Draft Discussion Paper

2014 Interior Fraser River Coho Management

March 12th, 2014

Introduction

Assessments of Interior Fraser River coho salmon stocks in the mid-1990's revealed that alarming declines in spawning populations were occurring in many spawning sites. Low marine survival rates in combination with excessive fishery impacts were identified as key factors in this decline (Bradford 1998). Beginning in 1997, DFO implemented a number of fishery management measures to reduce the harvest impacts on these stocks, with more severe measures being implemented starting in 1998. Since that time, Canadian fisheries impacting these stocks have been curtailed to a targeted exploitation rate of 2 to 3 percent (currently up to 3 percent), with an additional 10 percent permitted in US fisheries (as per the Pacific Salmon Treaty management regime).

While the status of Interior Fraser coho stocks has generally remained poor in spite of the 13 percent total exploitation rate limit, there are indications in recent years that their condition might be improving. In addition there have been improved returns of coho in Northern BC, the west Coast of Vancouver Island and inside Georgia Strait stocks in recent years. In 2013 there were significant numbers of jack coho throughout southern BC and marine indicators have been positive resulting in many of the stock groups with Outlook ranks of 3 (near target) or 4 (abundant). As a result, DFO has undertaken a scientific review of available stock and fishery information under the auspices of the Canadian Science Advisory Secretariat (CSAS) to determine the extent to which stock status has improved and the degree to which this might affect allowable exploitation rates on Interior Fraser coho for the 2014 fishing season. This assessment was to be developed in the context of the recovery objectives outlined in the 2006 conservation strategy developed by the Interior Fraser Coho Recovery Team that was formed when the Committee on the Status of Wildlife in Canada (COSEWIC) designated Interior Fraser coho salmon as *endangered* in 2002 (COSEWIC, 2002).

A pre-COSEWIC assessment was completed in 2013 (Decker and Irvine 2013) in preparation for a COSEWIC re-evaluation expected to be completed in 2015. A complete Wild Salmon Policy status assessment, planned for late 2014 or early 2015, will identify lower and upper status benchmarks for the five Interior Fraser Coho Conservation Units (CUs). This will inform the development of a longer term harvest management plan beyond the 2014 fishing season.

CSAS is the DFO process through which formal scientific advice is provided for fisheries management purposes. Science advice in the form of working papers are prepared by DFO staff, in conjunction with external authors in some cases, and reviewed through a committee process involving a cross-section of DFO technical experts as well as experts from First Nations and stakeholder groups. The advice on Interior Fraser coho was requested by DFO Fisheries

Management to inform planning for the 2014 fishing season and was reviewed by a committee on January 23rd and 24th and February 14th. A Science Advisory Report on the outcomes of this process has been produced and the results have informed the development of this Discussion Paper.

The purpose of this discussion paper, as noted in the March 3rd draft Integrated Fisheries Management Plan (IFMP), is to inform discussions with First Nations and stakeholders in considering possible fishery regimes for 2014 that are consistent with the science advice, DFO policy guidance and other considerations. The views received during consultations will ultimately inform the review of options and final decisions on the 2014 fishing season to be included in the Southern BC IFMP.

Stock Status

The *Conservation Strategy for Coho Salmon (Oncorhynchus kisutch), Interior Fraser River Populations* (2006) contains the following recovery objectives:

> ***Objective 1:*** *The 3-year average escapement in at least half of the sub-populations within each of the five populations is to exceed 1,000 wild-origin spawning coho salmon, excluding hatchery fish spawning in the wild. This represents a total Interior Fraser Coho spawning escapement of 20,000 to 25,000 wild-origin coho. This objective is designed to provide the abundance and diversity required to satisfy the recovery goal.*
>
> ***Objective 2:*** *Maintain the productivity of Interior Fraser Coho so that recovery can be sustained. This objective is designed to ensure that the threats to recovery are addressed. This objective may be met by addressing the causes for the decline that were identified by COSEWIC:*
>
> - *Development of a harvest management plan to ensure that exploitation rates are appropriate to changes in productivity caused, for example, by fluctuations in ocean conditions.*
> - *Identification, protection, and, if necessary, rehabilitation of important habitats.*
> - *Ensure that the use of fish culture methods is consistent with the recovery*

