom-up program to evaluate prey availability and to evaluate the salmon themselves.
- For steelhead, it would be better to first determine whether there are mortality hotspots and then assess whether predation is a survival driver through experimental studies.
- Consider large-scale and targeted experiments. For example, hatchery manipulations may alter abundance and distribution of juvenile fish at specific times and places.
- Address the following in the US-Canada operational structure: cross-border research collaboration; fundraising and outreach needs; and strategic integration with existing programs, relevant groups, forums, etc.

During the **Ecosystem Indicators** development workshop, roughly 50 participants convened t: (1) identify a suite of freshwater and marine ecosystem indicators that could be used to improve forecasts of returns of the numerous species and stocks of salmon in the Salish Sea, (2) determine a plan for monitoring promising indicators and closing spatial or temporal gaps in existing indicators, (3) identify important monitoring programs at risk, and (4) improve ways to share and synthesize data, standardize data collection methods, and coordinate efforts. For six species of salmon, workshop participants identified the most promising indicators in three categories: physical environment, prey and growth, and predators and abundance. Freshwater, estuarine, nearshore, and offshore habitats were considered separately in the context of species-specific life histories and migration patterns. Large-scale climate indicators are consistently monitored and available in standard formats. Biological indicators are less consistently monitored, tend to have gaps in space and time, and are at greater risk of being interrupted as agency priorities change. Food supply probably mediates salmon survival in most years, and there is a notable lack of zooplankton and ichthyoplankton data. Estuary habitats have the most difficult monitoring problems and the weakest data sets in many watersheds, though sufficient data are lacking in most marine environments, both nearshore and offshore. There is a need for basin-wide coordination of data collection, compilation, and analysis. A Salish Sea database will require development of a regional infrastructure and stable, long-term management.

An Ecosystem Indicators report and Salish Sea Marine Survival research proposal will be completed in 2013. These reports will provide the initial framework for implementing each program, with a significant degree of overlap between the efforts built in.

The remaining sections of this document describe the results of the two workshops. The marine survival research program recommendations and next steps are described, followed by the outcomes, recommendations and next steps identified in the ecosystem indicators workshop. Finally, a brief synopsis is provided that describes where the needs identified in both workshops overlap.

Note: This is a draft summary of the workshop recommendations. The marine survival portion of the summary is being reviewed and edited by the workshop Advisory Panel, after which it will be migrated into a full workshop report and sent to the workshop participants for review and comments before it is finalized. The full workshop report will include more information about the presentations themselves.

Salish Sea Marine Survival Research Planning Workshop

In November 2012, Long Live the Kings and the Pacific Salmon Foundation convened a 3-day, US-Canada workshop in Bellingham, Washington to:

> *determine the critical elements for a joint US-Canada research program focused on identifying the primary factors affecting the survival of salmon and steelhead in the Salish Sea. Such information is vital to the recovery of wild salmon and steelhead and for managing sustainable hatchery and wild stock fisheries.*

There is increasing evidence that changes in the Salish Sea marine environment may be significantly affecting the overall survival of salmon and steelhead. Chinook, coho and steelhead survival in the marine environment has declined substantially: from the time they leave the freshwater as juveniles to when they return to their natal rivers or are harvested as adults (aka. marine survival). Many of these Salish Sea wild and hatchery stocks are experiencing marine survival rates less than one tenth of the levels experienced in the 1970's and 80's. At the same time, wild pink salmon abundance has increased substantially since the 1990's and chum and sockeye abundance has varied extraordinarily over the past three decades. The commonality in patterns of survival among Salish Sea stocks compared to the survival trends of stocks outside the region suggest that overall survival is strongly impacted during the period salmon and steelhead are in the Salish Sea.

Effective salmon and steelhead management requires a thorough understanding of the factors controlling survival at each specific life stage. Current management and recovery efforts rely on understanding and addressing issues affecting freshwater productivity, but they are hampered by an inadequate and fragmented understanding of issues affecting productivity in the marine and estuarine environments. This is a critical knowledge gap since it is known that the marine life stages are of equal importance for salmon and steelhead survival compared to the freshwater life stages, and the early marine phase is generally considered one of their most critical periods, where the fish are known to experience some of their most rapid growth and highest mortality rates.

While the focus of the workshop discussions was primarily on the marine survival of Chinook, coho and steelhead, all species were included to some extent given interspecies interactions and potentially shared survival drivers (e.g., by life-history types). Also, future research methods can readily evaluate multiple species simultaneously. The results of this workshop are intended to provide guidance to US and Canadian scientists currently planning Salish Sea marine survival research. The scientists, and in the US, the project's Coordinating Committee, will review the results of this workshop and determine the next steps toward a collaborative research effort.

Over 90 participants representing multiple disciplines attended the workshop for the first two days, presenting and discussing hypotheses and research methods that help describe the salmon and the factors potentially affecting them (salmon biology/genetics/ecology, physical and biological oceanography, prey, predators, disease, toxins, toxics, and habitat). Facilitated discussions resulted in suggestions for how to improve upon the research recommendations provided by the US Technical Team for Puget Sound and the scientists who developed the Pacific Salmon Foundation's Strait of

Georgia Chinook and coho research proposal.[1] The content of the workshop background materials, the workshop presentations, and the participants' suggestions were then discussed by an Advisory Panel on the third day, who provided more detailed recommendations for moving forward with a US-Canada Salish Sea marine survival research program.

Advisory Panel Members

Richard Beamish (CA)	Retired, Senior Scientist, Department of Fisheries and Oceans, Pacific Biological Station
Dave Beauchamp (US)	Scientist, US Geological Survey & Professor, University of Washington, Aquatic and Fishery Sciences
Barry Berejikian (US)	Behavioral Ecology Team Leader, NOAA Northwest Fisheries Science Center
Eddy Carmack (CA)	Oceanographer, Department of Fisheries and Oceans
Ed Casillas (US)	Retired, NOAA Northwest Fisheries Science Center
Tracy Collier (US)	Science Director, Puget Sound Partnership
Ken Currens (US)	Hatchery Genetics Manager, Northwest Indian Fisheries Commission
Ed Farley (US)	Ecosystem Monitoring & Assessment Program Manger, NOAA Alaska Fisheries Science Center
Kurt Fresh (US)	Estuarine and Ocean Ecology Program Manager, NOAA Northwest Fisheries Science Center
Crawford "Buzz" Holling (CA)	Retired Ecologist
Mike LaPointe (CA)	Chief Biologist, Pacific Salmon Commission
Bill Peterson (US)	Oceanographer, NOAA Northwest Fisheries Science Center
Brian Riddell (CA)	President and CEO, Pacific Salmon Foundation
Rusty Sweeting (CA)	Scientist, Department of Fisheries and Oceans, Pacific Biological Station

Research Program Recommendations

The comments provided during the workshop and the recommendations of the Advisory Panel are described below. Four questions were asked directly of the Advisory Panel, and the workshop discussions were also guided toward determining the answers. Those are: **a) whether there is sufficient ecological and/or operational merit to warrant a collaborative international research program; b) whether a whole ecosystem study is needed; c) what factors should be investigated and research components implemented; d) what the resulting research program(s) should look like structurally and operationally.**

[1] The Hypotheses and Preliminary Research Recommendations for Puget Sound and the Strait of Georgia Chinook and Coho Proposal are available at: http://www.lltk.org/SSMSPworkshop/meeting-materials.

A) Is there sufficient ecological and/or operational merit to warrant a collaborative international research program?

The workshop participants concluded and then the Advisory Panel confirmed that there is sufficient merit to move forward collaboratively between US and Canada. The panel suggested that the following inform where, how and the degree to which collaboration should occur:

1. Physical/biological information (how much do the systems have in common? Where is the greatest degree of overlap?).

   > Based upon the workshop presentations and discussions, the Strait of Georgia and Puget Sound respond simultaneously to large events such seasonal changes and large-scale climate and ocean changes. And, generally, the marine survival of both Puget Sound and Strait of Georgia Chinook, coho and steelhead stocks have declined, and pink salmon abundance has increased, since the 1970-80s.

2. Existing assets or capabilities that are unique or have greater capacity on either side of the border.

   > The Canadian W.E. Ricker mid-water trawling cruises to capture juveniles offshore throughout the Salish Sea are a prime example.

The panel also concluded that a unified, US-Canada approach increases the likelihood that management and the general public will accept the outcomes of the research (the bar for information to influence policy is higher than the bar for publication).

B) Is a whole ecosystem study needed? C) What factors should be investigated and research components implemented? And D) What should the resulting research program(s) should look like structurally and operationally?

Ultimately, the workshop participants and the Advisory Panel do not think a whole ecosystem approach is needed (i.e., simultaneous data collection of all relevant environmental factors). The Advisory Panel instead recommends building from primary hypotheses based on existing evidence, and to strategically evaluate the other factors presented at the workshop, none of which could be discounted given the complexity of the salmon-marine environment relationship and the limited data available. They recommend including the multiple factors currently identified as potential stressors/survival drivers in a more comprehensive but simple retrospective analysis and modeling exercise, with the output of that exercise possibly resulting in a more limited list of factors to research. The Advisory Panel determined that certain data collection activities (via monitoring and experiments) should be implemented immediately and identified specific, high priority data collection needs (e.g., zoo/ichthyo- plankton prey availability) based upon existing information. They also concluded a well coordinated effort of simultaneous data collection is imperative. The Advisory Panel also recommends that the primary focus continue to be on the salmon and steelhead themselves as they will likely be able to provide the greatest amount of information regarding what is driving their survival. .

The Advisory Panel agrees with evidence that indicates size-selective mortality is a prevalent force regulating the marine survival of **Chinook and coho** in the Salish Sea, suggesting factors affecting size and growth are most important. Food supply (including the quantity, quality, timing, and spatial extent of prey and the impact of competition on food availability) was considered the strongest likely mediator of size and growth. Therefore, the Advisory Panel concludes that a greater understanding of bottom-up processes is critical to serve as the foundation for US-Canada marine survival research. This is consistent with the findings of juvenile salmon ecology studies from the California Current and Alaska indicating that size and growth during the first month or so in the marine environment explains a significant amount of the variation in overall marine survival to adulthood (fish that grow faster and get larger tend to survive better).

Other factors may affect size and growth (e.g., increases in water temperature, toxics and/or disease), and factors such as nearshore habitat loss, climate change and ocean acidification may be influencing bottom-up processes. None of the other hypotheses presented at the workshop describing the factors that could be affecting survival could be discounted with the information provided. In addition to the factors described above, these include: freshwater outmigrant timing/condition, limited diversity, the effect of Salish Sea residence duration, direct or indirect effects of harmful algae, and increased predation. The Advisory Panel discussed predation as the ultimate source of mortality in some detail, in response to the lack of evidence suggesting fish are starving to death and the rapid mortality witnessed in steelhead acoustic telemetry studies. While predator abundance could drive predation, increased predation may also be associated with reduced size and growth, mediated by bottom-up processes, or as a result of a limited abundance of prey. Ultimately, the Advisory Panel suggests predation as the other book end for the US-Canada study given its significant potential role in mortality. Within this framework, the other factors discussed during the workshop can be evaluated.

Predation was hypothesized as the primary cause of the high mortality rates documented for steelhead trout in Puget Sound. Acoustic telemetry data have indicated that steelhead migrate through Puget Sound much more rapidly (approximately two to three weeks) than Chinook and coho salmon. Telemetry data do not indicate size selective mortality in Puget Sound. Rapid migration coupled with high mortality rates suggest that proximal mechanisms such as poor feeding opportunities, low growth rates, starvation, or disease are less important contributors to high mortality than predation. A meta-analysis of segment-specific survival rates other Puget Sound populations has recently been initiated and will help in identifying spatial patterns in mortality rates and further isolate potential hotspots. Equivalent data do not exist for steelhead in the Strait of Georgia.

The Advisory Panel strongly urges that efforts continue to focus on the fish[2] to help determine how the research effort should unfold over time (which factors to focus on and which to dismiss) and not get caught up in trying to "explain" the entire ecosystem. For example, answering specifics about primary productivity basin-wide may be beyond the scope of the effort. The most significant data gap is zooplankton and ichthyoplankton data as this is the basis of their food supply and the direct connection between salmon and bottom-up processes. The historical data for zooplankton is fragmented in both Puget Sound and the Strait of Georgia (inconsistent collection spatially, temporally and methodologically; and not tailored to evaluating food availability [e.g., supply, timing, quality, preferred prey] for the salmon species of interest). The Strait of Georgia has more

[2] *Build from factors directly impacting the fish outward to determine the factors ultimately driving survival*.

data that is quantitative, but evaluations of long-term changes in the zooplankton population are confounded by changes in spatial and seasonal distribution of sampling, especially for comparisons before versus after 1994.[3] Zooplankton data have been periodically collected in Puget Sound since the 1970's from disassociated studies, resulting in data that are largely disparate. One long, largely qualitative data set (1975-95) also exists but has not been assessed for its utility. Ichthyoplankton data is very limited in both Puget Sound and Strait of Georgia.

Specific recommendations for improving the currently proposed research approaches for Puget Sound and the Strait of Georgia are as follows:

I. Organize and better analyze existing data and create a modeling framework for analyzing the results of future field research

One of the most repeated recommendations by the workshop participants and then confirmed by the Advisory Panel is to develop a modeling approach and begin retrospective analyses now versus waiting for new data to be collected. This should be done to: consolidate existing data, combine the effects of multiple factors/stressors, refine/increase the defensibility of hypotheses, better identify information gaps, potentially narrow the field of likely survival drivers, and provide a framework for future data inputs. This activity may also help identify immediate management actions. This exercise should include the factors identified by the Puget Sound and Strait of Georgia scientists who developed the research proposals leading up to the workshop, and adding measures of human population growth. Specific suggestions for this suite of activities are as follows:

1. Refine the current evaluation of salmon and steelhead survival and abundance trends:
    a) Do a more precise evaluation of the coherence throughout the Salish Sea ecosystem and of the survival response by reviewing the marine survival or abundance trends among Salish Sea salmon and steelhead populations and their life histories.
        - Determine whether the system is connected and heterogeneous or disconnected and homogenous (Schafer and Carpenter 2003[4]).
        - Evaluate species/populations both that are doing well and those that aren't.
    b) Determine whether the survival of salmon and steelhead in the ocean can be quantified and separated from their survival in the Salish Sea to try to isolate the survival impacts of factors related to ocean processes versus those related to Salish Sea processes. Do this by comparing the marine survival of coastal stocks to Salish Sea stocks.

2. Develop a comprehensive modeling approach:
    a) Develop a taxonomy of the multiple models required. First, establish the questions to answer with models.

[3] *Based on a January 29, 2010 email written by Dave Mackas to Marc Trudel, subject, "Plankton in the Strait of Georgia".*

[4] *Schaffer, M and S.R. Carpenter. 2003. Catastrophic regime shifts in ecosystems: linking theory to observation. Trends in Ecology and Evolution. Vol. 18. No. 12*.

b) Use models to facilitate early steps in research, utilizing retrospective data, but appreciate the existing information gaps (e.g., zooplankton data) when evaluating their utility.

c) Use models as a powerful tool for incorporating and analyzing the salmon-Salish Sea ecosystem relationship with future assessment data from the field research implemented. Use the intensive sampling and assessment activities recommended in section II, below, as an opportunity to compare to and validate model outputs.

d) Utilize multiple models for duplication (one model may be wrong, two better, etc.) and to address the multiple aspects that must be covered (physical processes, biological processes, adaptive management).

e) Evaluate various modeling approaches, and begin with simple model exercises, working toward more complex approaches as needed. Determine whether existing models (diagnostic bioenergetics, life-history stage analysis, EcoSim with EcoPath for Puget Sound and the Strait of Georgia; ROMs, etc. for the Strait of Georgia) can be utilized, what basic first steps should be taken, and what more comprehensive models should be developed (e.g., MoSSea[5] for physical and planktonic modeling, through zoo/ichthyoplankton, and Atlantis for enhanced food web modeling).

f) Ensure models are spatially explicit.

g) Ensure models facilitate the evaluation of multiple stressors / cumulative effects.

3. Some additional recommendations for retrospective analyses and modeling are:

a) Evaluate size and age-composition of juvenile salmon in the marine environment over time to help illuminate whether food limitations are occurring (e.g., W.E. Ricker data midwater trawl data synthesized with existing nearshore, estuarine and smolt trap data).

b) Use historical data and modeling to look for regime shifts.

c) Evaluate correlations that once worked and now don't (pre-90s) vs. ones that work now (can also be done in association with monitoring).

II. Implement specific field sampling and assessment activities

The Advisory Panel recommends that the research developers should not wait for the results of initial retrospective analyses and modeling to implement certain field sampling and assessment activities. There is strong agreement that a more rigorous marine fish sampling program is needed to address known information gaps and concurrence that a bottom-up sampling program should be implemented. These programs should be performed simultaneously and coordinated thoroughly. These programs should be finalized and implemented immediately and the samples collected should be preserved routinely. Standardized sampling approaches should be developed for these programs that provide standards and protocols for existing and future

[5] *MoSSea – Modeling the Salish Sea is a modeling project of the U. of Washington designed to provide the first ever high-resolution, realistic hindcast simulations of the physical circulation in the entire Salish Sea region. A biological component is also available to couple with the hydrodynamic component to model bottom-up processes. http://faculty.washington.edu/pmacc/MoSSea/.*

sampling activities so that data can be shared more readily and utilized broadly in analyses. Data management should be coordinated and mechanisms such as data aggregators or a shared web site housing the data should be considered. Consider beginning with an assessment program feasibility study based around specific populations and locations with multiple assessment approaches deployed concurrently and use the results to refine a broader program. Compare populations/life histories that are doing well versus those that aren't (within and among species) in the study.

The following are specific recommendations from the Advisory Panel:

1. Zooplankton and ichthyoplankton prey availability data collection/analyses is the highest priority as that is the direct link to salmon productivity and the most significant, current data gap. The Advisory Panel is not aware of local past or present ichthyoplankton research that would inform the development of an ichthyoplankton monitoring program. They recommend consulting with specialists outside of the region, such as scientist at NOAA's Alaska Fisheries Science Center, and consider implementing a feasibility study. Some Advisory Panel members cautioned that the effort put into ichthyoplankton monitoring should be consistent with the need for that information, based upon the apparent role of ichthyoplankton in the salmon food web: as a food source or a competitor for food. Basic ecosystem modeling with existing utilities may help determine how sensitive salmon are to potential changes in ichthyoplankton.
2. Use circulation models to help refine the spatial extent of sampling (this applies to fish sampling as well).
3. Better determine where and when salmon are feeding, day and night (e.g., depth).Be cost-effective about physical and primary production data collection; however, be inclusive of methods for understanding how physical processes affect the distribution of production.
4. Consider the entire year, not just the spring phytoplankton bloom, and vary the intensity of sampling based upon when the fish are in the system, especially during their first month of marine residence (predominantly February – October if including chum, pink and all life-histories of Chinook, coho, and steelhead). Evaluate the marine survival performance of salmon stocks that are released/outmigrate in the summer or fall compared to those that outmigrate in the spring to help determine whether food supply is an issue and the extent to which the spring bloom is playing a primary role.
5. Understand the condition of fish entering, and, if possible, leaving Salish Sea (to determine if they are "dead fish swimming", destined for higher mortality in the open ocean). Include other metrics in addition to size (e.g., energy, growth history from scales or otoliths). Make sure lipid content analyses are part of any monitoring program.

III. Develop large-scale and targeted experiments

Some Advisory Panel members suggest experimentation to isolate factors and evaluate their influence on survival. Some experiments were proposed in the Strait of Georgia Chinook and coho plan; however, they were largely not proposed as part of the Puget Sound preliminary research recommendations. The Advisory Panel recommends that the research developers further consider the utility of experiments. Some examples discussed were:

1. Hatchery manipulations, integrated on a Salish Sea – wide scale (composition [species and life-history], size, timing, numbers).
2. Mesocosm studies using net pens (varying mesh sizes resulting in varying degrees of access to various prey).
3. Net pen studies to evaluate growth rate restrictions in the marine environment.
4. Targeted acoustic studies to identify exactly where fish are dying (hotspots study).
5. PIT tag thousands of fish simultaneously and monitor seal haul-out sites and bird rookeries to evaluate predation.
6. Comparative survival studies: fish barged past potential hotspots vs. those not (especially for steelhead).
7. Control-treatment outmigrant studies re: barging fish through the system to avoid stressors like HAB and predators, disease treatment such as *Vibrio* inoculations, and chemical treatment for repelling sea lice.

Advisory Panel members also suggest that researchers look to changes in management over the past 30 years that could equate to large-scale experiments, such as some of the hatchery production changes that have occurred (e.g., 50% reduction in hatchery steelhead production in Puget Sound, the response to seal population reductions in Hood Canal from transient killer whales, etc.).

IV. Operational Recommendations

The Advisory Panel provided the following operational recommendations:

1. Develop an international management and public engagement strategy.
    a. The Pacific Salmon Foundation and Long Live the Kings should continue to help identify and coordinate the appropriate parties and facilitate the process.
    b. Strategically engage and utilize relevant groups, forums, etc. (e.g., Pacific Salmon Commission, Puget Sound Partnership, etc.)
2. Develop international workgroups to refine and begin implementing research components. The workgroups should be multi-disciplinary as appropriate and created to satisfy the specific research components:
    a. retrospective and modeling
    b. experiments
    c. diagnostic studies and monitoring
    d. collaboration, communication and data sharing
3. Establish an international equivalent to the US Coordinating Committee to help identify and secure funding and ensure management cooperation, buy-in and guidance.

E) Challenges and Opportunities

Specific challenges and opportunities were identified over the course of the workshop. Those that were more salient are listed below:

Challenges

- The current funding environment is poor, requiring creative, strategic thinking and targeting various funding sources for different components of the future research program.
- Retrospective work is typically not easy to fund, and the historical record is patchy.
- There are concerns about the longevity of existing programs as budgets continue to shrink.
- Careful study design is imperative to ensuring that short and long-term research efforts will inform management. To achieve this, experiments and process/diagnostic studies must be carried out within a larger monitoring and assessment framework. Short-term studies should focus on narrowing the field of factors affecting survival and provide a mechanistic context for their influence on survival. These results of these short-term studies will contribute data to longer time series and help refine the monitoring and assessment design. And, long-term time series analyses (via modeling, regressions, etc.) can be used to evaluate the utility of the mechanistic relationships over longer periods of environmental variability, and to determine whether changes to certain factors explain salmon and steelhead survival trends.
- The Endangered Species Act has "take" limitations that could affect the extent of sample collection. There are only a few salmon and steelhead populations with marine (outmigrant-to-adult) survival data in the Strait of Georgia, inhibiting the evaluation of factors effecting their survival.

Opportunities

- Citizen/community science to accomplish some of the spatially extensive monitoring likely required.
- Other retrospective data sources (e.g., fishermen's logs, First Nations data sets).

Next Steps

The US and Canadian scientists currently planning Salish Sea marine survival research are reviewing the results of this workshop in the context of their planning efforts and are working on the next steps to develop a comprehensive, collaborative research program. A revised research planning framework will be implemented that utilizes US-Canada workgroups to complete the research components that will benefit from transboundary collaboration. Fundraising is also a high priority. Long Live the Kings and the Pacific Salmon Foundation are working with the research developers and agency leads to develop a fundraising strategy. Target sources of funding will be identified for the various components of the research, and a high-level proposal will be drafted for participating managers to lobby for the project at the federal/Congressional level.

Ecosystem Indicators for Forecasting Adult Salmon Returns

In February 2011, co-managers associated with the North of Falcon Process met with John Stein, Director of NOAA Fisheries' Northwest Fisheries Science Center, to discuss their concerns over declining salmon stocks in Puget Sound. An increasing concern is the inability to consistently predict reasonably accurate marine survival rates (unique by species and by stock) used in salmon recovery efforts and to forecast Puget Sound adult abundances for the annual fisheries planning processes. Observed marine survival rates have declined considerably in recent years for many species and have varied by orders of magnitude for some species and stocks, even from year to year. Without advance indications of what to expect for the annual marine survival rate, the abundance forecasts for many Salish Sea stocks essentially utilize recent marine survival trends. As there appears to be increasing instability in marine survival rates, following the trend poses risks. Poor forecasts present a serious management challenge because they impact treaty rights and may drive future listing decisions of salmon populations as well.

Monitoring programs like those conducted on the Washington and Oregon coasts, which produce ecosystem indicators used to forecast adult returns of Chinook and Coho salmon to the Columbia River system and Washington Coast, are not consistently conducted in Puget Sound by NOAA or any other governmental group. A program in Puget Sound would improve the ability of harvest managers to accurately forecast adult salmon returns, reduce the risk of over-harvest, and improve the likelihood of meeting recovery goals for ESA-listed species. These issues were addressed with a workshop organized to improve ecosystem indicators used in forecasting. In recognition of the large topical overlap with that of the Salish Sea Marine Survival Workshop, this two-day meeting followed the Marine Survival workshop, with a large degree of cross-participation by organizers, speakers, and attendees.

The goals of the Ecosystem Indicators workshop were to:

- identify a suite of ecosystem indicators that could be used to improve forecasts of returns of the numerous species and stocks of salmon in the Salish Sea,
- determine a plan for monitoring promising indicators and closing spatial or temporal gaps in existing indicators,
- identify important monitoring programs at risk, and
- improve ways to share and synthesize data, standardize data collection methods, and coordinate efforts.

This workshop therefore differed from the Marine Survival workshop in several ways. First, it considered the potential utility of ecosystem indicators in both freshwater and marine systems. Second, it focused on the application of scientific findings that would be a logical outcome of the plan for research developed at the Marine Survival Workshop. Third, it emphasized the importance of long-term monitoring that is needed for fishery management and salmon recovery efforts and will persist beyond the 5-10 year timeline specified by the Marine Survival research plan.

Workshop Process and Results

In the two days of the workshop, participants heard from 18 speakers who have collected or utilized data on promising ecosystem indicators, broadly grouped into abiotic processes (climate, freshwater, estuarine, and marine habitat processes), population metrics at juvenile life stages (e.g., freshwater outmigrants, abundance within Puget Sound or the Strait of Georgia), and trophic interactions (predators, prey, and individual condition). During the second day of the workshop, participants discussed these findings in light of the goals of the workshop, focusing on three general issues:

A. what are the most promising ecosystem indicators for forecasting adult returns of the six salmon species found in Puget Sound?,

B. what indicators require new monitoring programs to fulfill, and is there a logical lead entity or entities to perform them?, and

C. given the existence of multiple entities collecting information, how should responsibility for data synthesis be shared, and is there a common and acceptable platform or framework for sharing data?

A) What are the most promising ecosystem indicators for forecasting adult returns?

This question was addressed in the context of breakout discussion sessions, with participants joining one of three groups: 1) abiotic indicators, 2) prey and growth, or 3) abundance and predators. There was large agreement that ecosystem indicators would depend largely on the species of interest, and in many cases, on individual stocks of that species. In the tables below, relevant indicators for each species are noted with a dot, and were considered in the contexts of freshwater, estuarine, nearshore (e.g., within Puget Sound), or offshore (Strait of Juan de Fuca and the Pacific Coast). Much of the discussion was focused on identifying potential indicators, rather than restricting the number of relevant indicators without better data analysis to determine which indicators best predict variation in adult salmon returns. Nevertheless, some species-specific winnowing of potential indicators was possible.

The abiotic indicators subgroup considered a variety of indicators across habitats (Table 1), and noted several variables with data that were limited (*) spatially or temporally. It was also noted that hydrodynamic models can be used to predict some abiotic variation (e.g., temperature in estuaries) and that, as a major habitat type, estuaries have the sparsest data coverage.

Table 1. Potential abiotic ecosystem indicators. Starred (*) indicators indicate limited sampling across years or space.

Potential Indicator	Chinook	Coho	Steelhead	Sockeye	Chum	Pink
Freshwater						
Average river flow	●	●	●	●	●	
Low flows		●	●	●		
Peak flows	●	●			●	●
Temperature (winter & summer)*	●	●	●	●	●	●
Turbidity*	●	●	●		●	●
Snowpack	●	●	●	●	`●	●
Estuarine						
Estuarine temperature*	●	●			●	
Dissolved oxygen*	●	●			●	

Salinity*	●	●			●	
Nearshore & offshore						
pH	●	●	●	●	●	●
Temperature (e.g., DFO lighthouse data)	●	●	●	●	●	●
Salinity	●	●	●	●	●	●
Wind direction	●	●	●	●	●	●
Climate indicators (e.g. PDO, ENSO)	●	●	●	●	●	●
Cloud cover	●	●	●	●	●	●
Dissolved oxygen	●	●	●	●	●	●
Stratification	●	●	●	●	●	●

[1]PDO = Pacific Decadal Oscillation, ENSO = El Nino/Southern Oscillation

The prey and growth subgroup discussed numerous potential data sources (Table 2) including some that focused on productivity of the system (e.g., nutrients, chlorophyll, and growth in geoducks) as well as diet and growth of individual fish. Subgroup members noted that many potential indicators lacked time series with any spatial resolution, so linking these datasets with adult returns is in some respects just getting started for the Salish Sea. Hence, while some measurements could be specified by habitat type, little species-specific information is available. For the long term, an exploratory approach for discovering the most useful indicators was recommended. Meanwhile, most participants agreed that food supply probably mediates salmon survival in most years, and there is a notable lack of zooplankton and ichthyoplankton data. Therefore, zooplankton and ichthyoplankton data collection should commence immediately along with intensive coordinated fish sampling. The group also noted that fiscal vulnerabilities are a big consideration for sampling. For example, the W.E. Ricker midwater trawling effort (run in Georgia Strait and Puget Sound), which effectively samples most species and provides good diet, size, and some growth data, may lack funding for additional work in Puget Sound or be directed to address emerging priorities in other regions of the ocean unless creative means are found to fund it independently.

Table 2. Potential prey and growth ecosystem indicators. Starred (*) indicators indicate limited sampling across years or space. Location of sampling is indicated by F = Freshwater, N = Nearshore, O = Offshore, and All = All habitat types.

Potential Indicator	Chinook	Coho	Steelhead	Sockeye	Chum	Pink
Individual size and size change (All)	●	●	●	●	●	●
Outmigrant timing (F)	●	●	●	●	●	●
Body condition (e.g., lipid content, stable isotopes)* (All)	●	●	●	●	●	●
Growth (e.g., IGF)* (All)	●	●	●	●	●	●
Stomach Contents (All)	●	●	●	●	●	●
Disease* (All)	●	●	●	●	●	●
Oyster condition (N)	●	●	●	●	●	●
Crab CPUE, abundance (N,O)*	●	●	●	●	●	●
Geoduck growth rates (N)	●	●	●	●	●	●
Nutrients (N,O)	●	●	●	●	●	●
Chlorophyll (contributions by taxa*) (N)	●	●	●	●	●	●
Zooplankton density & biomass (N,O)*	●	●	●	●	●	●

Lipid and fatty acids of zooplankton (N,O)*	●	●	●	●	●	●
Phytoplankton sedimentation rate (N)*	●	●	●	●	●	●
Forage fish biomass (N,O)	●	●	●			

The abundance and predators subgroup considered the few potential datasets on predators of juvenile salmon, and the many datasets on salmon abundance (Table 3). Potential predators include piscivorous fish, seabirds, and marine mammals. These are generally long-lived species with populations that do not show strong interannual fluctuations that could readily inform yearly variation in salmon returns. However, seabird densities and activities of pinnipeds and orcas could conceivably be useful in forecasts.

Numerous abundance metrics are measured for juvenile salmon during their life cycle. Freshwater abundances include returning adults (including jacks and kelts), eggs, and outmigrants (including production from hatcheries). Many of these measurements (particularly outmigrants) are well represented in Washington but not in Canada. A variety of techniques exist for sampling juvenile salmon in estuarine and nearshore habitats, although coverage is limited in space and time for most of these measurements. The longest time series include fyke trapping, beach seining, shoreline counts, and neritic sampling in the Skagit River estuary and, to a lesser extent, in the Snohomish estuary. In addition, midwater trawling by the W.E. Ricker in the deeper waters of Puget Sound and Georgia Strait has continued for 11 years. All these programs are vulnerable to funding cuts or to shifting priorities. Even sampling as fundamental as counts of adult returns has witnessed declines in funding over the last ten years.

Many sampling programs are species-specific. For example, shoreline counts are effective for measuring only pink and chum fry. Outmigrant sampling in many places can provide good estimates of chum, coho, and Chinook, but not steelhead smolts because they can avoid traps. In the nearshore, steelhead are particularly difficult to sample because of their size, speed, and rapid outmigration. It was suggested that a purse seining monitoring program would provide useful sampling for all salmon species as long as it was done at the appropriate times, frequencies, and locations. Purse seining, which is used in the Lower Columbia and in the Strait of Georgia, is less harmful for the fish and thus more consistent with reducing the take of listed species.

Table 3. Potential predator and abundance ecosystem indicators. Starred (*) indicators indicate limited sampling across years or space.

Potential Indicator	**Chinook**	**Coho**	**Steelhead**	**Sockeye**	**Chum**	**Pink**
Predators indicators – Nearshore						
Seabird abundance	●	●	●	●	●	●
Pinniped activity	●	●	●	●	●	●
Orca activity	●	●	●	●		
Abundance indicators – Freshwater						
Pre-spawn mortality	●	●	●	●	●	●
Adults	●	●	●	●	●	●
Jacks	●	●				
Eggs (adults * fecundity)	●	●	●	●	●	●
Juvenile outmigrants (NOR & HOR[1])*	●	●	●	●	●	●
Hatchery production	●	●	●		●	

Early survival of HOR groups	●	●	●		●	
Abundance indicators – Estuarine						
Cumulative density*	●	●			●	
Abundance indicators – Nearshore						
Shoreline counts*					●	●
Beach seining density*	●	●			●	●
Neritic density*	●	●			●	●
Midwater CPUE*	●	●		●	●	●
Purse seine CPUE*	●	●	●	●	●	●
Abundance indicators – Offshore						
Pelagic CPUE	●	●	●	●	●	●
Pattern of offshore migration	●	●	●	●	●	●

[1]NOR & HOR are abbreviations for natural-origin recruits and hatchery-origin recruits, respectively.

B) What indicators require new monitoring programs to fulfill, and by whom?

A number of indicators noted in the list above would likely be new in particular oceanographic basins. New indicators will be a challenge to use for predicting adult returns simply because they lack an annual time series, so choice of these new techniques should be based on existing work elsewhere in the Pacific Northwest, or based on analysis of spatially or temporally sparse local datasets. For example, many of the potential new monitoring programs follow from Bill Peterson's Ecosystem Indicators list. Workshop participants discussed these potential activities and provided logical lead entities for data collection. Many of the sampling programs conceivably could be performed locally by multiple groups, and could be incorporated into a comprehensive sampling effort that could offset the fiscal challenges of a large sampling program. Participants agreed that analysis leading to usage of data as indicators of adult returns should be performed by tribal, academic, state (WDFW) and federal (NOAA, DFO) entities.

C) How should responsibility for data synthesis be shared, and on what type of platform?

Data sharing platforms include NANOOS, SalmonScape, and cloud-based platforms. Logistics of managing such a diverse database are difficult and require planning and resources. Major issues include database development and maintenance, data sharing agreements, data synthesis – who does it and how is it shared – and timeliness. Products need to be available on a schedule that allows co-managers to use them in forecasts, and monetary support is essential if this is to take place. Furthermore, standards for data collection, analysis and sharing need to be agreed upon to support both timely forecasts and longer-term peer-reviewed publications.

Workshop participants agreed on the need for a centralized point of data access for research data sets and for annual indicators and other synthesized products. Given existing efforts by NOAA and DFO on production of indicators, many participants agreed that NOAA and DFO should take the lead in developing indices and the stoplight tables that inform predictions. However, methods still need to be developed with the co-managers and standardized among NOAA and DFO, particularly in how the red-yellow-green forecast categories are determined.

Table 4. Potential new monitoring activities that could provide useful indicators, and the logical entities for data collection.

Activity	Logical entities for data collection
Purse seining	NOAA,DFO, Tribes
Genetic stock ID	WDFW, DFO, Tribes
Phytoplankton	All
Zoo & Ichthyoplankton	All
Age and growth in geoducks	Tribes, Industry, WDFW
Condition factors (stomach contents, lipids, growth, size, IGF)	NOAA, DFO, WDFW, Tribes
Sediment traps	All
Forage Fish Biomass/age structure	NOAA, DFO, State, Tribes
Stable isotopes (N, C)	All
Seabirds	WDFW, Environment CA, Audubon/community groups
Marine mammals	NOAA, DFO, Tribes, community groups
Standardized adult monitoring (spatial gaps exist)	Tribes, WDFW,DFO
Outmigrant trapping (Georgia Strait gaps, additional options in Puget Sound)	DFO, Tribes, WDFW

Recommendations and Next Steps

Several clear recommendations emerged from the presentations and discussions of the Ecosystem Indicators workshop:

- A number of different indicators at several spatial scales (watershed, oceanographic basin, entire region) need monitoring in order for an ecosystem indicators approach to successfully be integrated into forecasts of adult salmon returns in the Salish Sea.
- Because of inherent differences in the biology and ecology of different salmon species, different sets of ecosystem indicators will likely need to be developed for each species.
- Monitoring plans need to address how existing gaps in indicators will be filled across space and time and how existing monitoring programs at risk can be maintained in the face of budget limitations.
- Several indicators, including zooplankton, individual size and growth, outmigrants, and midwater trawling are especially critical to initiate or maintain. Purse seining should be considered for increasing the capability of examining steelhead and other rapid salmon outmigrants and fish predators.
- Indicator development can be phased to take advantage of the variability of available time series. For example, numerous abiotic datasets that have good temporal and spatial representation could be used to produce an initial set of Ecosystem Indicators, and additional indicators could be added as more information becomes available.

- A number of indicators are amenable to distributed data collection efforts by Tribes, community groups, and other organizations. Collection of data in this manner will be facilitated by standardized data collection and management protocols.
- Links to the most commonly used abiotic indicators across the Salish Sea have been compiled as a product of this workshop, and these need to be incorporated into a database with a nested structure.
- Existing monitoring datasets will need to be managed in ways that facilitate both annual updating and timely availability for use by multiple co-managers charged with producing stock forecasts with seasonal deadlines.
- NOAA and DFO will coordinate the production of summaries of ecosystem indicators to facilitate forecasts of adult returns among major regions in the Pacific northwest (e.g., Columbia River system, Pacific Coast, and the Salish Sea).

Discussions on the second day of the workshop revealed that additional work needs to be done to coordinate monitoring, data management, and analysis tasks, particularly in light of the overlap with the Salish Sea Marine Survival workshop. First, a more detailed report is in preparation for early 2013, which will include presentation abstracts and expanded discussion summaries. This report will further lay out how the Salish Sea Marine Survival research plan will be linked with the development of Ecosystem Indicators. At the same time, members of the Ecosystem Indicators group will work with the Marine Survival technical team workgroups to follow the workshops' major recommendations regarding long-term monitoring, data management, and analysis. Concurrently, NOAA and DFO researchers will meet to discuss coordinating progress on ecosystem indicator development.

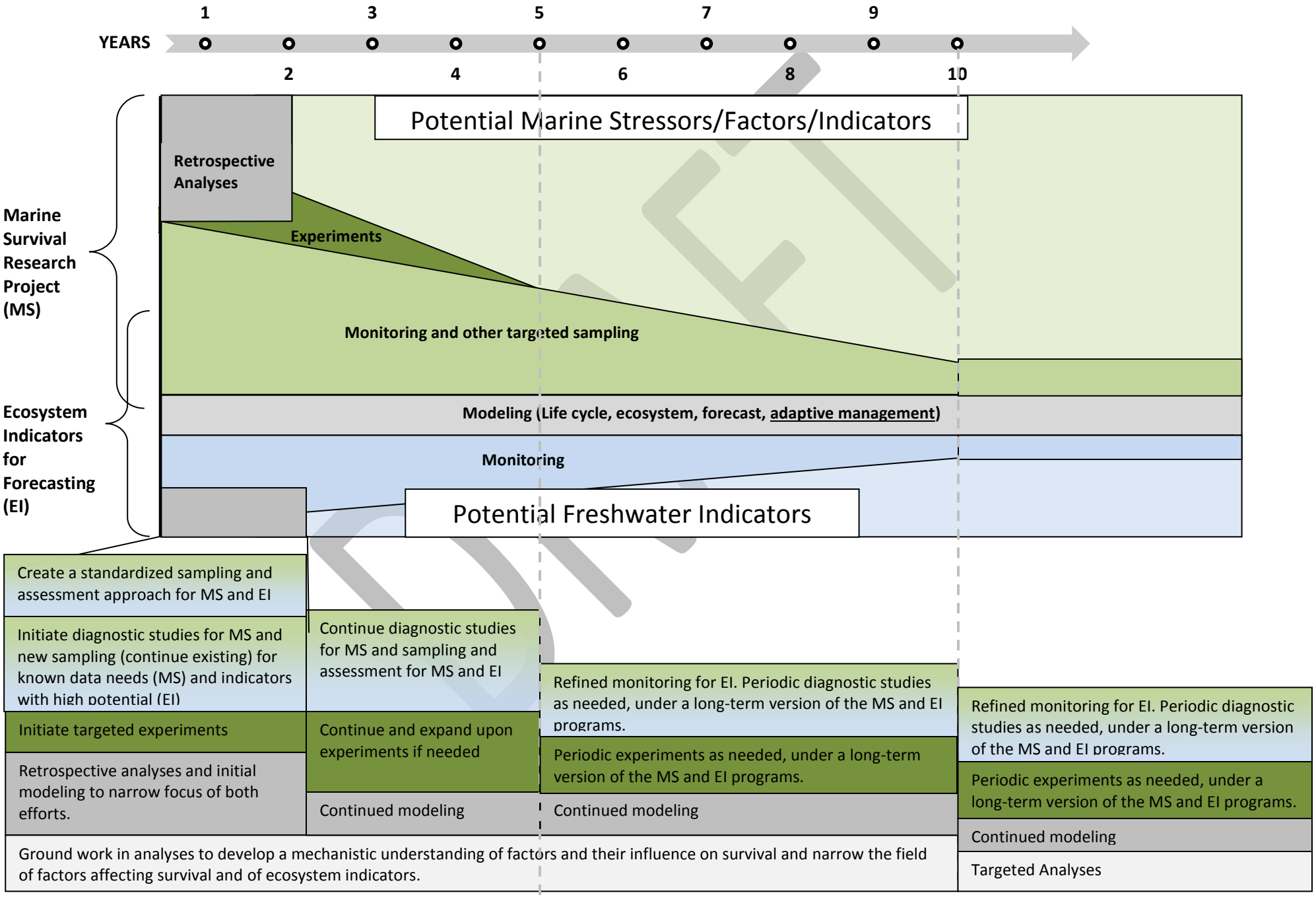
Marine Survival and Ecosystem Indicators Programs Overlap and Coordination

The workshop participants and, concurrently, the scientists and managers involved in developing the plans for both the Salish Sea Marine Survival and Ecosystem Indicators programs, believe there is significant merit in continued, strong collaboration between the two efforts. The Salish Sea marine survival research will help isolate the primary factors affecting survival in the marine environment. A broad, ecosystem-based approach will be employed, and the focus will be on narrowing the field of factors affecting survival and providing a mechanistic context for their influence on survival. This work is primarily intended to determine what factors have caused the long-term declines of Chinook, coho and steelhead witnessed in the Salish Sea. However, it also informs the development and application of ecosystem indicators to improve adult return forecasting: returns that vary significantly on an annual basis. While factors, or the combination thereof, affecting the long-term decline may be different from factors/indicators that describe inter-annual variation, the mechanistic context for the factor's influence on survival will remain the same.

The Ecosystem Indicators program represents the direct application of research activities and outcomes to management. A broad suite of ecosystem indicators to improve adult return forecasting can be roughly identified now based on current knowledge, to be tested and refined over time, and will include both freshwater and marine components. Those marine indicators not adequately measured will be included as part of a comprehensive monitoring program that also satisfies marine survival research program needs. Also, retrospective analyses and modeling needs are in many ways shared, to help narrow the field of potential survival drivers and inform indicator development.

Below is a diagram describing the programs and how they overlap. The initial phase of the marine survival program has been proposed to last 5 years. An additional 5 year increment is identified as the time it will likely take to continue to narrow the field of appropriate ecosystem indicators. It is assumed that the marine survival and ecosystem indicators programs will continue beyond the 5 and 10 year phases in some form, and that continuous monitoring and modeling, and periodic diagnostic studies and experiments will occur under the umbrella of the long-term effort.

Marine Survival Project and Ecosystem Indicators Program Process Overlap (Over time)



Terms of Reference for the Strategic Review Committee on In-River Assessment of Fraser River Sockeye and Pink (Hydroacoustics)

Draft prepared by Canadian Section

January 16, 2013

Background

Located approximately 80 km upstream of the mouth of the Fraser River, the Pacific Salmon Commission's (PSC) Mission hydroacoustic station has been operational since 1977, serving as a daily in-season enumeration reference, assessing the upstream passage of Fraser River sockeye and pink salmon.

The Diplomatic Note of August 13, 1985 (paragraph A.1.c) states that the Commission shall

> *conduct test fishing on Fraser River sockeye and pink salmon; collect data on upriver escapements by observation at Hell's Gate and through the conduct of a hydroacoustic program at Mission Bridge.*

Staff and funding requirements to support the Fraser River Panel have grown and the enumeration capacity at Mission has increased relative to the earlier period when the 1985 Diplomatic Note was signed. Given these developments, a review by the Pacific Salmon Commission of the in-river assessment programs for Fraser River sockeye and Pink salmon is timely.

Mandate

The purpose of the Strategic Review Committee (SRC) is to provide advice to the Commission on potential modifications to the hydroacoustic operations in the lower Fraser River based on the following:

- Clarification of in-river assessment objectives.
- Review of technological options (alternative or complementary) for providing accurate, precise and timely information to satisfy obligations under the *Pacific Salmon Treaty*.
- Effectiveness and affordability related to levels of risk tolerance and objectives.

Scope of the Review

To this end, the SRC shall examine alternative hydroacoustic monitoring configurations for the Mission Bridge and Qualark Creek stations – both as independent and as complementary operations, as well as other assessment methodologies. The SRC will be supported by the PSC Secretariat, Fisheries and Oceans Canada staff and others as required. The examination should include:

a) Clarification of the fisheries management objectives for lower Fraser River in-river assessment. Objectives may include (but are not limited to):
    - species priorities,
    - level of accuracy required to inform fisheries management decisions,
    - reliability and timeliness of data; (in-season versus post-season/in season timing versus location),
    - robustness of the enumeration system to unpredictable variations in fish behaviour, and river conditions (e.g. discharge, temperature);

b) Evaluation of existing hydroacoustics station configuration, as well as new alternatives or additions, in terms of whether or not they meet fisheries management objectives and value for money.

Based on the assessment the SRC shall provide recommendations for the next five-to-ten years.

Membership

The Strategic Review Committee shall be comprised of up to three (3) Commissioners from each party. Each party will designate one member to serve as a co-chair.