The CSAS stock assessment advice was based on the following interpretation of the above recovery objectives for Interior Fraser coho:

> Short Term Objective: 3 year geometric mean[1] escapement in at least half of the subpopulations within each of the 5 CUs to exceed 1000 natural spawners, excluding hatchery fish spawning in the wild; approximately 20,000 wild spawners; and
>
> Longer Term Objective: 3 year geometric mean escapement in all of the subpopulations within each of the 5 CUs to exceed 1000 natural spawners, excluding hatchery fish spawning in the wild; approximately 40,000 wild spawners

(Note 1: Using geometric means provides more precautionary generational averages and recognizes the importance (through heavier weighting) of smaller escapements to genetic diversity.)

Results of the assessment are summarized as follows:

- Significant fishery management actions beginning in 1998 to protect Interior Fraser coho effectively capped total (Canada and US) exploitation at approximately 13% compared to an average of 67% prior to 1998.

- The total return and spawning escapement of Interior Fraser coho from 1975 to 2012 are shown in Figure 1. For the most recent generation (2010-2012), aggregate wild coho escapement to the Interior Fraser River watershed averaged 36,000 adults (geometric mean). Although this is an increase over previous generational averages since conservation measures were implemented in 1997-1998, this is still about 40 percent lower than escapements during 1975-1988 when Interior Fraser coho experienced a period of relatively high total returns and escapements. The lowest escapements during the recent period of low productivity were in 1996 (~9,000) and 2006 (~7,000). Preliminary results suggest a total escapement of ~55,000 wild spawners for the Interior Fraser coho aggregate in 2013.

- With respect to uncertainties in escapement, there were no escapement estimates for Upper/Middle Fraser CUs during 1975-1997, or for the Lower Thompson CU during 1975-1983. Escapements to these areas were extrapolated based on ratios of abundance with other CUs during 1998-2000. For all CUs, surveys were often of limited coverage.

- Despite modest improvements in productivity (returns per spawner) in recent years (over the last 6 years, or 2 generations), the future is uncertain since there is no evidence that we have departed from the 'low' productivity period that has persisted since the 1994 return year. Current productivity is still well below that in the relatively high productivity period of 1978-1993 (Fig. 2).