Committee members shall be appointed for the duration of the work associated with the strategic review. In the event that any member of the SRC steps down from the Pacific Salmon Commission during their term, replacements may be selected

Meetings

Meetings of the Strategic Review Committee will be held when determined by the co-chairs to be necessary to carry out the business of the SRC. Scheduling shall be done to minimize costs and travel, and to the extent possible, so as to not to interfere with the normal course of business of meetings of the Commission or the Fraser River Panel. The co-chairs of the SRC shall communicate regularly with the chair and vice-chair of the Fraser River Panel to identify issues and the need, if any, for joint meetings of SRC and the Fraser River Panel.

The co-chairs of the SRC may invite other subject-matter experts (e.g. panel members, advisors ["shadows"]) to attend and/or participate in SRC meetings.

SRC meeting reports will be prepared by the co-chairs and presented to the Commission at its regularly scheduled meetings.

Executive Summary

Next Steps For Fraser River acoustics

Prepared by PSC Secretariat

January 14, 2013

The purpose of the document is to stimulate discussions among Commissioners and the Fraser River Panel *(and Secretariat)* **about the future plans for Fraser River acoustics.**

The cost of implementing the Secretariat's acoustics program at Mission has approximately doubled from about $300,000 in 1994 to $600,000 in 2012. In addition to the regular budget, the Southern Boundary Restoration and Enhancement Fund (SEF) supported the Secretariat's research at Mission in the amount of $668,000 since 2004 including the purchase of three DIDSONs. The Qualark site was re-established in 2008 using DIDSON technology and has operated continuously through 2012. Adding Qualark, Mission, and SEF funds, more than $1M was spent annually on lower river acoustics since 2008. The increased expenditures for program improvements at Mission and the initiation of work at Qualark have been driven largely by external pressures (formal public reviews into causes of discrepancies between Mission and upstream estimates).

II. Cost-Benefit Analysis

The width of the Fraser River (400m), variation in fish behavior, and the need for 24 hours per day, 7days per week coverage for 2-3 months drive program costs at Mission. The focus of research at Mission has been on improving accuracy of the estimates. Estimates from Qualark have been used to judge accuracy of Mission estimates, although it must be emphasised that both programs provide estimates of salmon abundance. The true number of fish passing Mission is unknown.

Three different programs linked to levels of abundance or species were evaluated:

1) Base program suitable for years of sockeye abundance up to about 4 million fish.
2) Enhanced program suitable for years of sockeye abundance up to about 14 million fish.
3) Supplementary program suitable for estimating pink salmon (up to 16 million pinks).

Generally more abundant populations require more extensive and intensive shore-based sampling platforms to ensure accuracy.

Each sampling program is illustrated schematically in figures and the incremental costs (both capital and operational) and benefits (effect on estimates) of each component are provided in tables. The quantification of "incremental" benefits needs a small refinement.

Major breakthroughs have occurred recently in the Secretariat staff's ability to estimate Fraser River Pink salmon[1]. We can generate credible acoustic estimates of pink salmon escapement which, coupled with catch estimates, can be used to generate estimates of total return that are independent of and much more precise than the traditional methods using test fisheries. However, these estimates come at a cost; approximately $100,000 more than the sockeye program.

[1] The 1985 diplomatic note regarding implementation of the treaty calls for the Commission staff to estimate upriver escapements of sockeye and pink salmon for the Fraser River Panel.

Our evaluation period is relatively short (5 years). Therefore conclusions about the programs, especially regarding a few specific components, are conditional on the circumstances observed and data collected thus far. Further testing would improve the robustness of conclusions and could be accomplished in the short term (2013, 2014). We are fairly confident that we have defined the maximum sockeye program needed, but less intensive sampling might be acceptable at intermediate levels of sockeye abundance which unfortunately were not observed in the evaluation period.

III. Potential future uses of the Qualark program

The acoustic estimation of salmon is much less challenging at Qualark than at Mission. We reviewed four potential future uses of estimates from the Qualark site: (1) Calibration of Mission estimates (focus of ongoing SEF work), (2) In-season validation of Mission estimates, (3) Evaluation and improvement of sampling at Mission (focus thus far), and (4) Other (e.g. Planning in-river fisheries).

Despite the acoustic advantages of the Qualark site, the site poses three main challenges related to fisheries management. First, fish take 2-4 days to travel from Mission to Qualark and this creates time lags in the availability of run-size assessments. Typically, the Fraser River Panel does not update total return estimates until after the peak of the run has been observed at Mission. If Qualark estimates were used instead of Mission, run size updates would be delayed by a further 2-4 days. Second, some sockeye populations (e.g. Cultus, Harrison, Birkenhead, Chilliwack, Weaver Creek), and more than two-thirds of the Fraser River pink salmon populations spawn downstream of Qualark. Third, the long time series of Mission estimates is used to quantify in-season adjustments to escapement targets to compensate for natural, environmental and stock assessment factors. The long historical data set at Mission cannot easily be replaced with information from Qualark without a commitment to fund both sites for a significant time period. These challenges preclude consideration of Qualark as a replacement for Mission.

IV. Estimation of Species Composition

Current acoustics applications have not typically been used to distinguish species. Thus, test fisheries are usually used to apportion acoustic targets to species. Test fisheries have provided biased estimates of species composition resulting in biased estimates of sockeye salmon at Mission in a few years (e.g. 2005). Sockeye estimates during the period when pink salmon predominate are of greatest concern. Species composition estimates at both Mission and Qualark are subject to test fishing biases.

Data gathered in recent years support development of stratified approach. Coupling test fishery sampling in different parts of the river with acoustic estimates for the same regions will provide more robust estimates of species composition. Hydro-acoustic based methods (e.g. fish length and tail beat frequency) are also being investigated.

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To: Commissioners and Alternate Commissioners

Our file: 63001

From: Mike Lapointe, Chief Biologist, Pacific Salmon Commission staff[a]
cc: Fraser River Panel members, National Correspondents
Date: January 14, 2013
Re: Next steps for Fraser River Acoustics

The purpose of this memo is to stimulate discussions among Commissioners, and the Fraser River Panel about the future plans for Fraser river acoustics. The memo is divided into four parts. The introduction provides the rationale for why a discussion is warranted. Next, we provide a cost-benefit analysis for the Mission program to support the development of a multi-year business plan. Third, we discuss the potential future uses for the Qualark program. Lastly, we discuss some challenges and potential budget implications related to the apportioning of acoustic targets to species.

I. Introduction

Estimates of escapement are fundamental to the Fraser River Panel's fisheries management process[b]. Under the terms of the Pacific Salmon Treaty, the Panel is responsible for collecting data on upriver escapements through the conduct of a hydroacoustic program at Mission[1]. Beginning in 1992, five reviews[2] brought public attention and scientific scrutiny, leading to several specific recommendations about the Mission program that resulted in an ongoing research effort. Outdated technology (i.e. single beam) and an entirely vessel-based sampling program were identified as significant weaknesses leading to updated technology (split beam and DIDSON sonar) and shore based sampling platforms. In 2008, hydroacoustics staff completed a 5-Year Strategic Plan to guide program activities and research. Though research efforts were successful in increasing the accuracy of estimates, and a major breakthrough has occurred in pink salmon estimation in recent years, program improvements have had pragmatic consequences. First, program complexity has increased from 1 acoustic system to up to 7 systems. Second, program costs have approximately doubled from about $300,000 in 1994 to $600,000 in 2012. In addition to the regular budget, the Southern Boundary Restoration and Enhancement Fund (SEF) supported research in the amount of $668,000 since 2004 including the purchase of three DIDSONs.

Pearse[2] also recommended additional acoustic sites along the Fraser River to assist in regulating in-river fisheries. In response, DFO conducted a 5-year experimental program from 1993-1998 at Qualark Creek (95 km upstream from Mission) to design and test acoustic equipment for assessment of salmon migration. The Qualark site was re-established in 2008 using DIDSON technology and results of both research phases have been applied to Mission. The Qualark site has a number of advantages for acoustic estimation of fish passage[c] which led PSC staff to advocate using Qualark to validate Mission estimates[3] and supported the SEF committee's decision to fund the Qualark program in 2011 and 2012 at a cost of $305,000/year. A main objective of the current Qualark SEF project is to integrate estimates for both sites and attempt to develop calibration factors[4]. The SEF also funded a second project related to improvements at Mission. The final reports for these projects will not be complete until mid-2013.

Adding Qualark, Mission, and SEF funds, more than $1M was spent annually on lower river acoustics since 2008. The Cohen Commission recently recommended that both Mission and Qualark continue[5]. However, funding both Fraser river acoustics programs cannot be sustained indefinitely without either a significant increase in available resources or a re-examination of existing priorities. Therefore, a review of the current programs and a plan for the future is warranted. We hope that this review will assist with any short-term funding decisions needed prior to the completion of SEF technical reports next summer, but we acknowledge that these reports will also inform further discussions.

[a] This document would not have been possible without significant help from Secretariat hydroacoustics staff. Kyle Adicks, Gary Graves, John Holmes, Barry Rosenberger, Larry Rutter, Mark Saunders, and Timber Whitehouse reviewed an earlier draft which improved this memo.

[b] See Appendix A for a detailed discussion of the purposes of lower Fraser acoustic monitoring

[c] See Part III. Potential future uses of the Qualark program.

II. Cost/benefit analysis of Mission program

There are two main challenges that shape the program used to estimate salmon passage at Mission. First, the Fraser River is 400m wide and fish are distributed throughout. Second, tides, river flow, boat noise from the transecting vessel, and river fisheries all affect fish behavior at the site.

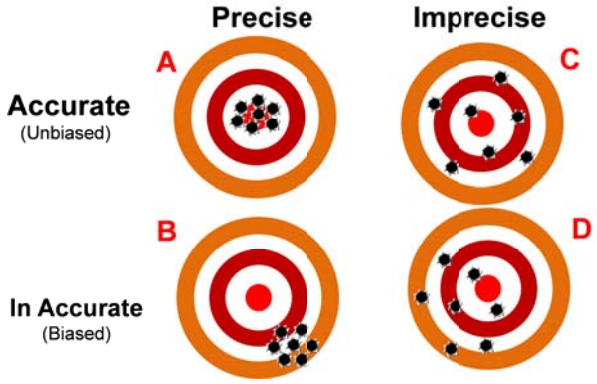
To address these challenges the Commission's research has explored various sampling configurations using state-of-the-art technologies. From this experience, Secretariat staff have grouped sets of sampling tools into three proposed sampling schemes: (1) A base program; suitable for years of low sockeye abundance, (2) An enhanced sockeye program; suitable for years of high sockeye abundance and (3) A supplementary program suitable for assessing pink salmon. For each program, we provide and schematic of the sampling design (Figs. 1-3) and the total costs for our recommended program, but we also identify the incremental effects of removing specific sampling components on costs and risks (Tables 1-3).

The most significant operating costs of the Mission program are associated with the need for 24/7 sampling for a period of two to three months and the associated personnel costs for collecting (on the vessel) and processing the data. Baseline capital costs include two vessels (one for the transecting program, and a second to aid in the deployment of the left-bank weir and to provide access to the right bank), a trailer which houses staff on the left bank, a shed on the right bank and fence materials on both banks which prevent fish from migrating inshore of the acoustic equipment (fences are not shown in Figs 1-3 below). Split beam systems, DIDSONs, computers and other miscellaneous equipment represent significant incremental capital costs, but generally the incremental costs of deploying each piece of equipment is small relative to data processing and capital costs.

Accuracy and precision

Benefits of assessment programs are typically quantified in terms of accuracy and precision as they impact the ability to achieve management objectives. These concepts are often misunderstood by layman and even biologists. Below we use a target to help illustrate the differences between these concepts(Fig. A). An accurate and precise program would generate estimates that are both close to the bullseye and to each other as show in panel A. Alternately estimates may be very precise (repeated estimates similar to one another), but inaccurate (systematically far from the bullseye) as shown in Panel B. Panel B is important to understand because it demonstrates that very high precision does not by itself ensure high accuracy. For example, a hydroacoustic program might sample a consistent but incomplete fraction of the total area where fish migrate, thus repeated estimates would be similar, but would be underestimates (biased low). Often when managers or policy makers hear a scientist indicate his or her estimate has "tight confidence intervals", they immediately assume the estimate is highly accurate. This is incorrect, confidence intervals refer to precision only. High precision comes from sampling large fractions of the population. To ensure high accuracy the data collection program must be designed carefully (e.g. completely sampling the area where fish are migrating). Absolute quantification of accuracy requires knowledge of the true value of what is being estimated. Panel D illustrates the inaccurate and imprecise situation. Lastly Panel C illustrates a situation where the *average* position of the estimates is close to the bulls eye, but there is scatter. Don't worry if you are having trouble understanding how Panel C demonstrates accuracy, it is not critical to our discussions.

Figure. A. Schematic of concepts of Accuracy and precision.



The Mission program has always generated highly precise estimates. Even in the early years when single beam acoustics technology was deployed and estimates were based entirely on the transecting vessel (e.g. Fig 1 with the vessel only), statisticians showed that estimates of 200,000 fish had a precision of ± 4% [6] (example from paper; precision of daily estimates varies). Changes to technology and adding shore based platforms (e.g. Fig. 1). has not

diminished the precision of the estimates. High precision comes from the large sampling effort – 24/7 temporal coverage and virtually complete spatial cover of the sampling area. Despite this high precision, elements of the program are subject to biases. For example, fish reach to the vessel and some avoid detection, especially in nearshore areas, hence the rationale for adding the shore-based systems (see Fig. 1). Thus, almost all of the Secretariat's efforts have been directed toward moving the program from Panel B toward Panel A above; improving *accuracy* has been our focus. Consequently, we do not quantify precision as a measure of benefit in the below tables. However, if the Fraser River Panel would accept less precision than currently generated, we could reduce costs by physically counting a smaller fraction of the targets. Research is on-going to refine precision estimation methods.

In the Mission context, where is the bullseye? We don't know because the the true number of fish (sockeye or pink) passing Mission on any given day is unknown. Thus, we are forced to draw an indirect inference about accuracy by comparing Mission estimates to other *estimates* that we believe are more accurate and precise than the Mission estimates. For several reasons, we believe that the best estimates currently available for judging the accuracy of the Mission estimates are the Qualark estimates(see section III below). One important caveat is that these comparisons are most informative about accuracy when both programs are seeing the same populations(not all the fish travelling passed Mission migrate upstream to Qualark). Consequently, we quantify benefits below by noting the deviation between Mission[d] and Qualark estimates and we also note the directional biases associated with removing particular sampling components (Tables 1-3).

Base program (suitable for years of low sockeye abundance)

The base program was developed of the period from 2005-2007 and it has been the primary sampling program used for in-season estimates since 2010. The base program has been sufficient for estimating daily abundances up to 200,000 total salmon and years with up to about 3 million salmon for the season. The program consists of two DIDSONs and two split beam systems (Fig. 1). Estimates from the left bank and mobile split beam systems account for most of the annual estimate (Table 1, col 5, Annual %). The right bank DIDSON contributes only 11% to the annual estimate but can be a significant contributor on particular days (Table 1, col 5, Daily %, row 5). Note that both the vessel and shore-based systems sample the nearshore areas. But to ensure that total coverage by all systems adds to 100% the vessel contributions have been reduced to represent quantities of fish estimated in the areas not covered by the shore-based systems (Table 1; col 5 Annual %). Thus, the values in Table 1 (col 5, Annual%) do not represent incremental changes. In 2012, the estimate for the full base program (all systems in Fig. 1) was 8% larger than the estimate based on only the Left bank and mobile data. In other words, the right bank system detected 8% more sockeye that the vessel did in the common area sampled by both (i.e. blue triangle on right bank; Fig. 1). We can quantify these incremental effects for all systems and will include them in future tables. The left bank DIDSON has not typically been used for estimation on low abundance years because the split beam system adequately covers the same area (Fig. 1). However, the left bank DIDSON provides important diagnostic information used to verify targets (fish, debris), fish behavior, and fish size.

Two comparisons with Qualark are most relevant to the base program; 2008 and 2012. In 2012, the base program operated for most of August when the Mission projected Qualark number[d] was 2% less than the Qualark estimate (Table 1; col 6; row 2). During this period about 29% of the Mission estimate was associated with lower Fraser spawning tributaries downstream of Qualark (e.g. Chilliwack and Harrison); 71% of populations were bound for Qualark. In 2008, the Mission estimate did not include a right bank component. In that year, the Mission projected sockeye number was 9% larger than the Qualark estimate (Table 1; col 6, row 5). During this period, only 17% of the Mission estimate was associated with lower river tributaries; 83% of the populations were bound for Qualark. While the two programs did not assess identical populations in these years, comparable estimates provide some confidence in the estimates from both sites.

The cost of the base program is $255,000/year. Incremental costs savings and risks associated with removing components are shown in Table 1. For example, the incremental cost savings for not operating the right bank DIDSON ($17,000, Table 1, row 6, col 3) are includes the costs of installing the right bank fence and shed, deploying and monitoring the DIDSON and counting the subsamples of each of the hourly DIDSON data file. Similarly, the incremental capital cost savings ($13,000; Table 1, row 6 col 2) represents the total costs of the right bank fence, shed and DIDSON divided by the expected lifespan of these items. Most of the cost is associated with a DIDSON and the associated cables (total cost $80,000, lifespan 8 years or $10,000/year). The Right bank DIDSON offers potential costs savings but can contribute significantly to estimates on some days (Table 1, col 5, Daily %). The trailer and left bank fence are included as capital costs under the Left bank split beam system. The Left bank DIDSON offers less potential savings, and adds considerable robustness to the estimation. Investments in robustness are akin to buying insurance against atypical fish distributions and behaviors. Deviation related to atypical behaviors or distributions cannot be quantified

[d] Mission estimate minus estimates for lower Fraser populations not bound for Qualark and any in-river catches between Mission and Qualark.

without these systems being in place at the beginning of the season. Note that the costs of analyzing the vessel data (about $3,000) were incorrectly included in the Left bank split beam row in Table 1 (col 3). If those costs are transferred the cost of the Left bank split beam and mobile components are comparable. Both components require 24/7 coverage and more temporary labor is deployed processing the higher density Left bank files.

Enhanced sockeye program (suitable for years of high sockeye abundance)

We have experienced two years (2006 and 2010) of high abundance that have suggested that the regular in-season Mission program was substantially biased low. In 2006, the in-season Mission estimates were approximately 1.5 million fish less than the sum of all spawning ground estimates plus in-river catch estimates for areas upstream of Mission[7]. In that year, the in-season estimates were based entirely on the left bank and mobile split beam systems (see Fig. 2). An experimental split beam system deployed on the right bank estimated an additional 340,000 sockeye post-season, but this additional amount still fell short of explaining the discrepancy. The left bank DIDSON data were not continuous enough for estimation. No offshore DIDSONs were deployed. Extremely low river flows were hypothesized to exacerbate fish avoiding detection by the transecting vessel.

In 2010, the in-season Mission estimates were based on the left bank and mobile split beam systems plus a DIDSON on the right bank. Again more fish were detected upstream both at Qualark and on the spawning grounds. The Qualark total salmon estimate exceeded Mission by about 2%, but this pattern of deviation is not consistent with the fact that 10% of the sockeye population was not bound for Qualark and there was harvest between the two sites. In-season projections of sockeye headed to Qualark were 20%(2.7M sockeye) less than the Qualark estimate. Post-season projections which included contributions from the left bank and right bank offshore DIDSONs reduced this discrepancy to 11% ((Table 2; col 6; row 2). The deviations in these two years clearly demonstrate the need for an expanded sampling program at Mission in years of high abundance.

The Enhanced sockeye program should be sufficient for estimating daily abundances up to 600,000 total salmon and in years with up to about 14 million salmon for the season. The enhanced sockeye program builds on the base program by adding up to two DIDSON systems mounted offshore (Fig. 2) and by using the left bank system as part of the estimation. The potential benefits of the left bank offshore DIDSON cannot yet be quantified because it has only been deployed in 2011 and in that year its coverage area completely overlapped with the left bank split beam system. Estimates from the left bank and mobile systems account for 82% of the annual estimate (Table 2; col 5, Annual %; rows 3,4,6), but right bank systems also contribute about 18% on an annual basis (Table 2; col 5, Annual %; rows 5,7). Both right bank DIDSONs can also represent significant fractions of the estimates on particular days (Table 2; col 5, Daily %; rows 5,7). The left bank DIDSON and split beam systems overlap in the first 20 meters (Fig. 2). Table 2 quantifies the annual contribution of the Left bank DIDSON (Table 2; col 5, Annual %; row 6), but we have reduced the contribution of the left bank split beam accordingly (Table 2; col 5, Annual %; row 3). It appears that the left bank DIDSON system detected more near-bottom targets than the left bank split beam in 2010, but a further evaluation in 2014 is desired. There is only one comparison with Qualark relevant to the enhanced sockeye program. For the period August 1st through September 10th, all systems shown in Fig. 2, except the left bank offshore DIDSON were operated continuously. During this period, the Mission projected Qualark number was 11% less than the Qualark estimate (Table 2; col 6; row 2). During the 2010 season only 10% of the Mission estimate was associated with lower Fraser tributaries downstream of Qualark (e.g. Weaver and Harrison); 90% of populations were bound for Qualark. We are confident that an enhanced program will improve accuracy, but we cannot be sure that the program will completely eliminate bias without testing continuous deployment of the sampling platforms shown in Fig. 2. Our next opportunity to test this configuration at high population levels will likely occur in 2014.

The total cost of the enhanced sockeye program is approximately $360,000/year. Incremental costs savings and risks associated with removing components are shown in Table 2. Note that the estimates from the left bank and offshore DIDSONS were made post-season in 2010; in-season processing would result in a minor cost increase (<5%). The left bank offshore DIDSON may offer modest cost savings if future evaluation indicates it does not substantially contribute to estimates. Additional operational savings could result if the left bank DIDSON estimate could be substituted for the left bank split beam estimates in the first 20 meters from shore where spatial coverage of the two systems overlaps.

Pink Salmon supplementary program

Until 2009, acoustic estimation of the upstream abundance of Fraser River pink salmon has not been possible because neither the single-beam (vessel based) nor the split beam systems are capable of effectively sampling the nearshore migration. A major breakthrough occurred in 2009 and 2011 when shore-based DIDSON systems were deployed on each bank. Although no independent escapement estimates exist for comparison (to judge accuracy), the resulting pink salmon escapement estimates were 16.1 and 13.4 million fish respectively. Adding catches to the escapements resulted in total return estimates that were comparable to independent total return estimates from marine purse seine test fisheries and other methods. The total return estimates were judged by the joint PSC-DFO Hydroacoustics Working

Group (HAWG) to use more robust methodology than the purse seine test fishing estimates of abundance (used since 2003) and they have been formally adopted as the best estimates by the Fraser River Panel. The capacity to generate credible pink salmon estimates at Mission is particularly important given that no upstream escapement estimation program has been conducted since 2001 and because of the renewed interest in pink salmon harvest. The estimates in any particular year have minimal benefits to in-season management decisions in that year because most of the migration occurs too late relative to the typical timing of marine fisheries. If upstream migration is early relative to potential harvest opportunities, it is possible that the combination of escapement passed Mission to date plus any planned future in-river harvests, might be used to ensure that escapement targets have been reached. However, it would be very difficult to extrapolate the escapement to date and estimate total return. Thus, total return and harvest shares calculations would still depend on the marine test fishery data. Thus the incremental added in-season value of escapement estimates within any particular year is likely small. In future years, however, when combined with catch estimates, the resulting total return estimates are independent of test fishery data. Thus, the expansion factors applied to test fisheries used for in-season run-size assessments in future years can be updated. Furthermore independent catch and escapement estimates would generate more accurate and precise estimates of exploitation rates than currently possible with the combination test fishery and catch data.The pink program has been sufficient for estimating daily abundances up to 1,800,000 total salmon and in years with up to about 18 million salmon for the season. This supplementary program would begin in mid-August of odd years only, and is incremental to the sockeye program. During the pink migration, 79% of the annual estimate comes from left bank split beam and DIDSON systems (Table 3; col 5, Annual %; rows 3 and 6). The right bank DIDSON and mobile split beam system contribute about 11% and 10% respectively (Table 3, col 5, Annual %; rows 4,5). The offshore right bank DIDSON contributed an immeasurable amount to the annual estimate (Table 3, col 5 Annual %, row6). Comparisons with Qualark estimates are not possible, because only a fraction of the pink salmon (historically about one third[7]) spawn upstream of that site.

The cost of the supplementary program on pink salmon is approximately $102,000/year. This represents the increased operation costs of extending the season about 6 weeks and the associated increased labor required to count the very high abundance DIDSON files. The increased costs of the supplementary program would be slightly smaller if the enhanced sockeye program preceded it because deploying the additional equipment would not be required. Capital costs are not included in this estimate, because the sockeye programs would already be in place. However, if offshore DIDSONs were required, those capital costs would be incremental to the $102,000 supplement in years when offshore DIDSONS are not required for the sockeye program. Incremental costs savings and risks associated with removing components are shown in Table 3. Both offshore DIDSONs require further evaluation, though based only on 2011, the offshore right bank DIDSON is not cost effective.

Concluding comments on the Mission Cost-benefit analysis

We have developed our three sampling programs from only five seasons of data gathered by an incomplete deployment of sampling components at Mission coupled with estimates from Qualark. The two offshore DIDSONs in particular (Figs. 2 and 3) require further testing in years with different pink and sockeye runs sizes for a more complete understanding of their potential benefit. We expect to evaluate the benefits of components for pink estimation again in 2013 without seeking additional funds from the Parties. However, we may need to approach the Parties for funds incremental to the regular program budget to evaluate the benefits of components for estimating large sockeye abundances in 2014. Alternately, funds may be available through SEF. So far, we have only been able to evaluate the enhanced sockeye program when the largest daily abundances were associated with late-run stocks. But we have observed different migration patterns in our acoustic data between periods dominated by summer-run versus late-run populations. Thus, we cannot be sure which sampling components will be most appropriate in years with large daily abundances of summer-run stocks. Similarly, we have observed an incomplete range of Mission sockeye estimates sizes during this 5 yr period with four relatively small escapements (up to about 4 million fish) and one (2010) extremely large abundance (>14 million fish). Thus, we do not know whether the base, enhanced or some immediate program is required to obtain accurate estimates when abundance estimates fall between 4 and 14 million sockeye. These intermediate abundance situations will require further evaluation. Consequently our conclusions about the potential benefits of the offshore DIDSONs (denoted by " ? " in Figs. 2 and 3) are conditional on the circumstances encountered and data collected thus far. However, we are confident that the enhanced sockeye program likely represents the most intensive sampling program that will be needed.

We chose the 3 years to drawn inferences about the accuracy of Mission estimates based on the fraction of sockeye common to both sites Sockeye estimates in the other two recent years, 2009 and 2011, are confounded by the pink salmon passage later in the season due to the challenges of species composition[e] associated with the test fisheries at

[e] See section IV below.

both sites. Some comparisons are possible for the period prior to significant upstream migration of pink salmon. For the period July 16-August 15 in 2009, about 75% of the sockeye passing Mission were estimated to be from stocks headed upstream to Qualark. During this period the Qualark estimate was 10% larger than the Mission estimate, but estimates at Mission in that year were based on the Left bank and mobile systems only (i.e. Fig. 1 without the right bank DIDSON). The complete base program was implemented in 2011. For the period July 21-Aug 17, less than 60% of the sockeye passing Mission are from stocks headed to Qualark, because of the large Harrison River run that year. During this period the Qualark estimate was 16% larger than the Mission estimate. Errors in the estimates of stocks bound for downstream of Qualark likely contribute to this difference; perhaps too many lower Fraser stocks were removed from the the Mission projection[d] used to compare with Qualark. Thus, we provide these comparisons for completeness, but caution readers about drawing strong inferences from them due to differences between the populations observed at both sites.

Tables 1-3 quantify capital costs as total costs divided by the expected life span of the equipment. This type of calculation is inconsistent with the current budget practices of asking for full capital replacement amounts in the year that equipment is due for life cycle replacement. We don't believe that the numbers shown in the Tables are misleading as the current practice may average out over time, but suggest that setting aside annual amounts is worthy of consideration in the future.

Decisions about potential reductions in number of sampling components from the three recommended programs we have outlined involve trade-offs between fishery management benefits (assessed through the Fraser River Panel) and program costs (assessed by the Commission's Finance and Administration Committee). Our intent is not to promote the full programs, but rather to provide objective information that can form the basis of discussion. Once this discussion is complete, we can explore the multi-year implications of various sampling programs in our business plan.

Base program – Suitable for years of relatively low sockeye abundance

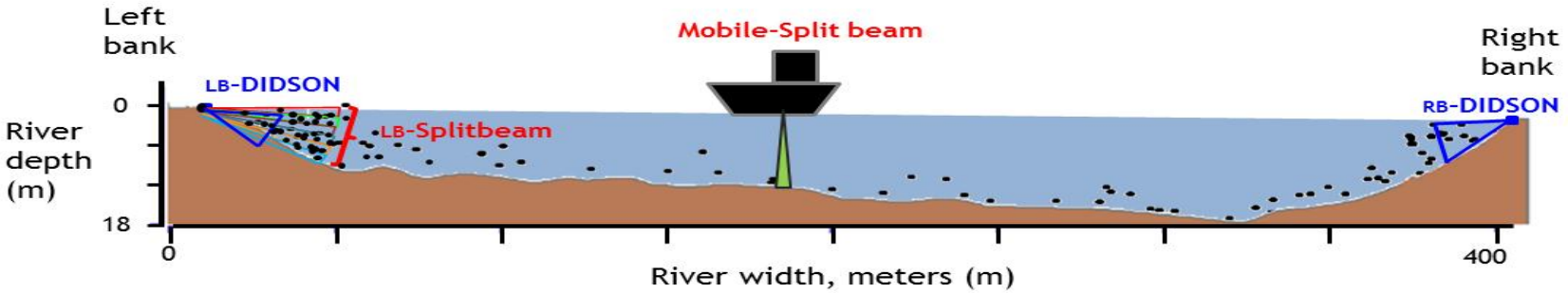


Figure 1. Schematic of base sampling program at Mission. Blue triangles denote approximate coverage of DIDSON sonar system on each bank. Multi-colored triangles on left bank denote multiple aims of split beam sonar system. The mobile split beam is denoted by the green triangle underneath the vessel. Black dots denote approximate cross river distribution of individual fish targets during periods of low daily abundance. Drawing is not to scale.

Table 1. Cost-benefit analysis of base program. For the base program, we list the Total Capital cost per year (Capital cost/expected equipment lifespan) and Total Operating costs. Costs for individual components are expressed as percentages of these totals. The spatial coverage is expressed as a fraction of the total river cross sectional area (i.e. blue shaded area in Figure 1 above). The proportion of the annual abundance and range in proportions of daily abundance estimates are expressed as fractions of the Mission estimates. The values in the Abundance columns are based on the August 6-24 period in 2012. The annual deviation with Qualark is calculated as (Mission projected sockeye to Qualark – Qualark sockeye)/Qualark sockeye) for the period when the Mission component systems were operating. Potential directional bias and other comments are provided as notes.

	Costs		Risks of removing components				
Component	Capital per year (% of Total)	Operating (% of Total)	Spatial coverage (% of river cross section)	Abundance Coverage Annual %	Abundance Coverage Daily % Range	Deviation from Qualark Annual %	Directional bias, and Other
Total cost	$89,000	$ 166,000				-2% (2012)	Note: Aug 6-24 when base program operated; +3% deviation for full season
Left Bank Split beam	39	40	10	66	32-79		Underestimation from boat due to avoidance; fish concentrated near left bank
Mobile Split beam	34	33	87	23	0-37		Underestimation due to fish distribution and large area
Right Bank DIDSON	13	17	3	11	4-47	9% (2008)	Underestimation from boat due to avoidance, Reduced capacity to verify targets (fish, debris), fish behavior and size
Left Bank DIDSON	14	9	3 (overlaps with split beam)	Not used for abundance on low years			Reduced capacity to verify targets (fish, debris), fish behavior and size

Enhanced sockeye program – Suitable for years of relatively high sockeye abundance

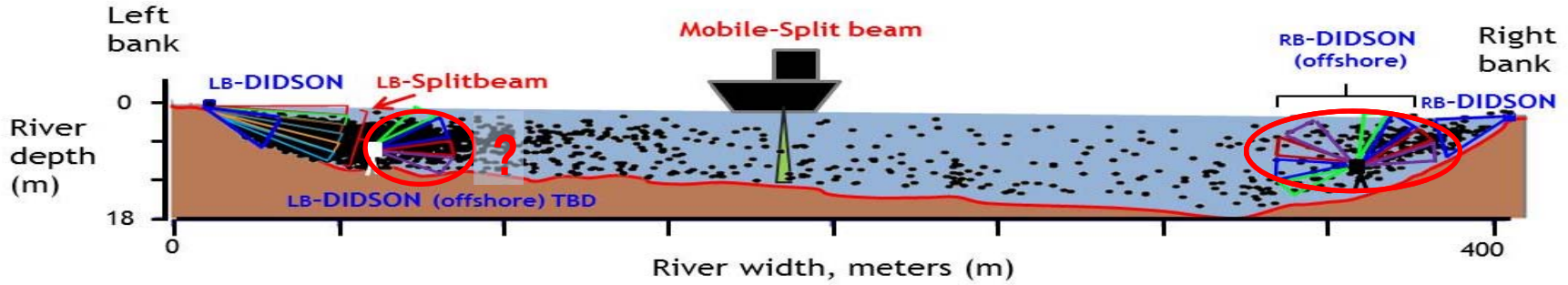


Figure 2. Schematic of enhanced sockeye sampling program. Same as Figure 1, except for two offshore DIDSON systems circled in red. Multi-colored triangles denote multiple aims of offshore DIDSON systems. The contribution of the left bank offshore DIDSON requires further evaluation. Black dots denote approximate cross river distribution of individual fish targets during periods of high daily sockeye abundance. Drawing is not to scale.

Table 2. Cost-benefit analysis of enhanced sockeye program. Same columns as Table 1. Calculations in Abundance coverage columns are based on August 1 through September 10 period of 2010. Offshore DIDSON systems have been added in last two rows.

	Costs		Risks of removing components				
Component	Capital per year (% of Total)	Operating (% of Total)	Spatial coverage (% of river cross section)	Abundance Coverage Annual %	Daily % Range	Deviation from Qualark Annual %	Directional bias, and Other
Total cost	$ 113,000	$ 247,000				-11% (2010)	Note: Aug 1-Sep 10 when all systems except Left bank offshore DIDSON were operating; -13% for full season
Left Bank Split beam	30	46	10	31	15-93		Underestimation from boat due to avoidance; fish concentrated near left bank
Mobile Split beam	27	31	69	31	19-57		Underestimation due to fish distribution and large area
Right Bank DIDSON	11	10	3	11	1-34		Underestimation from boat due to avoidance, Overestimation (same as below); Reduced capacity to identify small fish and debris
Left Bank DIDSON	11	9	3 (overlaps with split beam)	20	4-49		Underestimation from Left bank split beam if DIDSON detects more targets near bottom ; Reduced capacity to identify small fish and debris
Right Bank Offshore DIDSON	11	2	9	7	7-40		Underestimation from boat due to avoidance
Left Bank Offshore DIDSON	11	2	9	TBD	TBD		TBD Need to compare relative to Left Bank split beam

Supplementary program for assessing Pink salmon

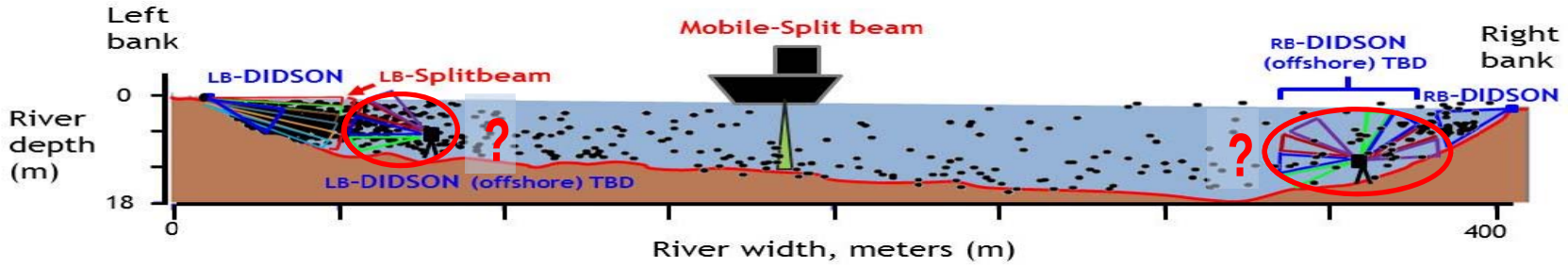


Figure 3. Schematic of pink salmon supplementary program. Same as Figure 1, except for two offshore DIDSON systems circled in red. Multi-colored triangles denote multiple aims of offshore DIDSON systems. The contribution of the both offshore DIDSON requires further evaluation. Black dots denote approximate cross river distribution of individual fish targets during periods of high daily pink abundance. Drawing is not to scale.

Table 3. Cost-benefit analysis of pink salmon supplementary program. Same columns as Table 1. Values in Abundance Coverage are based on the September period in 2011. Qualark deviations are not shown because of lack of comparability (see text). Offshore DIDSON systems have been added in last two rows.

	Costs		Risks of removing components			
Component	Capital per year (% of Total)	Operating (% of Total)	Spatial coverage (% of river cross section)	Abundance Coverage Annual %	Daily % Range	Directional bias, and Other
Total Cost	$113,000	$ 102,000				
Left Bank Split beam	30	38	10	21	14-92	Underestimation from boat due to avoidance; fish concentrated near left bank
Mobile Split beam	27	27	69	10	2-26	Underestimation due to fish distribution and large area
Right Bank DIDSON	11	11	3	11	4-27	Underestimation from boat due to avoidance, Overestimation (same as below); Reduced capacity to identify small fish and debris
Left Bank DIDSON	11	17	3 (overlaps with split beam)	58	47-80	Underestimation from Left bank split beam if DIDSON detects more targets near bottom ; Reduced capacity to identify small fish and debris
Right Bank Offshore DIDSON	11	6	9	<1%	0-1%	Likely a minor contibutor; reconfirm in 2013
Left Bank Offshore DIDSON	11	6	9	TBD	TBD	TBD likely a minor contributor; confirm in 2013

III. Potential future uses of the Qualark program.

The Qualark site offers a number of advantages for acoustic estimation of fish passage when compared to Mission. First, strong river currents concentrate fish within 20m of each bank which permits an entirely shore-based assessment using two DIDSONs. Second, there are no direct tidal impacts on fish behavior. Third, both river banks have been re-profiled and paved with sand bags, creating an environment that is optimal for acoustic sampling.

Despite Qualark's site advantages which permit much more robust estimates of fish passage, the site poses three significant disadvantages for fisheries management. First, fish take two to four days to travel between Mission and Qualark and this creates additional time lags between marine test fishery observations and subsequent acoustic validation. This time lag is consequential to in-season assessments and the achievement of Treaty objectives. Second, some sockeye populations (e.g. Cultus, Harrison, Birkenhead, Chilliwack, Weaver Creek; quantified above), and more than two-thirds of the Fraser River pink salmon spawn downstream of Qualark[8]. Third, the long historical data set at Mission cannot easily be replaced with information from Qualark without a commitment to fund both sites for a significant time period. These disadvantages preclude consideration of Qualark as a replacement for Mission.

Given this context, we review four potential future uses of estimates from the Qualark program below: (1) Calibration of Mission estimates, (2) In-season validation of Mission estimates, (3) Evaluate and improve sampling at Mission, (4) other (e.g. plan in-river fisheries).

Calibration of Mission estimates

The concept of calibration involves using a statistical model to relate deviations between Mission and Qualark to some measurable set of conditions (e.g. river flow, fishing effort patterns). Calibration factors could be estimated either using existing data from both sites or by augmenting these data with additional years. Following the overlapping data collection period, Qualark operations would be suspended, and conditions in future years would be used to predict the adjustments to Mission estimates.

Without prejudice to final SEF reports, discussions to date within the HAWG group have noted two significant challenges to this approach. These include: (1) Extended periods when the acoustic systems at each site are not estimating the same populations (as outline above). During these periods, relevant comparisons between estimates at the two sites require data such as species and stock composition from test fisheries and thus deviations between estimates cannot be attributed solely to acoustic sampling errors. (2) Deviations between estimates for short periods (e.g. one to several days) can result from variation in the time fish take to travel between the two sites (e.g. due to river flow, fishery or stock effects). These two sources of deviations complicate when and how comparisons can be used to develop calibration factors. Furthermore, we have only five years of comparisons, and it seems unlikely that the range of potential future environmental, fishery and relative abundance factors has been observed. Variation in the components used at Mission during this period further complicates the process. Therefore, if calibration is desired, it will likely require several more years of estimation at both sites.

In-season validation of Mission estimate

Under this scheme, Mission and Qualark would both operate together indefinitely. Daily comparisons of estimates from the two sites would be compared and Mission estimates could be adjusted during the season to reduce the pattern of deviations. This approach was used during the 2010 season, when estimates from Qualark were used to scale-up the Mission estimates because the latter appeared to be biased low. Alternately, Qualark and Mission could be combined to generate a more accurate and precise estimate. While continuous operation of both sites may provide the most robust lower Fraser River acoustic monitoring program, the challenges to calibration described above also add complexity to the in-season validation approach. For example, short term deviations might occur due to changes in travel time even though annual estimates might be very similar. Approaches that combine reduced Mission programs with in-season validation at Qualark would be less costly that operating both full programs, but they would be challenged by the same factors. An approach that uses Qualark to evaluate alternative sampling schemes at Mission would be more cost effective.

Evaluate and Improve sampling at Mission

This approach compares Mission and Qualark estimates to determine which sampling schemes at Mission are required to provide the most robust estimates of salmon passage. In effect, the sampling scheme that minimizes deviations between Mission and Qualark estimates is deemed "best". Secretariat staff have worked with HAWG to

use Qualark for this purpose since 2008, and our work has informed the approaches shown in section II above. The Qualark program could further inform sampling improvements at Mission in future years, but such efforts should be carefully planned to target specific periods when both sites are estimating the same populations. We believe the next opportunity for a useful comparison is in 2014, when we anticipate the next very large sockeye migration. Unfortunately, we did not have sufficient DIDSON units in 2010 to implement the configuration show in Figure 2 continuously through the season. An evaluation in 2014 would permit continuous evaluation of all components and help determine for example, whether a DIDSON anchored offshore of the left bank is needed. Thus, if funds can be found to implement Qualark in the future, 2014 would likely be the most informative year.

Other uses

Lastly, estimates from Qualark could be used for other objectives such as: (1) estimating upper river populations of Fraser River sockeye, pink salmon, or other salmon species (2) planning in-river fisheries, and/or (3) estimating en-route losses between Mission and Qualark. An evaluation of the program's potential to provide information related to these objectives is beyond the scope of this memo.

IV. Estimation of Species Composition.

The Mission and Qualark acoustic programs currently provide estimates of the number of salmon sized targets migrating upstream. But fisheries management requires estimates for particular species (e.g. sockeye, pink) and stock-groups (e.g. Weaver). Currently acoustic estimates are apportioned to species using the relative abundance found in test fishery catches. When sockeye predominate (e.g. >90% of a test fishery catch), the impact of species composition errors is small. However, composition errors can have significant management consequences when sockeye salmon are *not* the dominant species migrating upstream. Two periods are the most challenging; (1) early in the season in years when sockeye abundance is low relative to chinook, and (2) after mid-August on pink years, when pink salmon migration begins and soon predominates over sockeye. The early season issue is not new, and has minimal impact on bilateral management, because the main sockeye populations affected (Early Stuart, Chilliwack) are not the focus of commercial harvest opportunities.

The consequences of composition errors related to the later season problem has increased in recent odd years because the pink salmon migration has begun earlier (early August in some years) and overlapped with more of the Summer-run sockeye migration. The problem does not impact pink fisheries management decisions, because the effect of errors on the pink estimate is small and most of the pink migration occurs after most pink fisheries have concluded. The focus is on the impact on sockeye salmon estimates. For example, in 2005, in-season estimates of sockeye abundance passed Mission were decreased by about one third (from 8.4 to 5.6M), as a result of post-season adjustments for species composition errors[9]. The 2005 result triggered additional research that has expanded our knowledge of the problem. Below we briefly summarize ongoing efforts to address this issue.

Recent improvement to sampling schemes at Mission (e.g. Fig. 3) and observations from fish wheels and set nets anchored nearshore have reinforced our understanding that pink salmon migrate quite close to shore. This is especially true relative to sockeye salmon and explains why river test fisheries that sample the mid-channel areas catch disproportionately less pink salmon relative to their abundance. Conversely these test fisheries catch disproportionately more sockeye salmon. These observations dictate the need for a stratified approach that couples separate acoustic estimates of abundance for near-shore and offshore areas with separate estimates of species compositions in these regions.

We have gathered both acoustic and test fishery information in a stratified manner in recent years that can be used to evaluate alternative approaches. We have set net and fish wheel information for the nearshore areas and information from two drift net fisheries for the river channel. In addition to test fishing-based sampling, two acoustic based methods are being explored for species composition. PSC staff are exploring the use of lengths obtained from DIDSON images to distinguish species. DFO staff are testing a method that uses the fish's tail-beat frequency to distinguish species (again using DIDSON). Projects related to both methods have received funding from SEF, with the latter project entering its last year in 2013. While both of these methods are currently still in the experimental phase, both offer potential for more representative sampling than test fisheries which appear to be selective with respect to these species. The use of DIDSONs on each shore at Mission facilitates implementing either of these techniques for nearshore species composition in the future.

Depending on the details or provisions regarding the use of fish, test fishery-based species composition may be accomplished with little or no requirement for addition funding from the Parties but could impact the quantity of test fish deducted in determining harvest shares. If acoustic methods are employed, additional temporary personnel may be required for data processing. The magnitude of potential cost increases would likely be small ($10,000-$20,000/year) but they cannot be accurately estimated at this time.

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[1] Diplomatic note of August 13, 1985 regarding implementation of Article XV (paragraph 3) of the Pacific Salmon Treaty, paragraph A.1.c.

[2] (1) Pearse, P. H. (1992). Managing salmon in the Fraser: Report to the Minister of Fisheries and Oceans on the Fraser River Salmon Investigation.: Department of Fisheries and Oceans. Ottawa.

(2) Fraser River Sockeye Public Review Board. (1995). *Fraser River sockeye 1994: Problems and Discrepancies.*Public Works and Government Services Canada. Ottawa.

(3) Macdonald, J. S., M.G.G. Foreman, T. Farrell, I.V. Williams, J. Grout, A. Cass, J.C. Woodey, H. Enzenhofer, W.C. Clarke, R. Houtman, E.M. Donaldson, and D. Barnes. (2000). The influence of extreme water temperatures on migrating Fraser River sockeye salmon (Oncorhynchus nerka) during the 1998 spawning season. Canadian Technical Report of Fisheries and Aquatic Sciences 2326, Minister of Public Works and Government Services. Ottawa.

(4) External Review Committee. (2003). Review of the 2002 Fraser River Sockeye Fishery. Department of Fisheries and Oceans. Ottawa.