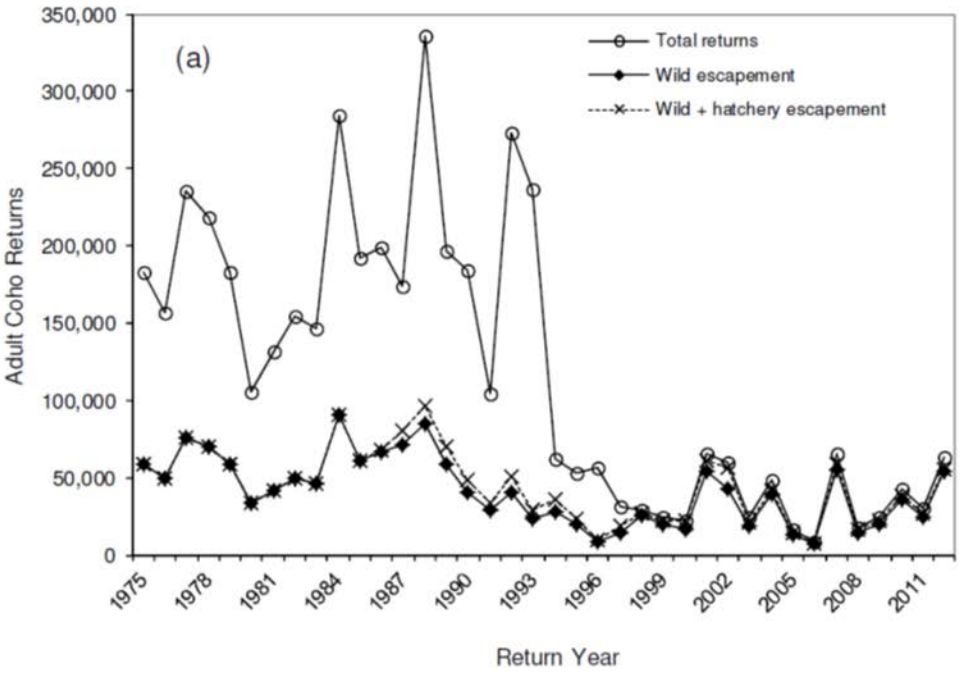

Figure 1. Reconstructed time series of wild Interior Fraser coho escapement, total escapement (hatchery plus wild) and total return (fishing mortality plus escapement) during the period 1975 to 2012.

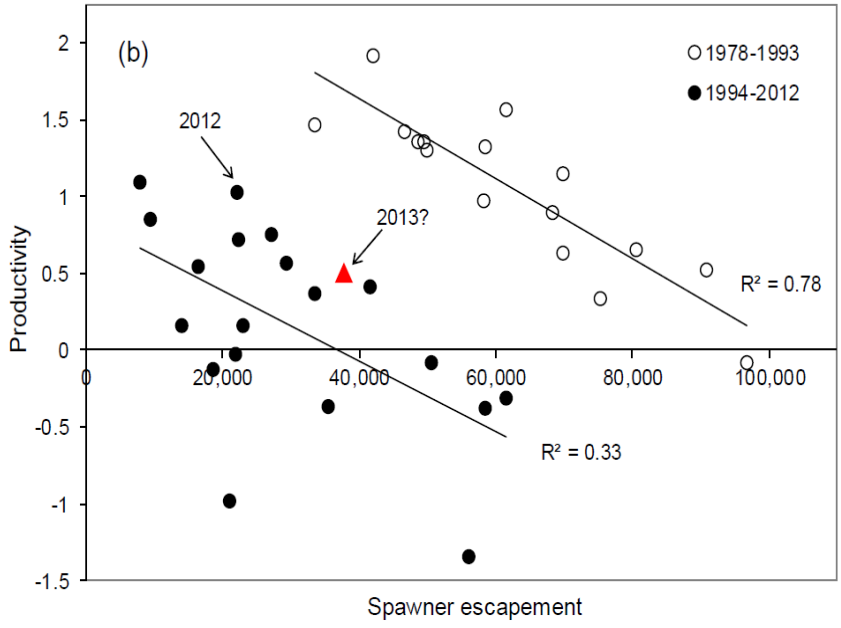

Figure 2. Plots of productivity (ln[recruits/spawner]) versus aggregate brood escapement for 1978-1992 and 1993-2012.

- Table 1 provides estimated probabilities of achieving the short and longer term recovery objectives (3-year geometric mean) for a range of exploitation rates for a low productivity period similar to the one experienced in the 1994-2012 period. Based on the results of the simulations, exploitation rates exceeding 30% suggest there is lower than a 50% probability of achieving the short term conservation objective of 20,000 spawners. Note that these probabilities are projections based on a Ricker stock-recruit model using the 2010 to 2012 spawning escapements as the starting point for forward simulations. As such, they should be considered as useful guidance in evaluating the generational implications (3 years for Interior Fraser coho) of alternative exploitation rate policies, but care should be taken in their application to annual fishery planning.

Table 1. Results of the harvest scenario analysis to determine the probability of meeting or exceeding short term and longer term 2006 IFCRT conservation objectives under a range of total exploitation rates and for three rebuilding periods, assuming a continuation of the 1994 to 2012 low productivity regime. Conservation objectives are expressed as the generational geometric mean numbers of spawners.