(5) Williams, B. (2005). *2004 southern salmon fishery post-season review: Part I Fraser River sockeye Report.* Ottawa.

[3] Lapointe, M. 2010. Uses and value of Qualark acoustics program. Memo to B. Rosenberger and L. Loomis. November 19, 2010.

[4] Whitehouse, T. and R. Hope. 2012. Improvements to estimates of daily sockeye and pink salmon abundance migrating in the Fraser River: integration of estimates from two sonar sites, Mission and Qualark. Detailed proposal to Southern Boundary Restoration and Enhancement fund. 8 p.

[5] Recommendation 29 of 75 : *"The Department of Fisheries and Oceans should continue to provide sufficient funding to enable the Pacific Salmon Commission's hydroacoustic facility at Mission and DFO's hydroacoustic facility at Qualark to operate at the 2010 level."* See Cohen Commission final report Vol. 3, p. 108.

[6] Banneheka, S.G., R.D. Routledge, I.C. Guthrie and J.C. Woodey. 1995. Estimation of in-river fish passage using a combination of transect and stationary hydroacoustic sampling. Can. J. Fish. Aquat. Sci. 52: 335-343.

[7] Pacific Salmon Commission 2011. Report of the Fraser River Panel to the Pacific Salmon Commission on the 2006 Fraser River sockeye and pink salmon season. (see Appendix I. p. 50)

[8] Average proportion of major population spawning below Qualark 1957-1985 is 69%; range 41-93%.

[9] Pacific Salmon Commission 2009. Report of the Fraser River Panel to the Pacific Salmon Commission on the 2005 Fraser River sockeye and pink salmon season. (see Appendix J. p. 62).

Appendix A Purposes of acoustic monitoring

The principal uses of lower river escapement data include:

(1) *Achievement of conservation objectives*: The highest priority management objective for the Fraser River Panel is to "obtain spawning escapement goals by stock or stock grouping"[1]. During in-season management, the Fraser River Panel actively monitors progress toward "gross" escapement goals to ensure that sufficient fish are passing upstream for the combination of spawning escapement, management adjustments (see (2) below) and any in-river catch requirements.

(2) *Estimation of management adjustments*: Management adjustments are increments to spawning escapement targets that are added to compensate for either systematic assessment errors, or en-route losses that cause upper river escapement estimates to be less than lower river estimates. The Fraser River Panel adopts these adjustments to increase the likelihood that escapement targets are achieved.[2] Compensation for systematic differences observed in Early Stuart and Early Summer run sockeye estimates began in 1995. An extensive post-season review following the 1998 season(see MacDonald et al. 2000; endnote 2(3) in main document) recommended that PSC and DFO staff develop models to predict needed adjustments to escapement targets in response to adverse river conditions (high temperatures, high flows). These "Environmental" Management Adjustment (EMA) models were first used to predict expected differences based on in-season forecasts of river flow and temperatures in 2001 and they have been integrated as part of in-season management every year since. In 2012, nearly 400,000 fish were added to the escapement targets of Early Stuart, Early Summer and Summer-run sockeye to compensate for expected differences. Given the increased frequency of warm river temperatures observed in the last 15 years and future predictions from climate change models, management adjustments are likely to become increasingly important for ensuring the long term sustainability of the stocks.

(3) *Estimation of Run-size:* Run-size estimates are critical for the achievement of conservation and allocation objectives defined in the Treaty[3] and both in-season and post-season estimates of total Fraser sockeye returns rely heavily on Mission estimates. Without acoustics, in-season run size estimates would be much more uncertain as daily abundances from test fisheries are 5 to 10 times more variable than abundances estimates obtained from acoustics. For most of the historical time series, post-season estimates of the total Fraser sockeye return were based on summing the catches in all areas with the spawning escapements. However in the last 20 years lower river escapement estimates (instead of spawning escapement plus in-river catches) have been used to estimate returns for several stocks and years to better account for in-river losses. Conservation actions taken in response to en-route losses and other sources of declining productivity of Fraser River sockeye salmon have included in-season reductions in allowable catches and also have increased the importance of escapement estimates in total return calculations.

[1] Pacific Salmon Treaty, Annex IV, Chapter 4, paragraph 10.
[2] Pacific Salmon Treaty, Annex IV, Chapter 4, paragraph 3b
[3] e.g. Pacific Salmon Treaty, Annex IV, Chapter 4, paragraphs 3, 10, 13

Fr[illegible] River Panel Renegotiation of Annex IV, Chapter 4 Document 2[illegible] Revised Action status: January 16, 2013 Time: 4:00pm

List of procedures or provisions that may need amendment or inclusion

Item	Context	Existing Treaty paragraphs (all Annex IV, Chapter 4 unless otherwise indicated)	Technical work and schedule
1. Distribution of Fraser River Aboriginal Fishery Exemption (AFE) (pre-season and in-season)	Commission Guidance has been used to operationalize the Aboriginal Fishery Exemption in recent years. Incorporate Commission Guidance changes into Annex language Consider creating a procedures document for implementing this guidance. Consider implication of AFE amounts when US overage/underage is determined based on last in-season Panel decision	3, 3(c), 3 (d) Commission Guidance Feb 2011	Retrospective comparison of alternate in-season AFE amounts for situations where US overage/underage calc is based on last Panel decisions. Feb 2013
2. Management groups	Consider option for the use of more than 4 Management Groups. FRP has operated with 5 management groups in 8 of last 10 years. Describe the principles under which the Panel may adopt the use of more than 4 groups in any given year.	3(e) number of groups, re: distribution of AFE 3(d), 4 Commission Guidance Feb 2011	If adopt more than 4 management groups then procedures for implementation are needed (AFE, escapement, MA and TAC calculations) .
3. Proportional sharing across management groups	Commission Guidance has been used to operationalize proportionate sharing in recent years. Incorporate Commission Guidance changes into Annex language	3(e)	none
4. sockeye/pink management challenges principles	Consider use of guidance language or principles for situations where sockeye and pink abundances create management challenges.	3	none
5. payback provisions for United States	Incorporate Commission Guidance changes into Annex language	8, Commission Guidance Feb 2011	None
6. Term of agreement	Keep current expiry offsets with other Chapters or align expiry with other Chapters, other factors that might affect choice of term	1	None
7. Treatment of Alaska Catch in TAC calculations	The Alaskan catch has not been included in in-season TAC calculations since 1999. Since 2005, the Alaskan catch has not been included in determining the U.S. share.	3	FRP is seeking a presentation on the current operating practices and catches for Dist. 104 – Feb 2013.

Bilateral CWTIT Report January 2013

Prepared by the bilateral CWTIT January 15, 2013

Background

The Chinook chapter of Annex IV of the Pacific Salmon Treaty January 1, 2009, provides in paragraph 3(b) as follows:

> The Parties agree to provide $7.5 million each in their respective currencies (subject to the availability of funds) to implement over a five year period beginning no later than 2010 within their respective jurisdictions critical improvements to the coast-wide coded wire tagging program operated by their respective management agencies.

The goal of this coordinated bilateral effort is to improve the precision and accuracy of aspects of the coast wide CWT program for the purpose of better implementing the agreed Chinook management regime.

The Commission established a bilateral body, the Coded-Wire-Tag Improvement Team (CWTIT) to provide recommendations to the Commission and the Parties on use of the funding provided under the new agreement to support specific actions identified in the Pacific Salmon Commission Technical Report Number 25. Although Parties prioritize actions based on their specific requirements to improve the precision and accuracy of statistics used by the Chinook Technical Committee (CTC) in support of the Chinook agreement, the CWTIT also performs a coordination role to optimize the benefits of the CWT programs operated in the various jurisdictions.

Canada implemented the program in 2009, a year earlier than in the U.S. due to differences in the beginning of the fiscal years. 2013-14 will be the final year of funding for this initiative in Canada; the program will continue in the U.S. through 2014-15. Total expenditures by Party and PSC Technical Report #25 issue are reported in Table 1. Projects fall under two main categories: 1) improvements in CWT tagging, sampling, and harvest and escapement estimation and 2) improvements in data coordination and reporting.

Canada has invested close to $1.5 M annually on a total of 57 individual projects. The majority of investment has occurred on multi-year projects under category 1 (improvements to CWT tagging, sampling, harvest and escapement estimation). Improvement projects under data coordination and reporting have generally been one time investments. The U.S. has invested $1.5 M annually on a total of 37 individual projects. Like Canada, the majority has been spent on category 1, but a substantial investment has been made into improvement in category 2 as well, which primarily include major upgrades to the CWT reporting systems in Oregon and Washington, and minor upgrades to the same in Alaska.

Benefits / Performance of CWT Improvements to Date

Projects funded under the CWTIT authority are summarized by issue in Table 1. Some individual projects address multiple issues, so the allocation of funding by issue is approximate.

Table 1. Regional priority and total investment 2009-2012 in issues identified in PSC Technical Report 25. Issue priority is rated as low, medium or high (L, M and H) under the column headed by 'Priority TR 25' for each Party. [1]

		Canada			US		
Issue #	Tech Rpt 25 Issue	Priority TR 25	Total Funding	% Funding	Priority TR 25	Total Funding	% Funding
CWT Tagging and Sampling							
1	Representation of Production Regions	H	$623,761	10.5%		$829,217	18.4%
2	Determination of Tagging Levels	M-H	$1,885,099	31.8%		$109,160	2.4%
3	Representation o f Hatchery Production	L	$5,500	0.1%		$124,349	2.8%
4	Low Sampling Rates in Terminal Fisheries	M_H	$482,420	8.1%		$389,313	8.7%
5	Low Sample Rates in Escapements	L-M	$339,390	5.7%		$5,628	0.1%
6	Uncertainty in Estimates of Escapement or Catch	L-H	$359,370	6.1%		$124,992	2.8%
7	Low Sample Rates in Highly Mixed Stock Fisheries	L-M	$324,020	5.5%		$1,219,115	27.1%
8	Uncertainty in Estimates of Catch in Mixed Stock Fisheries	M-H	$286,600	4.8%		$14,843	0.3%
9	Non-representative Sampling	M-H	$267,530	4.5%		$111,604	2.5%
10	Incomplete Coverage of Fisheries or Escapement	L-M	$460,645	7.8%		$111,184	2.5%
11	Voluntary Sport Fishery Sampling Programs	H	$293,860	5.0%		$0	0.0%
12	Sampling to Facilitate MSF Evaluations	L	$73,250	1.2%		$155,792	3.5%
	sub total		**$5,401,445**			**$3,195,196**	
Data Coordination and Reporting							
13	Timeliness of Reporting	H	$154,700	2.6%		$433,615	9.6%
14	Incomplete/No Exchange of CWT Data		$122,600	2.1%		$258,165	5.7%
15	Inter/Intra Agency Coordination	M	$104,300	1.8%		$82,775	1.8%
16	Unclear Authority to Enforce/Establish Protocols		$0	0.0%		$0	0.0%
17	Updating CWT Data is Difficult/Cannot Be Tracked		$70,000	1.2%		$124,716	2.8%
18	Validation is Inadequate For Current Uses of CWT Data		$70,000	1.2%		$142,937	3.2%
19	Lack of Formal Designation of RMPC as US Public Database & Lack of Adequate Funding Support		$0	0.0%		$115,444	2.6%
DTT	Funding Guidance		$0	0.0%		$141,586	3.2%
	sub total		**$521,600**			**$1,299,237**	
	2009-2012 Total		**$5,923,045**			**$4,494,433**	

[1] The Canadian summary is for 4 years and the U.S. summary is for 3 years.

In addition to funding provided by the Parties, Northwest Marine Technology, Inc. has worked with agencies to defray costs of increasing tagging levels, and to reduce costs and improve availability of equipment, such as CWT detectors. The objective of these measures is to reduce uncertainties about CWT-derived statistics.

CWTIT-funded projects can be usefully categorized as: (1) "legacy"; (2) "operational": and (3) "data improvements."

"Legacy" projects are those that will provide lasting improvements to ongoing database and reporting issues, reduce costs, or improve efficiencies. Examples of legacy projects include:

a. DFO Salmonid Enhancement Program (SEP) database improvements. This project will improve CWT data coordination and reporting procedures, and develop a formal set of Best Practices for the coordination (collection, transfer and management) of CWT heads and data at all DFO escapement projects. Archived escapement data from DFO enhancement programs are being reviewed to ensure that standardized analytical techniques and data verification procedures have been employed.

b. DFO Mark Recovery Program (MRP) database and data exchange improvements. DFO has made significant progress in reviewing and converting the legacy FORTRAN system to current technology and improving interfaces within DFO reporting systems (hatcheries system, catch monitoring system, and escapement systems). The query interface has also been updated to a faster, easier system with many new features for all users, from beginner to advanced. These projects will provide lasting benefits for access to information and timeliness of data exchange to the Regional Mark Information Centre (RMIS). Data improvements include validation and corrections to data and historical algorithms.

c. Improvements to the DFO Fisheries Operating System (FOS) commercial database will establish standard protocols for reporting and will improve timeliness of reporting and availability of final commercial catch estimates including test fishing data.

d. Updating and integration of Oregon's computer programs to improve the consistency, timeliness, and accuracy of CWT data reporting.

e. Updating several aspects of Washington's CWT reporting system to improve the consistency, timeliness, data retrieval and accuracy of CWT data reporting.

f. Development of a Decision-Theoretic Tool for planning individual or multiple CWT improvement programs (tagging, sampling, catch/escapement estimation).

g. Purchase of new or replacement equipment, such as CWT detectors and microscopes.

h. The development of indirect methods to estimate CWT recoveries by age and stock in freshwater sport fisheries, from the 3-year study in Puget Sound, which provides the basis to correct past estimates and provide estimates in the future.

"Operational" projects are of three general types: (a) projects to maintain existing capabilities; (b) projects that reduce costs of sampling, processing, or reporting CWT data or improving the timeliness of availability; and (c) projects that evaluate the feasibility of developing and applying new estimation methods. Examples of operational projects include:

- Increased coverage and sampling of terminal fisheries (Central Coast marine and fresh water sport, Strait of Georgia marine sport, Chilliwack River sport and Lower Fraser First Nations fisheries) resulting in increased accuracy and precision of exploitation rate estimates for CWT indicators
- Increased effort in monitoring and sampling indicator escapement programs resulting in increased accuracy and precision of indicator cohort abundance, survival rates, and exploitation rates.
- MRP, FOS, and SEP database improvements which will provide more timely reporting and access to data required for assessing fishery impacts.
- Methods to use surrogate data to estimate CWT recoveries in sport fisheries.
- The use of detection wands in SEAK to reduce freight and CWT lab storage and processing costs by not shipping heads from adipose-clipped salmon without CWTs.

It has been difficult at times to separate CWTIT projects from programs conducted by agencies using other funding. For example, in Canada some CWTIT projects were developed to estimate costs and quality of information that would result from the redesign of CWT sampling programs. In the U.S., operational projects have included funding provided to address the loss of funding from Anadromous Fish Act grants for CWT sampling in Washington and Oregon. Operational projects have also included projects to evaluate the feasibility of methods to reduce costs or improve the timelines of providing CWT data.

"Data Improvement" projects involve indicator stock tagging and sampling programs to fill information gaps. The full realization of the improvements resulting from these types of CWT projects depends upon the availability of funding beyond the anticipated end of the CWTIT program. Examples of such projects include increased representation of production regions by indicator systems (e.g., Fraser River, Philips River south coast mainland inlets, Atnarko River central coast BC, Oregon coastal stocks, and Southeast Alaska stocks). For indicator stock programs, some of the data produced by CWTIT projects will not become available until after the anticipated end of CWTIT funding (see Table 2). CWTs from augmented CWT releases began being encountered in two-year-old Chinook in fishery and escapement sampling programs in 2011 but all possible marine ages will not be represented until at least 2015 or later (Table 2). A more detailed analysis of the impacts of the increased CWT releases will be provided in a future year.

Annual program review by CWTIT provides a means to monitor and evaluate the status of the CWT program. Although not project related, the CWTIT program has improved communication and collaboration among agencies. CWTIT workshops have provided opportunities for agency staff involved in all aspects of the CWT program (tagging, monitoring, analysis, data management, etc.) to share information and expertise to improve the CWT program through the exchange of information, discussion of issues, and experience.

Table 2. Year of incremental tag application and anticipated tag recovery by age. Y-Yes, NA-Not Available until future return years.

Fiscal Year	Tag Application	Tag Recovery by Age			
		2	3	4	5
2009/10	Y				
2010/11	Y				
2011/12	Y	Y			
2012/13	Y	Y	Y		
2013/14	Planned	NA	NA	NA	
2014/15		NA	NA	NA	NA
2015/16		NA	NA	NA	NA
2016/17			NA	NA	NA
2017/18				NA	NA
2018/19					NA

Developing Issues

Although the CWT improvement program has delivered many positive benefits to the CWT system some issues were identified as the program proceeded.

Timing and availability of funds has hampered some U.S. projects from beginning at the planned date because of delays in receiving funds due to unanticipated complications in completing the grant process for some agencies/entities and federal appropriations and budgeting processes. In some cases, projects which were approved in February did not begin until 9-10 months after that time.

Inflation has eroded the buying power of the funding available through the CWTIT program due to increases in personnel, transportation, freight, equipment and other costs.

The initial funding commitment of $15 million over a five year period was insufficient to make needed, lasting improvements to the CWT program just for Chinook. Improvements are also needed for Coho and in systemic programs that affect multiple species (e.g., estimation, sampling, and reporting of catches and escapements, separation of hatchery and wild components, methods to assess impacts of mass marking and mark selective fishing).

The potential for future reductions in funding to support CWT programs is a major concern. Management agencies of both Parties are experiencing substantial pressures for fiscal austerity. In the U.S., a means to provide funding to support continuation of base-level ocean sampling in WA and OR to address budgetary pressures from the loss of Anadromous Fish Act grants has not been addressed to date. Agencies are evaluating alterations to tagging and sampling programs, and major funding agencies like the Bonneville Power Administration are reviewing future commitments for CWT-related efforts.

Long-term Issues

1) CWTs remain the only tool that can provide the information needed for coast wide fishery management and assessment. This is especially true because CWTs provide stock and age specific identification without error, i.e., the tag code is from a specific hatchery or wild stock from a specific year class and provide the established mechanisms for coastwide data sharing and broadly accepted methods for statistical analysis. Other tools have been used for various management or stock assessment objectives, primarily for region-specific applications, but these other tools do not provide the tools necessary to implement the PST and they are more costly.

2) The CWTIT program is scheduled to sunset in 2013/2014 for Canada and in 2014/2015 for the U.S. A means to continue funding is needed for these improvements to be maintained. Projects such as indicator stock programs, tagging levels, sampling and recovery of tags, and data reporting require sustained commitment of funding and staff resources. Funding from other sources, such as the Endowment Funds, which could provide funding to support CWT-related improvements is uncertain due to variability in investment performance and the need to provide funding to support other PSC initiatives, like the Sentinel Stocks Program. **Future funding is required to maintain the CWT program, let alone improve it**. Since 2009 when this program was initiated, core agency monitoring and sampling programs have been reduced. In some cases, CWT improvement funds have been used as a temporary solution to cover emerging gaps in agency resources. The consequences of not adequately funding the CWT program in the future are numerous and include: a) not recovering the CWTs already in circulation, b) reduced sampling rates and coverage coast wide, c) reduced tagging levels, and d) loss of a portion of the base agency ocean sampling in Washington and Oregon.

Appendix 1. Progress reports for projects funded in 2012.

2012 U.S. Project Reporting

Project title (as stated in Project Proposal): Decision-Theoretic Tool (D-T) For Improving the CWT Program

Agency (as stated in Project Proposal): MORI-ko, LLC (through Northwest Indian Fisheries Commission), Gary Morishima

Approved funding for this cycle (as stated in Project Proposal): None

Total CWTIT funding approved to date (if funded previously): $141,586

Continued CWTIT Funding Needed (yes, no, maybe): Not unless additional modifications or refinements are requested from user feedback

Objectives and Relationship to PSC Technical Report 25: Chapter 6, and the CWT Expert Panel and CWT Workgroups recommended that a Decision Theoretic Tool be developed.

Proposal for CWT Improvement Projects, 2010. Produce a D-T tool to guide modifications to the CWT program as recommended by the CWT Expert Panel (Report of the Expert Panel on the Future of the Coded Wire Tag Program for Pacific Salmon. *PSC Tech. Rep. No. 18, November 2005*). The proposed tool would be designed to simultaneously analyze interdependencies between investments involving CWT marking, sampling, and catch/estimation programs on multiple stocks and fisheries in terms of quantitative estimates of improvements in selected PSE/CVs of exploitation rates. Uncertainty surrounding estimates of exploitation rates would be computed using methods described by Bernard and Clark. (*1996. Estimating salmon harvest based on return of coded-wire tags. Canadian Journal of Fisheries and Aquatic Sciences 53:2323-2332*) and Chapter 5 of the CWT Workgroup Report (An Action Plan in Response to Coded Wire Tag (CWT) Expert Panel Recommendations. A Report of the Pacific Salmon Commission CWT Workgroup. *PSC Tech. Rep. No. 25, March 2008*). The tool, largely based on the guidance provided in Appendix B of PSC TR25, would consist of four primary components: (1) a menu driven interface to enable users to select the types of statistics to be produced (e.g., stock-age-fishery, total fishery exploitation rate); (2) a simple, steady-state forward cohort model to approximate CWT recovery patterns resulting from changes in survival and fishery harvest rates from base period levels; (3) a module to estimate CVs, given tagging levels, sampling rates, and uncertainties surrounding catch/escapement estimates; and (4) an optimization module to allocate expenditures for proposed projects to improve the CWT program. The D-T tool would be parameterized using CWT data and fishery strata employed by the CTC.

Project Description, Accomplishments (describe shortfalls from objectives), Results and Deliverables:

Funding was not received until September 2010, delaying initiation of the project. CWTIT was consulted during development and modifications made as requested. The tool, named Plan It! (PI!), was completed early in 2012. Executable and source code, user guide, manual, and report have been delivered. The D-T project was originally proposed to be developed in the R statistical system, but was

written as a stand-alone Visual Basic program since that is the primary language that is utilized by the CTC.

Qualitative and Quantitative (if appropriate for project) Benefits to Coded Wire Tag Program and PSC Salmon Management:

- Increased visibility and awareness of costs and benefits of modifying or investing in improving CWT programs
- Improved allocation and use of limited funding to support CWT programs and increased awareness of the implications of CWT programs undertaken by one agency on other jurisdictions.

Project title: Stikine River Chinook Smolt CWT

Project agency: ADFG (note this project is also funded by Canada), Phillip Richards

Approved funding for this cycle: $121,883

Total CWTIT Funding approved to date: $356,965

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 1 (Incomplete representation of production regions) and Issue 2 (Determination of Tagging Levels)

Project Description, Accomplishments, Results and Deliverables:
This bilateral project was designed to represent the Stikine River population of Chinook salmon, which averages run sizes of about 50,000 adults, and to increase the level of coded-wire tagging of smolts to 35,000 or more annually. In addition approximately 2 per cent were measured for weight and length. The tagging goal has been reached each year. Returning adults are sampled in marine fisheries, with most CWTs recovered in SEAK sport, gillnet and troll fisheries near Petersburg, but in fewer numbers in other areas of SEAK and occasionally in NBC. The escapement and inriver fisheries are sampled to determine the marked rate by brood year, which provides a basis to estimate harvest contributions, exploitation rates, smolt and adult abundance and survival rates. The U.S. has paid the bulk of funding for the CWT portion of this program since its inception. Canada has paid for the bulk of escapement recoveries since its inception.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
Tagging rates could not have been achieved without this funding source. This program, along with the inriver run and escapement estimation program (funded by other sources) provides the tools to forecast and manage the terminal run of this stock per Chapter 1 of the 2009 PST Agreement.

Success: Yes; and additional data will be available when recently tagged broods recruit to fisheries in the future.

Project title: Mid-Oregon Coastal Production Region Coded-Wire Tagging, Recovery and Escapement estimation of Elk River fall Chinook salmon

Project agency: ODFW, Shelly Miller

Approved funding for this cycle: $123,501

Total CWTIT Funding approved to date: $376,184

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 1 (Incomplete representation of production regions), Issue 3 (Representation of hatchery production), Issue 4 (Low sample rates in terminal fisheries) and Issue 6 (Uncertainty in estimates of escapement or terminal fisheries)

Project Description, Accomplishments, Results and Deliverables:
ODFW considers the Elk River coded wire tag (CWT) Chinook Salmon Program as a candidate exploitation rate indicator stock (ERIS) for the mid-Oregon coast aggregate. As such, it is critical to estimate the number of CWT Chinook salmon in the terminal run by sampling the freshwater harvest and spawning escapement thus continuing historic data collection efforts to characterize the Chinook salmon run in the Elk River.

Specific objectives include:
1. Conduct a statistical creel survey to sample harvested Chinook salmon and provide estimates of terminal catch within a usable time frame for fisheries management.
2. Assist with broodstock and hatchery collection and processing to recover coded wire tags from returning Chinook salmon adults.
3. Sample spawning grounds to recover a sample of escaping hatchery origin, tagged Chinook salmon.
4. Survey spawning areas to provide an estimate of spawning escapement of returning hatchery, CWT and naturally produced fish.
5. Tag (coded wire tag) and remove adipose fins from approximately 325,000 Elk River fall Chinook salmon annually to provide harvest and escapement estimates in subsequent return years. Work under CWTIT funding for 2012-13 is still ongoing but is on target for successful completion. As of Dec. 6, 2012, all aspects of the 2012 Elk River project are in progress and results should be available in March of 2013. Creel technicians have sampled 589 Chinook and collected 136 snouts. Spawning ground surveys are now in full rotation with peak spawner activity expected in January. Swim-in totals at the hatchery thus far include 930 adult males, 335 females and 142 jacks, with nearly 800 snouts collected that tested positive for CWT. The application of CWT's to approximately 300,000 hatchery smolts from the 2012 brood is scheduled for late spring of 2013.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
Without consistent representation, the Mid-Oregon Coast (MOC) aggregate of fall Chinook stocks will not be adequately accounted for nor appropriately modeled for their contribution to Pacific Salmon Treaty (PST) fisheries. Recent evidence demonstrates that the Elk River stock is a significant contributor to aggregate abundance based management (AABM) fisheries. The past three years of CWTIT support have provided consistent ERIS representation of the MOC aggregate, an important contributor to Pacific Salmon Treaty (PST) fisheries. This program is necessary for the proper estimation of CWT Chinook salmon, by tag code, that return to Elk River between 2010 and 2015 to assess ocean survival, ocean and

freshwater harvest and spawner escapement. This project directly relates to the CWTIT RFP 2012 Cycle Themes E and F: "Terminal Fishery Escapement Sampling Issues" and "Tagging Issues" respectively. Completion of the proposed work will augment the existing CWT program by providing consistent estimates of distribution and exploitation rates for MOC stocks.

Success: Yes; and additional data will be available when recently tagged broods recruit to fisheries in the future.

Project title: ODFW Coded Wire Tag Database Program Support Systems

Project agency: ODFW, Mark Engelking

Approved funding for this cycle: $110,000

Total CWTIT Funding approved to date: $520,000 on ODFW CWT Reporting System

Continued CWTIT Funding Needed: Probable

Objectives and Relationship to PSC Technical Report 25: Issue 13 (Timeliness of Reporting), Issue 14 (Incomplete/no exchange of CWT data), Issue 17 (Updating data is difficult and updates cannot be tracked) and Issue 18 (Validation is inadequate).

Project Description, Accomplishments, Results and Deliverables:
There are two aspects to the project. Firstly is the conversion of existing CWT historic data and processes for ocean fisheries to newer Web based technology (SQL c#.net) used by the CWT F application. This conversion will improve management of coded-wire tag data and report recoveries promptly. Secondly paper forms and the manual data entry processes for CWT recovery and release information from hatcheries are to be replaced by data loggers and software programs that will provide electronic data uploads to the CWT F application database.
The Agile Software Development process of adaptive and interactive software development was successfully used in the development of the CWT F application. Developers have successfully programmed a data logger to capture CWT recovery data from Bonneville Hatchery and upload it to the CWT F application. Parallel testing at Bonneville Hatchery of this recovery program is in progress. Development for CWT release programs is on-going. Data loggers that are both durable in field conditions and compatible with Microsoft Mobile 6 software have been identified and will be purchased. ODFW has defined 85 development stories for transforming those PC computer-based processes to Web based technology. Reports to support the ocean fisheries programs are in development and testing. Migration of historic information from the MRP is in process to the CWT F application. The CWT F application is now modified to accommodate Ocean fisheries data and migration of historic information is underway.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
Timeliness of reporting, access and retrieval of CWT data, updating of CWT data will be easier and can be tracked and validation and accuracy of CWT data from Oregon will all be improved once these improvements are complete and implemented.
Success: Likely Yes, but the project is still in progress.

Project title: Improving Timeliness of Reporting Washington's Catch and Sample Datasets for CWT Expansions

Project agency: WDFW, Brodie Cox

Approved funding for this cycle: $72,206

Total CWTIT Funding approved to date: $307,725 on WDFW CWT Reporting System

Continued CWTIT Funding Needed: Unknown

Objectives and Relationship to PSC Technical Report 25: Issue 13 (Timeliness of Reporting), Issue 15 (Inter/intra-agency coordination), and Issue 17 (Updating data is difficult).

Project Description, Accomplishments, Results and Deliverables:
This solution will enhance future WDFW near real-time recovery reporting capabilities. This should improve the timeliness of post season analyses. Future work in this area will involve developing an interface for use by field personnel, thereby creating a fully integrated system of data entry and retrieval, and provide for statewide standardization of CWT reporting.

CWT Recovery Workflow:

1. CWTs heads collected in the field
2. CWTs analyzed in the Tag Recovery Lab
3. The data is entered into the recovery database
4. As the heads are processed and instantly (*more or less*) reported via data.wa.gov/ Salmon Conservation Reporting Engine (SCoRE). Researchers and fishery scientists have access to raw recovery data in a timely manner

Old System: Grade: approximately 6 (scale of 1-10 with 10 being best)
The database improvements affect the third step in the simplified recovery workflow. The old system was designed quite some time ago, and although it had been migrated to SQL Server in 2009, it was non-standard structure and was not connected/connectable to other data sets, including the Tagging Application operational database ("Tagwire"). Reporting of recoveries is via request to the data steward or at twice yearly time of RMIS reporting

New system: approximately 8 (scale of 1-10 with 10 being best)
This project modernizes, simplifies and standardizes both the Tag Recovery lab database as well as the TagWire database. Additionally It adds an automated and accessible reporting component for displaying in-season recoveries a as they are processed. Changes to the system are as follows:

- Migration of Tagging Crew operational database to agency standard format
- Mapped the SQL Server database objects used in the MS Access user interface.
- Separated all the database objects that are required by the MS Access user interface and move them into a new database. This includes scripting the stored procedures, views, functions, and the like, to individual files to be checked into source control (CVS). This also includes modifying the MS Access user interface to use the new database.

- Stored procedures refinement. Further investigation revealed a total of 184 stored procedures (many redundant) which our dev. team was able to reduce to 62 stored procedures.
- Lookups successfully migrated to Agency common lookup set.
- Developed 'Live' export web service available via Data.wa.gov

Improvements in timeline:
Before: Recovery data is available every 6 Months (or recovery data on request via steward)
After: Recovery data (non-reconciled) available daily via **https://data.wa.gov/**

Ongoing Work:
Availability of recovery data via Data.Wa.gov anticipated by the time end of December 2012
Availability of recovery data via SCoRE II in Spring of 2013.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
Timeliness of reporting, access and retrieval of CWT data from Washington will all be improved.
Success: Yes.

Project title: SEAK Spring Troll Reporting Re-stratification

Project agency: ADFG, Ron Josephson and Tim Frawley

Approved funding for this cycle: $29,685

Total CWTIT Funding approved to date: $29,685

Continued CWTIT Funding Needed: No

Objectives and Relationship to PSC Technical Report 25: Issue 8 (Uncertainty in estimates of catch in highly mixed stock fisheries) and Issue 9 (Non-representative sampling).

Project Description, Accomplishments, Results and Deliverables:
This project's objective was to reduce the number of time and area strata in the spring troll fishery in SEAK to reduce errors in expansions of CWTs from this fishery. This fishery is primarily managed to maximize the harvest of returning Alaska hatchery Chinook and over 200 time/area strata are employed in the management plan for this fishery. The number of strata was reduced by 80% by lumping weekly strata into 2 periods, May and June. This eliminates most of the strata with no fish sampled and eliminates expansions with less than 1 fish. Data exploration is complete and programming is underway to complete the transition, which will be complete by spring of 2013. Historical estimates will be updated as well; overall estimates change very little, but the precision of estimates increases substantially.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
Precision of CWT estimates from the spring troll fishery in SEAK will be improved and more in line with the summer and winter troll fishery estimates.
Success: Yes, but the project is incomplete for the programming stage.

Project title: Purchase of Microscope and Related Equipment for Coded-Wire Tag Lab

Project agency: The Makah Tribe, Hap Leon

Approved funding for this cycle: $5,312

Total CWTIT Funding approved to date: $5.312

Continued CWTIT Funding Needed: No.

Objectives and Relationship to PSC Technical Report 25: Issue 13 (Timeliness of Reporting).

Project Description, Accomplishments, Results and Deliverables:
The objective of this project is to improve the efficiency of reading coded-wire tags in the Makah Fisheries tag lab, by providing an electronic microscope with an LCD display. This equipment should allow for faster, clearer tag reading, as well as providing ergonomic benefits to the tag reader. The equipment was purchased after some difficulties in obtaining funds and it has worked well in the speed and ease of reading CWTs collected from the Makah Tribe salmon fisheries. This data is shared with the tribal staff and managers and then sent to WDFW for transfer to RMPC.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
The timeliness of reading tags from the Makah fisheries has been improved and this will likely translate into a faster upload to RMPC as well.
Success: Yes.

Project title: Coded Wire Tag Field Equipment Replacement—Handheld Wands

Project agency: WDFW, John Kerwin

Approved funding for this cycle: $230,726

Total CWTIT Funding approved to date: $230,726

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 12 (Sampling methods to facilitate sampling of mark-selective fisheries and CWT processing) and Issue 13 (Timeliness of Reporting).

Project Description, Accomplishments, Results and Deliverables:
The Washington Department of Fish and Wildlife (WDFW) has approximately 500 coded wire detection wands in current inventory. The WDFW sampling database lists approximately 240 sampling locations where Chinook and coho are sampled for CWTs. Additionally, streams and rivers in every major river basin, as well as all WDFW hatchery facilities are surveyed annually for Chinook and coho that contain CWTs. All of these locations require the necessary equipment to allow for adequate sampling of both marked and unmarked CWTd fish. The purchase of 85 coded wire detection wands represents the first influx of the new technology and significantly more sensitive wands for WDFW samplers to utilize.

Because funding for the purchase of the coded wire detection wands was not received in time to purchase the wands for the 2012 Chinook fishing season, WDFW has not placed the wands into service. However, it has allowed us to plan the most efficient method to deploy the new coded wire detection wands. These wands will be utilized at port sampling locales that have high numbers of Chinook sampled. This will involve replacing coded wire detection wands first at the Washington coastal and Puget Sound sampling locations that have the highest levels of Chinook sampling.
Because there are coded wire detection wands that are at other locations which are unreliable, WDFW will make an assessment of the coded wire detection wands turned in by port samplers and use the most useful to replace the unreliable coded wire detection wands. For example, some wands have been retrofitted with shields while others have not. WDFW will replace non-retrofitted wands with reliable retrofitted wands.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
Increased accuracy of detecting CWTs in sampling using handheld wands. Some increase in speed and efficiency of sampling should be realized as well.
Success: Yes, the wands were purchased and will be used for the 2013 season for Washington fisheries.

Project title: Coded Wire Tag Field Equipment Replacement—Handheld Wands

Project agency: ODFW, Ken Johnson

Approved funding for this cycle: $80,710

Total CWTIT Funding approved to date: $80,710

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 12 (Sampling methods to facilitate sampling of mark-selective fisheries and CWT processing) and Issue 13 (Timeliness of Reporting).

Project Description, Accomplishments, Results and Deliverables:
ODFW was able to purchase 30 new handheld wands at a significant discount by partnering with WDFW's order of 85 handheld wands. The lower cost per wand was a result of WDFW's waiver of indirect charges for this purchase.
Oregon's Fish Identification Section received 30 new wands in mid September, 2012. Twenty wands were then delivered to Oregon's Ocean Sampling Program, headquartered in Newport. Ten wands were delivered to Oregon's Columbia River Management program which samples lower Columbia River commercial and sport landings for CWT marked Chinook and coho.
The new wands arrived at the end of the fisheries in the Columbia River and the Ocean. As such, the new wands were not been rigorously tested in field sampling. However, preliminary results indicate that samplers appreciate the ergonomic balance of the redesigned wands. In addition, it is very clear that the new wands are much more sensitive and eliminate the need for "mouth wanding" in large Chinook. Full scale use of the wands will start with Oregon's spring 2013 fisheries.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
Increased accuracy of detecting CWTs in sampling using handheld wands. Some increase in speed and efficiency of sampling should be realized as well.

Success: Yes, the wands were purchased and will be used for the 2013 season for both Washington and Oregon fisheries.

Project title: SEAK Port Sampling Tag Detection Wands and Sampling/Training

Project agency: ADFG, Anne Reynolds

Approved funding for this cycle: $131,309

Total CWTIT Funding approved to date: $131,309

Continued CWTIT Funding Needed: Yes-for additional sampling time but not for additional equipment

Objectives and Relationship to PSC Technical Report 25: Issue 12 (Sampling methods to facilitate sampling of mark-selective fisheries and CWT processing) and Issue 13 (Timeliness of Reporting).

Project Description, Accomplishments, Results and Deliverables:
The primary objective of this project was to purchase 26 new handheld wands from NMT and add sampling effort and training to increase coded-wire-tag (CWT) sample rates and decrease shipping costs in SEAK commercial fisheries. Additional Fish and Wildlife Technicians and one biologist in the ports of Sitka and Craig were supported. Staff were trained and the new wands were tested during the spring troll fishery, whereby all adipose-clipped fish were shipped to the Alaska Tag Lab regardless of tag detection status. In May of the spring fishery, some minor errors in false negatives occurred due to protocol lapses, but accounted for 0.1% of ad-clipped fish. In June, these errors were eliminated and heads tested without CWTs were not shipped. Port samplers in all ports except for Hoonah and Excursion Inlet used electronic tag detection wands to examine adipose clipped Chinook salmon harvested in the summer Southeast Alaska troll fisheries to determine if valid CWTs are present before CWT processing protocols are invoked. The heads of any positively identified tagged fish were collected and the tags decoded by ADF&G staff. During the first summer troll Chinook retention period in July of 2012 port samplers observed 3,138 Chinook salmon missing their adipose fin. Using NMT electronic tag detection wands 2,105 of those Chinook salmon missing their adipose fin did not signal positively indicating the presence of a CWT. During the second troll Chinook retention period in August of 2012 port samplers observed 3,657 Chinook salmon missing their adipose fin. Of those, 1,948 (53%) Chinook salmon did not signal positively indicating the presence of a CWT. In total 4,053 Chinook salmon heads were not shipped to the Alaska Department of Fish and Game (ADF&G) Mark, Tag and Age lab (MTA) saving the department shipping costs on approximately 8,000lbs of salmon heads. Sampling rates of the summer troll fishery remained above the coast-wide standard and overall were above 30% for Chinook salmon harvested in the troll fisheries. The additional port sampling staff funded by this project contributed to this sampling effort.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
Costs were reduced for shipping heads without CWTs (No Tags) in SEAK commercial fisheries, primarily troll-caught Chinook salmon. This also maintained sampling rates above 20% and contributed to increased sampling efficiency.
Success: Yes, the wands were purchased and will be used for the 2013 season for Alaska fisheries.

Project title: CWT Sampling and Harvest Estimation in Puget Sound Freshwater Chinook Sport Fisheries: Sampling methods and development of new analytical techniques.

Project agency: WDFW, Kris Ryding

Approved funding for this cycle: $185,122

Total CWTIT Funding approved to date: $550,401

Continued CWTIT Funding Needed: No, last of 3-year program

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Sampling rates in terminal fisheries) and 6 Uncertainty in estimates of escapement or terminal fishery catch.

Project Description, Accomplishments, Results and Deliverables:

This project involves conducting intensive creel surveys on four freshwater Chinook fisheries in Puget Sound for the purposes of examining differences harvest estimates obtained from creel surveys and catch record cards and to compare the number of expanded CWTs from a sampled sport fishery with expected CWTs numbers for the same fishery obtained using indirect estimation. The objectives for this year's funding are to:

1. Continue to make refinements to creel sampling methodology, focusing on efficient use of resources, ensuring that data are representative of fishing activity, and that sampling rates are adequate to meet data quality criteria.
2. Collect enough CWTs in the sampled fishery so that comparison to indirect methods can be made.
3. Compare harvest estimates obtained from creel sampling with those calculated from catch record cards.
4. Compare direct and indirect methods of estimating the numbers of CWTs in the sampled fisheries.
5. Examine the consistency of catch numbers and CWT recoveries across years in order to evaluate using average recovery and catch values in CTC models when harvest estimates are not yet available.

The objectives of this proposal are to add one more year of data to the analysis making it possible to do across year comparisons of harvest estimates and CWT recoveries within the same fishery. Deliverables will be a set of fishery specific recommendations on the use of indirect and direct analytical techniques, and on the use of average recovery and catch values in CTC models when harvest estimates are not yet available. Thus far, objectives 1 and 2 have been accomplished. Objectives 3 through 5 will depend on the outcome of analyses that depend on 2012 catch record card estimates not available until late 2013. This project should be successful in meeting its objectives.

Qualitative and Quantitative (if appropriate for project) Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the coded wire tag program include an objective assessment on the information coming from freshwater fisheries data in Puget Sound, and guidance on which data sources will be most useful in evaluating impacts from these fisheries. Efficiencies are in savings from not sampling the fisheries directly each year.

Project title: Sampling Washington Ocean Fisheries

Project agency: WDFW, Doug Milward

Approved funding for this cycle: $339,400

Total CWTIT Funding approved to date: $692,500

Continued CWTIT Funding Needed: Yes, and other funding preferred

Objectives and Relationship to PSC Technical Report 25: Issue 7 (Low sampling rates in highly mixed-stock fisheries).

Project Description, Accomplishments, Results and Deliverables:
This project addressed the priority activity identified by the CWTIT for improving sampling rates in highly mixed-stock fisheries (fisheries with multiple stocks). The activities of this project include catch sampling and collection of Chinook and coho salmon biological data including coded-wire tags (CWTs) from commercial and recreational fisheries conducted along the coast of Washington State. During the 2012 ocean recreational salmon fisheries, the objectives of this project were accomplished. All ocean salmon fisheries were fully sampled temporally and spatially, and the minimum sampling goal of 20% of landed Chinook and coho was exceeded in all fisheries. Sampling rates for most species/fishery combinations increased relative to 2011. Over 3,600 Chinook CWTs and 1,500 coho CWTs were collected and will be added to the RMPC database.
The WDFW Chinook sampling rates of approximately 45% in the recreational ocean salmon fishery and 42% in the non-Treaty commercial troll ocean salmon fishery. Chinook sport fisheries were sampled at about 45%, gleaning a sample size of 15,081 from an estimated catch of 38,581. Chinook troll fisheries were sampled at a rate approximate to 42%, providing a sample of 15,401 from an estimated catch of 36,855 landed Chinook. Coho sampling rates were similarly high, at 52% in the recreational ocean salmon fishery and 28% in the non-Treaty commercial troll ocean salmon fishery.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management: No new benefits, but this is a program with past success that was repeated for base sampling in 2012.
Success: Yes, sampling rates for sport was 45% and that for commercial troll was 42% in 2012.

Project title: Improvements to Oregon Ocean Coded Wire Tag Sampling of Commercial Troll and Recreational Fisheries in the Columbia River Ocean Salmon Management Area

Project agency: ODFW, Eric Schindler

Approved funding for this cycle: $101,101

Total CWTIT Funding approved to date: $201,237

Continued CWTIT Funding Needed: Yes, and other funding preferred

Objectives and Relationship to PSC Technical Report 25: Issue 7 (Low sampling rates in highly mixed-stock fisheries) and Issue 13 (Timeliness of reporting).

Project Description, Accomplishments, Results and Deliverables:
The primary objectives of this project (initially begun with the 2011 ocean salmon fishing seasons) have been to implement full electronic sampling for coded wire tags and maintain the minimum required CWT sampling rate of 20% with emphasis on Chinook salmon in Oregon's ocean salmon fishery in the Columbia River Ocean Salmon Management Area. Implementation of this required a uniform approach for the entire Oregon ocean salmon fishery.
The objectives have been met and the project has been a success to date, although overall catches during the period have remained relatively light and some challenges to maintaining sampling rates in the commercial salmon fishery are yet to be faced. In the 2012 ocean commercial troll salmon fishery through August, we had recovered readable tags from 330 unmarked Chinook (76 from the Columbia River Area), and these tags would not have been recovered without the support from CWTIT. An unexpected benefit has been the recovery of tags from "unmarked" Chinook that were supposed to have been marked (missed clips or regenerated adipose fins may be the cause). Based on the tag recoveries from California stocks these un-clipped recoveries of Chinook made up ~1% of the total recoveries.
Tag recoveries from Pacific Salmon Commission stocks accounted for ~73% of the CWTs recovered in the Columbia River Area and ~29% of the CWTs recovered South of Cape Falcon. Unmarked CWT Chinook make up a decreasing percent of the CWTs recovered to the South, but are still made up $\geq$50% of the CWT recoveries as far South as the Coos Bay Area.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management: The proponents indicate that about 50% of this project is enhanced CWT program benefits because of "full electronic sampling" that is being employed.
Success: Yes, the sampling rates were high, about 45% for sport and troll.

2012 Canada Project Reporting

Project title: Increased CWT Marking of Chinook Indicators

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: $263,500

Total CWTIT funding approved to date: $1,132,500

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 2 (Determination of Tagging Levels)

Project Description, Accomplishments, Results and Deliverables:

This project involved increasing coded wire tagging application and release levels on 9 Chinook indicator stocks in British Columbia. Tagging levels were set based on recent survival and fishery sampling rates in order to achieve stated precision objectives in the estimation of fishery-specific exploitation rates. The indicator stocks that received increased tagging through this project were: Robertson Creek, Cowichan River, Big Qualicum River, Quinsam River, Chilliwack River, Harrison River, Nicola River, Lower Shuswap River, Atnarko River

Increased tagging was initiated on selected stocks prior to brood year 2009 (e.g. Quinsam) through other external funding sources, but comprehensive increases in tagging levels began across all stocks in brood year 2009. To date, CWT release targets have been met for all stocks in all brood years, save for the Cowichan River in BYs 2009 & 2010 when poor escapements prevented collection of adequate broodstock for full release targets. Infrastructure improvements at DFO hatcheries that were funded through the first year of CWTIT continue to allow expanded tagging to be completed on an annual basis. Returns of marked 3-yr old adult Chinook to SEP hatcheries in 2012 from the first year of expanded tagging were strong, indicating that increased CWT recoveries are likely to be observed in future years as the releases from the expanded marking mature and enter the various fishery and escapement strata. This project can be considered to have been successful to date. Continued funding will be required to maintain current marking levels, otherwise marking will likely return to pre-2009 levels.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the coded wire tag program include increased CWT recoveries in all fishery and escapement strata for the 9 Chinook indicators, which will allow for increased precision in the estimation of exploitation rates in the various fishery strata.