Total Expl. Rate	Short Term Objective (20,000 spawners)			Longer Term Objective (40,000 spawners)		
	One Generation	Two Generations	Three Generations	One Generation	Two Generations	Three Generations
0%	0.75	0.84	0.87	0.00	0.23	0.31
5%	0.72	0.80	0.84	0.00	0.19	0.26
10%	0.69	0.76	0.79	0.00	0.16	0.22
15%	0.65	0.71	0.73	0.00	0.12	0.17
20%	0.60	0.66	0.67	0.00	0.09	0.13
25%	0.56	0.59	0.59	0.00	0.07	0.09
30%	0.51	0.52	0.50	0.00	0.05	0.06
40%	0.39	0.36	0.31	0.00	0.02	0.02
60%	0.15	0.07	0.03	0.00	0.00	0.00

- Under the low productivity regime and a Ricker stock-recruit model, the simulation analysis suggests that the longer term recovery objective of 40,000 spawners is unlikely to be achieved even with a zero exploitation rate over one, two or three generations. For 2014 in the absence of WSP biological benchmarks, simulations using the short term objective of 20,000 spawners will be most informative for fisheries planning.

- The CSAS assessment cautioned that there are potentially significant sources of uncertainty with respect to estimates of fishery exploitation, escapement, and stock-recruit parameters. While exploitation rates were estimated from coded-wire tag recoveries in catch and escapement prior to 1998, estimates since that time have relied on models that assume an average marine distribution by time and area of Interior Fraser coho and similar relationships between fishing effort and harvest rates during the period covered by coded-wire tag data. In addition to the uncertainty created by these assumptions, it should be noted that fishing effort is not monitored completely in all

fisheries and may also have changed with the movement from competitive to quota based fisheries.

- Since stock recruit model selection was based on fitting to the exploitation and escapement time series, there is uncertainty in the predictions of stock responses to harvest. In addition, implementation error, the variability in the ability to implement a change in exploitation rate, is not captured in the models that generated the probabilities in Table 1.

Pacific Salmon Treaty Implications

Annex IV, Chapter 5 of the Pacific Salmon Treaty establishes the international management regime for southern BC and southern US origin coho based on the status of defined Management Units (MU) in each country. Each MU is to be managed using a series of decision rules which are based on the status of the MU, or groups of MUs in the case of the US. The three status levels are low, moderate and abundant and in the case of Canadian MU's like Interior Fraser coho, the limits on US interceptions are expressed as exploitation rate limits as outlined in Table 2. Within the PSC specified low status zone, each country is expected to implement additional fishery management measures as may be necessary to address conservation needs for MU's within its jurisdiction, which Canada has done by reducing its share of the total exploitation rate in low status from a maximum of 10 percent to 2-3 percent for Interior Fraser coho since 1998.

Table 2: Pacific Salmon Treaty abundance-based exploitation rate limits on coho salmon stocks in fisheries harvesting southern BC coho.

MU Status	US ER caps	Total ER
Low	10%	Up to 20%
Moderate	12%	>21 to 40%
Abundant	15%	>41 to 65%

Current Management Approach

Since 1998, in time periods when there is potential to encounter IFR coho salmon in southern B.C. waters, management actions have generally ranged from non-retention to time and area closures. These management measures have had implications for the following areas and fisheries:

- West Coast Vancouver Island (WCVI) troll (commercial and First Nations) and recreational fisheries in offshore areas from late May until early September;
- Commercial net and recreational fisheries in the Straits of Juan de Fuca from June until early October;
- Commercial, recreational and First Nations fisheries in Johnstone and Queen Charlotte Straits from early June until late August;

- Commercial, recreational and First Nations fisheries in the Strait of Georgia from June until early October,
- Commercial, recreational and First Nations fisheries both off the mouth of, and in, the Fraser River from early June until mid-October, and
- Commercial, recreational and First Nations fisheries in the Fraser River upstream of Sawmill Creek from mid- to late September until late October.