Project title: Stikine River Chinook CWT Application and Tag Recovery

Project agency: DFO, Marc Labelle & Peter Etherton

Approved funding for this cycle: $30,000

Total CWTIT Funding approved to date: $120,000

Objectives and Relationship to PSC Technical Report 25: Issue 2, Determination of Tagging Levels

Project Description, Accomplishments, Results and Deliverables:
The project was designed to increase the level of coded-wire tagging of Stikine River Chinook salmon smolts. Approximately 35,000 additional wild Stikine Chinook smolts (including the Little Tahltan stock grouping) were tagged annually. In addition approximately 2 per cent were measured for weight and length.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
Tagging rates could not have been achieved without this funding source. Approximately 80% of the fishery catch in the Stikine River were sampled for CWTs and heads sent to J.L Thomas Labs Inc. for analysis. Loss of this funding would compromise PST commitments to monitor fishery impacts, i.e. fewer CWT's in US fisheries for exploitation rate analysis; and lack of information to evaluate / refine Chinook escapement goal. In the absence of this funding some baseline biological data (age gender size) would be collected from the fishery catches. However, the resulting small sample size would result in low precision after CWT expansion.
Success: Yes; however, additional data will be available when current / recent year CWT fish return.

Project title: Taku Chinook Fishery Monitoring and CWT Application

Project agency: DFO, Marc Labelle & Ian Boyce

Approved funding for this cycle: $30,000

Total CWTIT Funding approved to date: $120,000

Objectives and Relationship to PSC Technical Report 25: Issue 2, Determination of Tagging Levels

Project Description, Accomplishments, Results and Deliverables:

Application of CWTs to wild out-migrating Taku juveniles for use in monitoring of directed Chinook fisheries was established in 2005. 8,000 additional wild Taku Chinook smolts were tagged based on this funding.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
Tagging could not have been achieved without this funding source. Prior to tagging, Taku fisheries were not sampled. During this program 20-70% sampling rates have been achieved.

Loss of this funding would compromise PST commitments to monitor fishery impacts, i.e. fewer CWT's in U.S. fisheries for determining exploitation rates; lack of information to evaluate and refine Chinook escapement goal.

Success: Yes; however, additional data will be available when current / recent year CWT fish return.

Project title: Atnarko Chinook CWT Indicator Program: Uncertainty in estimates of escapement and terminal CWT catch

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: $130,000

Total CWTIT funding approved to date: $346,500

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issues 1,4,6 & 10 (Representation of Production Regions, Low sample rates in Terminal Fisheries, Uncertainties in Estimates of Escapement or Catch, Incomplete coverage of fisheries or escapement)

Project Description, Accomplishments, Results and Deliverables:
This project began in 2009 with the objective to expand the Atnarko assessment program to a Central Coast Chinook indicator (noted as lacking in Technical Report 25). The only northern indicator, Kitsumkalum, is a stream-type stock; Atnarko is an ocean type stock. Progress included application of 250,000 incremental CWTs, sampling of the terminal commercial, sport, and First Nations fisheries, and reintroduction of a mark-recapture program to improve escapement estimates and CWT recoveries. This project has been successful in improving the sample rates and precision in the estimation of CWTs in escapement and terminal catch.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management: The 2009 escapement mark-recapture program was very successful. 925 tags were applied, 2630 carcasses examined and 24% of tags recovered, to provide a spawning estimate of 10,700 Chinook (CV 5.7%). The commercial fishery sampling rates ranged from 34-72% (and 110 CWT recovered) with the exception that catch in the first week of July was not sampled. The Bella Coola First Nations fishery was sampled at 25% and 57 CWTs recovered.

The 2010 escapement mark-recapture program was impacted by a major flood event at the end of September. Prior to the flooding event, 1008 Chinook were tagged, 1025 carcasses examined, and 87 tags recovered. The preliminary escapement estimate using the standard is 10,900 - 11,760 (CV 10-11%). 86 CWTs were recovered. The Bella Coola River First Nation fishery caught 3,200 fish (preliminary), 775 were examined for fin clips, and 76 heads collected for CWT dissection.

The 2011 escapement mark recapture program was successfully implemented. 833 Chinook were tagged, 775 carcasses examined, and 68 tags recovered, providing a preliminary escapement estimate of 9105 (CV 14%). In 2011 all terminal fisheries were monitored. Greater than 30% of the First Nations

FSC fishery was sampled and 47 CWTs recovered. The commercial gillnet fishery caught 4600 Chinook and the Bella Coola sport fishery caught less than 200 Chinook due to flow conditions.

The 2012 escapement mark recapture program was successfully implemented. 644 Chinook were tagged, 1097 carcasses examined, and 65 tags recovered, providing a preliminary escapement estimate of 10389 (CV 12%). 98 CWTs were observed in the spawning escapement. In 2012 terminal FSC and commercial fisheries were monitored. Greater than 40% of the First Nations FSC fishery was sampled and 147 CWTs recovered. The commercial gillnet fishery caught 3300 Chinook; CWT results are still pending.

Is continuing funding required? Without continued funding, ongoing maintenance of the terminal mark-recapture program to estimate spawning escapement, terminal fishery sampling and increased CWT application will not be possible. Increased numbers of CWTs applied since 2009 may not be recovered in terminal fisheries and escapement without intensive sampling programs.

Project title: Salmonid Enhancement Program CWT Head Data Coordinator/Archival CWT Database Review

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: $67,000

Total CWTIT funding approved to date: $67,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issues 10, 13 & 15 (Intra-agency Coordination, Timeliness of Reporting, Uncertainty in catch estimates and CWT expansions, data management)

Project Description, Accomplishments, Results and Deliverables:

This project funded the staffing of a term biologist position in the DFO Regional Salmonid Enhancement Program (SEP) sector for 10 months in 2012/2013. Two main objectives included:

1) Development of a formal set of Best Practices for the collection, transfer and management of CWT heads and data at all escapement projects. This includes serving as a Regional Head Data Coordinator for all escapement programs on an in-season basis; and

2) Review of archival escapement data from DFO enhancement programs to ensure standardized analytical techniques and data verification procedures have been employed.

Through the Regional Head Data coordinator role, this project served to provide a single point of contact to lead the annual program to collect CWT heads and deliver them to the dissection lab in a timely manner. In the course of this role, a thorough review of the current data and head transfer program was conducted, efficiencies were identified, and a complete set of Best Practices are being developed with

the goal of improving data quality and delivery time, reducing costs at the dissection lab, and streamlining operations for current DFO staff.

The archival data review component of this project involves a systematic review of historic and recent SEP escapement data, including hard copy CWT sampling records, tag decoding, and stratum abundance estimates. As part of the implementation of a new data management system in SEP in recent years, ongoing review of archival data has identified inconsistencies with the current database records that require reconciliation. This project has systematically begun a review of archival hard copy CWT sampling records, updating existing databases with retrieved CWT and stratum abundance estimate data as it has been located and/or corrected. As data updates are made to the new SEP Enhancement Planning and Escapement Database (EPAD), database updates will then be transferred to the CTC CWT database as part of the annual data upload. To date, there have been significant improvements made in the quality of the data that is provided annually for international and domestic data sharing, with future updates expected as this project continues.

To date, significant progress has been made on both key objectives in this project. It is anticipated that the CWT Head Data Coordinator project will be completed successfully over the next few months. It is also anticipated that the historic CWT data review project will continue to make progress, although it was recognized at the beginning of this project that review of all CTC indicator data would not likely be completed in one year.

Qualitative and Quantitative (if appropriate for project) Benefits to Coded Wire Tag Program and PSC Salmon Management: Improvements in reporting of CWT data from escapement projects will directly benefit the CWT program and CTC by ensuring the current return year escapement data are available in time for annual CTC CWT analysis. In addition improvements made in the delivery and CWT dissection system will serve to reduce future costs for processing of escapement heads. These savings will help to offset pressures from increased CWT recoveries expected as an outcome of the CWTI program, and will provide lasting improvements in the quality and timeliness of CWT reporting.

Project title: Regional CWT Data System Programming

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: $90,000

Total CWTIT funding approved to date : $350,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 13, 14, 15, 17, & 18 (Timeliness of Reporting, Incomplete / No exchange of CWT Data, Inter/Intra Agency coordination, Updating CWT Data Difficulties, Inadequate CWT Validation)

Project Description, Accomplishments, Results and Deliverables:

This project involves hiring a programmer/analyst to provide systems analysis, design and programming support to Fisheries and Oceans Canada (DFO) coded wire tag program system – the Mark Recovery Program (MRP). The objectives for this year's funding are to continue ongoing system improvements and new development including:

1. Improve data through improvements to validation, corrections to data, and corrections to historical algorithms
2. Improve data management through new data entry interfaces to central database
3. Improve access to information for DFO users and exports to the Regional Mark Information Centre (RMIS)
4. Improve interfaces with DFO hatcheries system, catch monitoring system, and escapement systems
5. Modifications for new data sources from other CWTIT projects

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

This is the fourth year of funding to support improvements to the MRP system. Prior to CWTIT funding, DFO had a significant backlog of programming issues and was not able to meet the bi-lateral reporting requirements effectively as the MRP system was a legacy fortran system. With this additional resource, DFO has made significant progress in reviewing and converting the legacy system using current technology and in developing new interfaces to improve access to the information within DFO. This has allowed DFO to meet bi-lateral exchange deadlines and to make modifications that have been necessary or will be required in the future.

Is continuing funding required?

Yes, DFO has made significant progress but on-going funding in 2012 and future years is requested in support of the above objectives. Additional programming support is still required to improve data management and automation for all CWT dissection activities, and for data management of First Nations and Escapement sampling.

Project title: Regional Sport and FN Fishery CWT Recovery Coordination

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: $85,000

Total CWTIT funding approved to date : $326,400

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 4, 7, 9, 10, & 11 (Low sample rates in terminal fisheries, Low sample rates in Highly Mixed stock Fisheries, Non-representative sampling, Incomplete coverage of fisheries or escapement, Voluntary Sport Fishery Sampling Programs)

Project Description, Accomplishments, Results and Deliverables:

This project involves hiring a senior fisheries technician to implement fisheries sampling improvements within Fisheries and Oceans Canada (DFO) recreational and First Nations fisheries. Objectives are to:

1. Develop protocols and implement sampling programs to adequately represent First Nations fisheries
2. Develop and implement program improvements to Increase participation in the recreational voluntary sport recovery program to increase sample rates representatively
3. Provide technical support, including design, review, implementation, and QA/QC for all aspects of CWT sampling within commercial, recreational, test and First Nations fisheries
4. Promote improvements to catch monitoring and sampling participation through communications promotional material, or improvements to sampling protocols.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

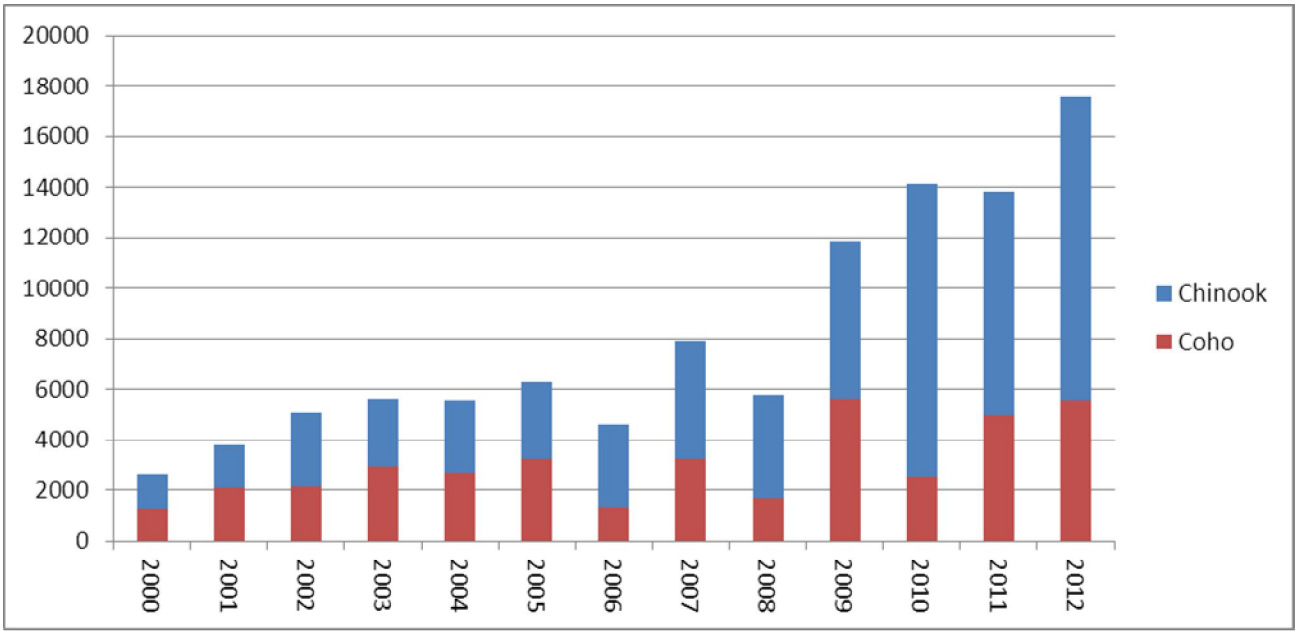
This is the fourth year of funding a fisheries technician to make improvements to sampling of recreational and First Nations fisheries. With the addition of a second fisheries technician, DFO has made significant progress in improving sampling across all CWT fishery sampling programs (recreational, First Nations, Commercial and Test fisheries) in terminal areas and in mixed stock fisheries.

Specific First Nations Achievements include the introduction and increasing progress toward adequate sampling rates in the following fisheries:

- Robertson Indicator - Alberni Inlet Food/Social/Ceremonial(FSC)First Nations fisheries – 2012 preliminary sample rate (2012SR) 52%
- Cowichan Indicator - Cowichan Tribes FSC fisheries sampled – 2012SR – not yet available (tbd)

- Atnarko Indicator –Nuxalk FSC (2012SR 46%)
- WCVI Mixed Stock T'aaquiihak economic fishery – 2012SR 54%
- Lower Fraser – FSC fishery – 2012SR 5-10%
- BC Interior – Kamloops Lake economic fishery – 2012SR 100%, FSC – 2012SR – tbd

Recreational Improvements can be generally viewed by reviewing the impressive increases in recreational samples since this project commenced in 2009 compared to historical results.



Is continuing funding required?

Yes, with the increased workload associated with the oversight and delivery of recreational and First Nations sampling programs, continued funding through 2012 and in future years is imperative to ensure that gains achieved are maintained across all DFO fishery sampling programs.

Project title: Regional CWT and Catch Estimation QA/QC

Agency: Fisheries and Oceans Canada, Bruce Patten

Approved funding for this cycle: $75,000

Total CWTIT funding approved to date: $264,700

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issue 6&8 (Uncertainty in estimates of escapement or terminal fishery catch, Uncertainty in estimates of catch in highly mixed stock fisheries).

Project Description, Accomplishments, Results and Deliverables:

This project provides QA/QC of all catch data associated with CWT recoveries and ensures proper stratification for tag expansions. Checks of current (2012) season's data were maintained as the data were received. Quality assurance of previous seasons' (2007-2011) salmon logbook data has been completed. As time allows, staff will continue checking 2006 and earlier seasons. Importing of historic test fishery data has been contracted out, to be completed by mid-March 2013.

Benefits to Coded Wire Tag Program and PSC Salmon Management:

This project has contributed to the accuracy of the CWT reporting system by systematically checking for, and resolving, errors. Loss of these resources would result in reduced QA/QC and consequently a reduction in data quality.

Project title: Improvements to Commercial Catch Databases (FOS)

Agency: Fisheries and Oceans Canada, Bruce Patten

Approved funding for this cycle: $60,000

Total CWTIT funding approved to date: $60,700

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issue 6&8 (Uncertainty in estimates of terminal fishery catch and Uncertainty in estimates of highly mixed stock fisheries)

Project Description, Accomplishments, Results and Deliverables:

This initiative funded a contractor to consult with DFO Area Managers on the Salmon Post-Season Catch and Effort Estimate Finalization Policy. They also developed area-specific procedures to ensure the estimates will be finalized each year. The contractor will compile historical catch and effort data (2005 and later) and import it into the Fishery Operations System (FOS).

Benefits to Coded Wire Tag Program and PSC Salmon Management:

This project is establishing standard procedures and finalizing catch estimates in the FOS, so that final post-season catch and effort estimates are available for use by the CTC in a timely manner. Once complete, this project will contribute to the accuracy of the catch data associated with CWT recoveries and ensure proper stratification for tag expansions. Regionally, this project is very important to ensure consistent post-season catch and effort estimates are available for use by the Mark Recovery Program.

Project title: MRP Archive Data Recovery

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: $20,000

Total CWTIT funding approved to date : $20,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 13 & 14 (Timeliness of Reporting, Incomplete / No exchange of CWT Data)

Project Description, Accomplishments, Results and Deliverables:

This project involves hiring two temporary technicians to review over 40 years of archived material associated with the DFO CWT program. The objectives for the funding are to:

1. Create an inventory of archived material including: review and classify, identify gaps in DFO CWT information system vs source documents or CWTs, and identify data recovery projects
2. Develop a strategy for retention. Options include data recovery / data entry, digital conversion of paper forms, CWT reading and digitizing, archive, with retention requirements established, redistribute to appropriate existing DFO staff, or destroy
3. Develop estimates to perform priority data recovery, scanning of paper forms, coded wire tag reading and digitizing for 2013 CWTIT projects
4. Perform priority data recovery, scanning of paper forms, coded wire tag digitizing, as determined as employment period allows.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

It is expected that this project will result in identification of historical sources of data (such as recoveries from test, research or First Nations fisheries) or fields on data records that have never been entered into the CWT system. Additionally, performing this review will result in the development of new protocols for digital management of DFO CWT program records which will improve access to data for QA/QC in the future. Finally, the reduction of archived material will eliminate future expenditures by DFO for the management of large quantities of archive material and allow for these funds to be spent on CWT program delivery. This is year one of a two year project.

Project title: Regional Commercial, Sport and First Nations Fishery CWT Recovery Improvements

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: $215,000

Total CWTIT funding approved to date : $585,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 4, 7, 9, 10, 11, & 12 (Low sample rates in terminal fisheries, Low sample rates in Highly Mixed stock Fisheries, Non-representative sampling, Incomplete coverage of fisheries or escapement, Voluntary Sport Fishery Sampling Programs, Sampling methods to facilitate MSF Evaluations)

Project Description, Accomplishments, Results and Deliverables:

This project is a portfolio of many activities being directed at Canadian fisheries to make strategic improvements to CWT sampling programs and CWT data. The focus of these projects is to make improvements that provide a legacy of improvements that can be sustained in the future. Projects include such things as:

1. Replacement, repairs and upgrades to sampling infrastructure requirements such as electronic sampling equipment or sampling tables for commercial fisheries,
2. Expansion of equipment to facilitate increases in recreational and First Nations sampling (ie, freezers, freezer boxes, closed containers for brine solution).
3. Development of communications strategy – participations in meetings, PR events, etc.; development and distribution of communication or promotional materials
4. On-site review of existing sampling programs and introduction of QA/QC through ongoing audits
5. Review, development and production of improved data collection materials (forms, labels, sample kits)
6. Introduction of sampling of freezer troll vessels in BC fisheries to improve representative sampling in this fishery.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

This project has made improvements the quality and quantity of CWT data that is available for use in analysis across all DFO fishery sectors.

Is continuing funding required?

Funding is required through 2012. Projects have been designed to become operational and will not require ongoing funding; however, future funding at a reduced level will be required for life-cycle replacement of equipment.

Project title: CWT Head Lab Processing and Data Management

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: $70,000

Total CWTIT funding approved to date : $316,400

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 2, 4, 7, 9, 10, 11, & 12 (Determination of tagging levels, Low sample rates in terminal fisheries, Low sample rates in Highly Mixed stock Fisheries, Non-representative sampling, Incomplete coverage of fisheries or escapement, Voluntary Sport Fishery Sampling Programs, Sampling methods to facilitate MSF Evaluations)

Project Description, Accomplishments, Results and Deliverables:

This project is required to pay for increased costs to ship, dissect and perform data entry for increased quantities of head recoveries from all Fisheries and Oceans Canada (DFO) fisheries and escapement sampling programs. Increases are attributed to the implementation of other CWT improvement projects including the following:

1. Increased tag rates in fisheries as a result of bi-lateral increases to tagging (issues 1-3)
2. Increased deadpitch CWT recovery efforts (issue 5)
3. Increased sampling rates, in commercial, test or research fisheries (issue 4, 7)
4. Introduction of First Nations sampling programs (issue 4, 7, 9)
5. Improvements to Voluntary Sport Head Recovery Program, resulting in increased sampling rates (issue 4, 7, 11)
6. Introduction of sampling of freezer troll vessels in BC fisheries to improve representative sampling in this fishery. (issue 11)
7. Re-introduction of sampling of unmarked Chinook (double index tagged fish) to support assessment of mark selective fisheries (issue 12)

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

This project ensures that funds and effort spent to complete other projects that increase tag recoveries of indicator stocks result in useable CWT data to support analysis.

Is continuing funding required?

With increased head recoveries across all DFO CWT recovery programs, continued funding will be required in 2012 and in future years.

Project title: Chinook Test Fishery CWT and Biosample data import to FOS

Agency: Fisheries and Oceans Canada, Bruce Patten

Approved funding for this cycle: $15,000

Total CWTIT funding approved to date: $41,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issue 10 (Incomplete coverage of fisheries)

Project Description, Accomplishments, Results and Deliverables:

This project incorporates historic data for Albion and Skeena Tyee Test Fisheries into the Fishery Operations System (FOS). The Skeena Tyee Test fishery project is complete. Fishery openings, catch data and biodata have been imported back to 1955. Staff are now able to report the in-season comparison with the historic index using an automated process rather than the previous manual one, increasing efficiency and quality control. For the Albion historic data import, 2002 data are currently being imported into FOS, 1997 - 2001 biodata have been imported into FOS and verified, 1990 - 1996 data have been reformatted and are ready to import into FOS, and 1980 - 1989 data are being updated.

Benefits to Coded Wire Tag Program and PSC Salmon Management:
Regionally, this project is very important in that it enabled historical catch data associated with CWT recoveries and tag expansions to be imported and consequently available for use by the Mark Recovery Program, creating a more accurate time series on which to base calculations. Capturing the Albion and Skeena Tyee data in FOS has improved the quality of CWT estimates for stocks caught in theses test fisheries and for the data used by the CTC for exploitation rate analysis of the Kitsumkalum, Lower Shuswap, Dome, Nicola, Chilliwack, and Harrison River indicator stocks. The data can be used to identify CWT recoveries in terminal net fisheries not previously identified by the CTC. Once data are captured in FOS, it is easier to extract information, do historic analyses, and export data to the MRP program.

Project title: Lower Fraser First Nations (LFFA) Coded Wire Tag Recovery Improvements

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: $25,000

Total CWTIT funding approved to date : $80,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 4, & 10 (Low sample rates in terminal fisheries, Incomplete coverage of fisheries or escapement)

Project Description, Accomplishments, Results and Deliverables:

The Lower Fraser Fisheries Alliance (LFFA) is a relatively new organization formed in March 2010 which has been empowered by its 29 member First Nations to establish a First Nation to First Nation (Tier 1) working relationship to address issues of common interest and work with the Department toward resolutions for effective resource and fisheries management.

This project is closely related to the 'Operational Support for First Nations CWT Sampling' Project which provides the DFO resource to the LFFA to support this project. This project is a collaborative project between Fisheries and Oceans Canada (DFO) and the (LFFA) to make improvements to CWT awareness and sampling in the Lower Fraser Area (LFA) through the following activities:

1. Building understanding of the CWT program and the Salmon Head Recovery Program throughout the LFA by engaging First Nations leaders and communities
2. Providing technical support to LFA First Nations monitoring organizations on the collection and provision of biological samples and high quality supporting data associated with the CWT program.
3. Development of a communication plan, identifying the audience, message, strategy, form and timing of communication for First Nations in the LFA.
4. Development of communication presentations and products.
5. Provision of communication, education and awareness sessions with LFA First Nations, targeted to First Nations Community leaders, fisheries managers, biologists and technical staff, and fishers.
6. Provision of training in the collection of CWT biological samples and data to First Nations fishery monitoring programs to support and enhance existing First Nations fishery monitoring programs in the LFA.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

This is the second year of a collaborative project between the LFFA and DFO targeting improvements to CWT sampling in the area addressing low sample rates in terminal fisheries. Both, this project and the related project, benefit the CWT program by increasing awareness within LFA communities, aiding monitoring organizations to implement changes and build tools to support CWT sampling and data collection, and increasing the number of head samples collected from fisheries.

Summary of head recoveries in Lower Fraser First Nations fisheries, 2010-2012

Species	2010 FSC	2011 FSC	2011 Econ.	2012 FSC
Chinook	8	14	11	19
Coho	0	3	36	16
TBD	0	0	0	2
Totals :	8	17	47	37

* *note that retention of Chinook and coho was not licenced in 2012 fisheries with a sales component*

FSC : *Food, Social and Ceremonial Fisheries*

Econ. : *Fisheries with a sales component*

Is continuing funding required?

Targeted sampling and directed program discussions by LFFA and DFO staff, supplemented with monitor training sessions and feedback on data quality, are proving to be effective in increasing submission of heads and improving data collected. On-going funding is requested to continue work in support of these objectives.

Project title: Operational Support for First Nations CWT Sampling Projects

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: $25,000

Total CWTIT funding approved to date: $25,000

Continued CWTIT Funding Needed : yes

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Sampling rates in terminal fisheries) and 10 (Incomplete coverage of fisheries or escapement).

Project Description, Accomplishments, Results and Deliverables:

This project involves hiring a seasonal technician to provide support to Lower Fraser Area (LFA) DFO and First Nations (FN) monitoring groups targeting increased sampling of Chinook and coho for Coded-Wire

Tags (CWTs) and improving collection of supporting mark rate information. The objectives for this year's funding are to:

1. Continue to build the relationship between DFO and the Lower Fraser Fisheries Alliance (LFFA) around CWT sampling in First Nations fisheries.

2. Work with staff from the LFFA on initiatives to increase understanding of the importance of the CWT Program within the LFA FN communities and monitoring organizations.

3. Provide support to LFA DFO and FNs in order to increase the number of head samples collected from LFA FN fisheries and work on improving the systems for collection and quality of data on mark rates from LFA FN monitoring programs.

Qualitative and Quantitative (if appropriate for project) Benefits to Coded Wire Tag Program and PSC Salmon Management:

This is the second year of a collaborative project between the LFFA and LFA DFO targeting improvements to CWT sampling in the area addressing low sample rates in terminal fisheries and was the first year funding was provided for DFO technical support. Both this project and the related LFFA funding provided in 2011-12 and 2012-13 benefit the CWT program by increasing awareness within LFA communities, aiding monitoring organizations to implement changes and build tools to support CWT sampling and data collection, and increasing the number of head samples collected from fisheries (reported in collaborative project).

Is continuing funding required?

On-going funding is requested to continue work in support of these objectives.

Project title: WCVI First Nations Fisheries Chinook Assessment Enhancements

Agency : Fisheries and Oceans Canada

Approved funding for this cycle : $6,000

Total CWTIT funding approved to date : $18,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issue 6 (Uncertainty in estimates of escapement or terminal fishery catch)

Project Description, Accomplishments, Results and Deliverables:

The objective of this project is to improve survey coverage, biosampling rates, estimates of Chinook mark rates and increase head recoveries from WCVI First Nations fisheries .

This project improved sampling of the Somass First Nation fishery via support for a technician to collect catch data from the First Nations Economic Opportunity fishery and to sample catch for mark rate/head recovery. This sampling provided an estimate of total catch, mark rate of the catch, and recoveries of heads/CWTs from marked Chinook.

Additional activities include:

- Participating in a First Nations fisheries technician training workshop.
- The creation of a Mark Recovery Program/CWT information pamphlet to improve awareness and participation in the program.
- The purchase of freezers and supplies to facilitate sampling and head recoveries.

Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the CWT program and PSC salmon management include improved estimates of Somass First Nations fisheries impacts on Somass Chinook a CTC indicator.

Project title: Central Coast Chinook mark incidence and catch estimation program

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: $7,000

Total CWTIT funding approved to date: $10,500

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issues 7 & 10 (Low sample rates in Highly Mixed stock Fisheries , Incomplete coverage of fisheries or escapement)

Project Description, Accomplishments, Results and Deliverables:
The objectives of this project were to increase survey effort for B.C. Central Coast sport fisheries, including lodge and independent catch, to:
1) Obtain mark-rate data for Central Coast sport fishery which is stratified both spatially and temporally from late June to late August when the majority of Chinook are caught.
2) Estimate independent catch for Areas 7-9 by month using C&P collected independent fisher data.
3) Determine under-reporting bias for marked head submission by comparing the lodge logbook mark-rates to those collected by C&P.
4) Calculate submission rates for Central Coast sport fishery either through integration of data into MRP or independently.
All objectives were met.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management: Immediate benefits have been realized as program results have allowed calculation of Central BC (PFMA 7-10) submission rates as well as "estimated" expansion factors. The availability of these data has precluded the use of mark-rates from other areas (global pooling) in DFO's Mark Recovery Program. The observed submission rates during the past two years are higher than proxy data previously used in MRP and corresponding expansion factors are believed to better represent Central BC sport fishing impacts on CWT stocks. This project has yielded catch estimates for the previously unaccounted for independent angler (non-lodge based) component of the fishery as well as submission rates and corresponding "estimated" expansion factors. This recreational fishery is a significant harvester of Chinook (approx. 6000 in 2012).

Is continuing funding required? Without an annual program to collect Central BC Chinook mark-rate and independent angler catch data, proxy data from other areas would once again be used in MRP to expand CWT recoveries. The deficiencies inherent with this method have been highlighted previously and were the primary reason for initiating this project in 2011.

Project title: Operational Support for Recreational CWT sampling projects

Agency: Fisheries and Oceans Canada, Kathryn Fraser

Approved funding for this cycle: $30,000

Total CWTIT funding approved to date : $69,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issues 4, 7, 9, 10, & 11 (Low sample rates in terminal fisheries, Low sample rates in Highly Mixed stock Fisheries, Non-representative sampling, Incomplete coverage of fisheries or escapement, Voluntary Sport Fishery Sampling Programs)

Project Description, Accomplishments, Results and Deliverables:

This project involves hiring 2 seasonal fisheries technicians to support the implementation of fisheries sampling improvements within DFO recreational fisheries. Objectives are to:

1. Perform audit inspections and recommend improvements to Voluntary Sport Head Recovery Program Depots in Southern BC.
2. Implement specific recreational fishery sampling improvement projects in Southern BC to adequately represent recreational fisheries.
3. Perform public relations and communication with Voluntary Sport Head Recovery Program Depots or fishers in Southern BC.
4. Perform QA/QC to improve recreational sampling data.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

This is the second year of funding seasonal fisheries technicians to make improvements to DFO sampling of recreational fisheries. With the addition of a second fisheries technician and seasonal staff, DFO has made significant progress in improving sampling through the voluntary sport head recovery program.

Is continuing funding required?
With the increased workload associated with oversight and delivery of recreational and First Nations sampling programs, continued funding in 2012 is requested, however, long term funding is not required.

Project title: Expansion of Catch Monitoring & Sampling in the Southern BC Sport Fishery (Operational enhancement of the southern BC marine waters recreational creel survey).

Agency : Fisheries and Oceans Canada

Approved funding for this cycle : $100,000

Total CWTIT funding approved to date : $280,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issue 4, 6, 7, & 8 (Sampling rates in terminal fisheries, Uncertainty in estimates of escapement or terminal fishery catch, Sampling rates in highly mixed stock fisheries, Uncertainty in estimates of catch in highly mixed stock fisheries)

Project Description, Accomplishments, Results and Deliverables:

This project funded operational enhancements to monitoring of marine recreational fisheries in Southern BC; including the Strait of Georgia, Juan de Fuca Strait, the West Coast of Vancouver Island and Johnstone Strait. Operational enhancements took two forms:

1. Conduct creel surveys at times and locations currently unsurveyed to verify assumptions of low Chinook and coho catches.
2. Increase recreational creel survey intensity (creel survey shifts and flight counts) in areas and times previously shown to be important for Chinook catch to improve estimates.

Operational enhancements in the 2011/12 funding year focused primarily on expanding coverage (#1 above). The results of this work verified assumptions that Chinook and coho catch rates in unsurveyed periods are low and focus for the project in 2012/13 was shifted to increasing survey intensity during peak catch periods (#2 above). Increases in survey interview coverage resulted in higher interview numbers and rates in key recreational fisheries relative to previous years increasing precision in catch per trip estimates. Increases in the number of aerial effort counts improved estimates of effort.

Benefits to Coded Wire Tag Program and PSC Salmon Management:

Direct benefits to the CWT program include improved estimates of Chinook (and coho) catch during peak recreational fisheries in the South Coast of British Columbia, along with updated catch estimates during periods no longer monitored via creel. Indirect benefits include synergy with other CWT funded projects focused on review and improvements to recreational monitoring approaches and flow of data, particularly marked and unmarked Chinook and coho catch estimates, from field programs to analysts.

Funding pressures for recreational catch monitoring continue to be downward. CWT-IT funding through 2012 has assisted in focusing future efforts towards improved cost effectiveness in recreational monitoring while improving our ability to estimate total annual recreational catch in the recreational fishery. Continued CWT improvement funding in this area would be used to support transformative improvements to recreational Chinook catch methods, as well as continued increases to creel coverage in key times and areas based on 2011-2012 results. Transformative recreational monitoring work being considered in 2013/14 include:

- Implementing more cost effective internet-based alternative methods to collect data to estimate Chinook catch, particularly in areas and times where creel surveys are inefficient due to low fishing rates or the remote nature of the fisheries.
- Focusing current monitoring efforts to key areas and times to most effectively estimate and sample Chinook catch.
- Engaging the fore-hire sport sector to improve the catch, effort and biosample data collected from this professional component of the recreational fishery.

Project title : Middle Shuswap Sport Fishery Catch Estimation and CWT Sampling

Agency : Fisheries and Oceans Canada

Approved funding for this cycle : $16,000

Total CWTIT funding approved to date : $31,000

Continued CWTIT Funding Needed : yes

Objectives and Relationship to PSC Technical Report 25: Issue 4 (Sampling rates in terminal fisheries) and 6 Uncertainty in estimates of escapement or terminal fishery catch.

Project Description, Accomplishments, Results and Deliverables:

This project is one component of a broader objective to decrease the uncertainty in catch estimates and increase sample rates of terminal fisheries. The aim of this project was to estimate the encounters of Chinook salmon, and other species by clip status, and any other regulation variation that affects the age composition of retained and released catch. 2012 represented the second year of enhanced efforts to survey the recreational and FSC Chinook fisheries as well as promote the Coded Wire Tag program on the Middle Shuswap fishery.

Similar to 2011, there was considerably less effort and catch observed in the 2012 Middle Shuswap Chinook fishery than in past surveys likely due to a management closure implemented to protect

Bessette Chinook in 2011 and 2012, high water levels and late arrival in 2011 and low returns of Chinook to the system in 2012. Although catch and effort has been atypical of past years the project has gained information required to meet objectives. Continued support for a multi-year creel survey would continue to build on a number of CWT improvement objectives that include decreasing the uncertainty in estimates of terminal fishery catch, increasing sample rates in terminal fisheries as well as promoting the CWT program.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the coded wire tag program include decreasing the uncertainty in estimates of terminal fishery catch, increasing sample rates in terminal fisheries as well as promoting the CWT program. Information from the mid-Shuswap terminal fishery, in combination with other work, provides useful information required to evaluate fishery impacts.

Project title :Expansion Catch Monitoring & Sampling Chilliwack River Recreational Fishery (Chilliwack River Creel Survey Extension)

Agency : Canadian Department of Fisheries and Oceans

Approved funding for this cycle : $15,000

Total CWTIT funding approved to date : $30,000

Continued CWTIT Funding Needed : Maybe

Objectives and Relationship to PSC Technical Report 25: Issues 4 & 6 (Sampling rates in terminal fisheries) and 6 (Uncertainty in estimates of escapement or terminal fishery catch)

Project Description, Accomplishments, Results and Deliverables:

The objectives of this project were to expand the coverage of catch monitoring of the Chilliwack River recreational fishery and evaluate the performance of indirectly estimating CWT recoveries during by comparing to direct estimates of CWT recoveries using creel survey data.

The Chilliwack River is an exploitation rate indicator stock used by the CTC. A significant recreational fishery targets fall-run Chinook salmon returning to the Chilliwack River. Historically, CWT recoveries from the Chilliwack River recreational fishery for the first half of September were indirectly estimated using the head recovery data and the submission rate measured with creel survey for the last half of September; the accuracy and prudence of this approach has not been evaluated. In 2011, the CWTIT funded the CDFO to initiate the Chilliwack River Creel Survey project two weeks earlier to allow direct estimates of catch and CWT recoveries for the entire month of September. The study was repeated in 2012. Both the 2011 and the 2012 studies have provided catch estimates, by species and mark status, and an estimate of total angler effort for the September 1st to 15th period. Additional bi-monthly catch

and effort estimates have been provided for the Sep.16th to Nov.15th period by CDFO Fraser Stock Assessment using existing CDFO funding. Work is ongoing to compare the 2011 & 2012 Sep.1-15 period direct and indirect estimates of catch and CWT recoveries; comparison of analytical techniques will occur in early to mid 2013. Deliverables will include a recommendation about the use of indirect estimates of CWT recoveries and catch for any period of the Chilliwack River sport fishery that is not directly assessed. This project should be successful in meeting its objectives.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the coded wire tag program include an objective assessment on the CWT data for the Chilliwack River recreational fishery and guidance on use of indirect estimation for this fishery. This project will improve the accuracy of the terminal runs for the CWT indicator stock for 2011 and 2012, and provide advice about the suitability of the indirect estimation method for the Chilliwack River recreational fishery.

Project title: 2008-2012 Campbell/Quinsam Chinook Mark Recapture Improvements (assess bias in random mixing of carcass mark recapture)

Program Agency: Fisheries and Ocean Canada

Approved funding for this cycle : $7,500

Total CWTIT funding approved to date : $37,500

Continued CWTIT Funding Needed : maybe (continued funding would be of value to maintain the expanded snorkel coverage on Second Island Channel)

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Low sample rates in escapement)

Project Description, Accomplishments, Results and Deliverables:

CWT improvement funding was used to increase the stream area sampled for CWTs specifically the Second Island Channel in the Campbell River (2009-2012) allowing more access to carcasses in deep pools. In addition, this project assessed the assumption in a carcass mark recapture that the tagged and untagged carcasses mix randomly in the population. Two methods were employed and compared:

1. carcasses were tagged and placed back where it was found (random mixing unlikely unless there was some sort of flood event after that placement)
2. carcasses were marked and then placed into the flow of the

Population estimates derived using the old method were 1 to 16% less than new method except in 2011 (16% more). In recent years we had three very dramatically different flow conditions in order to evaluate the various release methods. Additional sampling effort and expanded spatial coverage contributed an increase in CWT recoveries on the Campbell River with only a slight reduction in sampling rate on the Quinsam River.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
Benefits to the coded wire tag program include:

- an improvement in the accuracy and precision of the mark recapture estimates of escapement
- Increased sampling effort and spatial coverage on the more challenging component of the system resulted in higher CWT recoveries on the Campbell River

Project title: 2011-2012 Phillips River Chinook escapement estimation and increase CWT application

Program Agency: Fisheries and Ocean Canada

Approved funding for this cycle: $10,000 + 150K CWTs

Total CWTIT funding approved to date : $38,000

Continued CWTIT Funding Needed: yes. Based on the recent success and increased CWT tagging it will be key to maintain the program to ensure the recoveries of those tags in the escapement in future years.

Objectives and Relationship to PSC Technical Report 25: Issue 1, 2, & 6 (Incomplete representation of production regions, Determination of tagging levels, Uncertainty in estimates of escapement)

Project Description, Accomplishments, Results and Deliverables:

This production area is not represented by a CTC indicator stock. This project supports existing community partnership efforts to develop an indicator. The two main objectives of this project are:

1. To develop a mark recapture program on a southern BC mainland inlet Chinook population to provide accurate and precise estimates of tagged and untagged Chinook escapement.
2. To increase the number of CWT tags released to 150K for this population.

This project involved a 2 stage mark recapture of adult Chinook returning to the Phillips River. Tags were applied via broodstock collection events and seining events. Deadpitch activities were conducted throughout the watershed. There was a significant improvement in the number of tags applied, carcasses recovered, and the precision of the estimate in 2012 relative to 2011. The clipped contribution to the return was estimated at 11.6%.

Preliminary results indicate that escapement estimates have shown improved precision over the last 2 years and brood collection in 2012 will result in the 150K CWT application target being met for release in 2013.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:

Benefits to the coded wire tag program include:

- The development of a low cost indicator program for a Chinook population in the poorly monitored Mainland Inlet Area of the Southern BC coast appears feasible
- Over the duration of this project it has been demonstrated that we can achieve a precise estimate of Chinook escapement to the Phillips River as well as clipped contribution, and
- This project has demonstrated that increased CWT tag releases to the level of 150K are achievable in this remote location.

Project title: Cowichan Chinook Assessment Enhancements

Agency : Fisheries and Oceans Canada

Approved funding for this cycle : $30,000

Total CWTIT funding approved to date : $120,000

Continued CWTIT Funding Needed : Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5, 6, & 10 (Sampling rates in escapement, Uncertainty in estimates of escapement or terminal fishery catch and Incomplete coverage of escapement areas).

Project Description, Accomplishments, Results and Deliverables:
The objective of this project was to improve escapement survey effort and coverage, biosampling rates, estimates of Chinook mark rates, and increase head recoveries from escapement to Cowichan River. This improved escapement sampling complements increased tagging rates in Cowichan Chinook.

In 2012 drought conditions resulted in extremely low waters in Cowichan River until mid-October. Low water led to poor migration conditions and increased the potential for Chinook spawning in the lower river. This project supported additional deadpitch monitoring activities in the lower river in 2012 and greater sampling rates of carcasses from a wider area relative to the standard program.

In 2012, 577 carcasses were sampled, resulting in 569 scale samples, 145 adipose fin clipped Chinook (141 heads collected and submitted for processing), and a recapture of 46 marked carcasses. Forty-two carcasses (7.3%) were collected outside of the normal sampling area, and would not have been sampled without this project. Overall, 15% of the 3730 adults and jacks natural spawners estimated to have migrated past the fence were sampled by deadpitch crews.

Benefits to Coded Wire Tag Program and PSC Salmon Management:
Benefits to the CWT program and PSC salmon management include improved escapement survey coverage, biosampling and head recovery rates resulting in improved accuracy and precision of escapement estimates for the Cowichan River.

Project title: Improved CWT Recovery, Chilliwack River Indicator Stock Program

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: $14,000

Total CWTIT funding approved to date: $56,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Sampling rates in escapement)

Project Description, Accomplishments, Results and Deliverables:
This project provided additional staff on the Chilliwack River Chinook deadpitch program to increase survey frequency and the probability of recovery of carcasses. As a direct result, CWT recoveries were increased relative to expected at base survey frequency, thus increasing the precision of estimation of escapement by tag code.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
It is difficult to quantitatively assess success to the annually variable rates of recovery resulting from different escapements of multiple species and annually variable environmental conditions. Sampling rates are dependent on the number of carcasses present, the prevalence of carcasses of other species, fluctuating water levels, predators and a host of other factors. Carcass sampling rates on the Chilliwack River tend to be hindered by high flows and large escapements of chum salmon, which result in considerable extra effort being required to find and recover carcasses of Chinook. Increased Chinook carcass recoveries result from the increased sampling effort, thus improving CWT recovery rates. The relationship is NOT linear so at any escapement level, the net benefit will differ, but proportional benefits are greater in years of more unstable flows and larger chum salmon returns.

Is continuing funding required?

Loss of continued funding for this project will result in reduced CWT recoveries, thus estimates of return by tagcode will become less precise.

Project title: Improved CWT Recovery, Harrison River Indicator Stock Program

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: $16,000

Total CWTIT funding approved to date: $64,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Sampling rates in escapement)

Project Description, Accomplishments, Results and Deliverables:
This project provided funding for additional effort to expand marking and recovery effort during Harrison River Chinook mark-recapture study, thus increasing the sampling rate and precision of the mark-recapture estimates.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
It is difficult to quantitatively assess success to the annually variable rates of recovery resulting from different escapements of multiple species and annually variable environmental conditions. Sampling rates are dependent on the number of carcasses present, the prevalence of carcasses of other species, fluctuating water levels, predators and a host of other factors. Carcass sampling rates on the Harrison River tend to be hindered by high water levels and large escapements of chum salmon, which result in considerable extra effort being required to find and recovery carcasses of Chinook. Increased Chinook carcass recoveries result from the increased sampling effort, thus improving CWT recovery rates. The relationship is NOT linear so at any escapement level, the net benefit will differ, but proportional benefits are greater in years of more unstable flows and larger chum salmon returns.

Is continuing funding required?

Loss of continued funding for this project will result in reduced CWT recoveries, thus estimates of return by tagcode will become less precise.

Project title: Improved CWT Recovery, Nicola River Indicator Stock Program

Agency: Fisheries and Oceans Canada

Approved funding for this cycle: $8,000

Total CWTIT funding approved to date: $32,000

Continued CWTIT Funding Needed: Yes

Objectives and Relationship to PSC Technical Report 25: Issue 5 (Sampling rates in escapement)

Project Description, Accomplishments, Results and Deliverables:
This project provided funding for contracting additional staff to expand recovery effort and sampling frequency during the Nicola River Chinook deadpitch. By increasing the frequency at which the entire 50km of river are surveyed, sampling rate was increased as carcasses are sampled prior to predator removal, thus increasing the sampling rate and precision of the mark-recapture estimates.

Qualitative and Quantitative Benefits to Coded Wire Tag Program and PSC Salmon Management:
It is difficult to quantitatively assess success to the annually variable rates of recovery resulting from different escapements of multiple species and annually variable environmental conditions. Sampling rates are dependent on the number of carcasses present, predators and other factors. Carcass sampling rates on the Nicola River tend to be hindered at escapements less than 10,000 due to the effects of predators. Until predator response is saturated, increasing recovery effort yields increased carcass recoveries by increasing the chances of encountering carcasses before predators, thus improving CWT recovery rates. The relationship is NOT linear so at any escapement level, the net benefit will differ, but proportional benefits are greater at depressed escapements.

Is continuing funding required?

Loss of continued funding for this project will result in reduced carcass and CWT recoveries due to predator removals, thus reducing the precision of the escapement estimate and CWT recoveries.