Exploitation Rate Options

The Department is seeking feedback on 3 options of exploitation rate for Interior Fraser coho in Canadian fisheries in 2014 as well as input into potential fishing plans within each option:

1. Continue current actions to limit Canadian exploitation rates to 3 percent or less (status-quo). Total exploitation of 13%.
2. Permit increased exploitation rates in Canada from 4 to 9 percent. Total exploitation at 19% or less for preseason planning.

3. Permit increased exploitation rates in Canada from 10 to 16 percent. Total exploitation at 28% or less for preseason planning.

Although the fishery reference points for the Low, Moderate and High categories in the Pacific Salmon Treaty have not been identified at this time, Options 1 and 2 would be consistent with the *low* abundance zone where the United States is entitled to a 10% exploitation rate. Under Option 3, the United States exploitation rate would increase from 10 to 12 percent. (Table 2)

The general characteristics of these alternatives are presented in Table 3, while more detailed scenarios are appended to this document (Appendix I, II and III).

Things to consider in up-coming discussions include the following policies as well as tools to consider when designing fisheries:

- Consistency with the DFO policy framework for salmon fisheries management;
    - Pacific Salmon Treaty
    - Wild Salmon Policy,
    - Sustainable Fisheries Framework - Precautionary Approach,
    - Policy for the Allocation of Pacific Salmon,
    - Policy for the Management of Aboriginal Fishing
    - Policy for Selective Fishing
    - Fishery Monitoring and Catch Reporting Framework

- Potential benefits from increased exploitation rate in 2014 on Interior Fraser coho in fisheries directed on other species and stocks, including an expected large return of Fraser sockeye with considerable allowable harvest as well as abundances of chum, Chinook and non-Interior Fraser coho;

- Stock and fishery monitoring capacity (resources required to monitor fisheries) within DFO, and among external partners;

- The timing of the coho window closure in a particular area and potential changes to the dates;

- The use of selective fishing techniques during times when IFC are prevalent, and

- Potential mitigation measures to address uncertainties in stock and fishery assessment, particularly at higher exploitation rates.

Fishery Planning tools

For fishery planning purposes, Interior Fraser coho fishing mortality is estimated pre-season using a variety of domestic models. Exploitation rates in the marine fisheries are estimated using a harvest rate spreadsheet model, which is based on the historical relationship between fishing effort and associated exploitation rates in the period 1986 to 1997 as determined from coded wire tag recoveries of Interior Fraser Coho and release mortality rates as identified in the South Coast Integrated Fisheries Management Plan (IFMP).

In-river food, social and ceremonial, commercial and recreational impacts are estimated using a decay model which is based on the number of Coho encounters in fisheries directed on other species, the average timing and the proportion Interior Fraser Coho makes up of the total Fraser Coho return at the time of the particular fishery and release mortality rates as identified in the IFMP. Coho encountered in tributary and mainstem Fraser River fisheries upstream of Sawmill Creek are assumed to be 100% Interior Fraser Coho.

A post-season estimate of exploitation rate is developed from the same models but using reported catch and release and /or fishing effort data collected during the fishing season.

For the purpose of implementing the PST Coho Chapter, Canada works with the United States within the Pacific Salmon Commission process to estimate fishery impacts on southern BC coho using a bilaterally agreed model (FRAM). The FRAM model is used pre-season bilaterally to plan fisheries within the stock specific constraints dependent on status as identified in the Agreement. FRAM estimated impacts on IFC may not match the estimates projected by Canadian domestic models as it is based on a shorter base period of CWT data (1986-92 vs 1986-97 in the domestic models) and includes other impacts associated with natural mortalities and dropouts.

Management Options for Consideration

Potential management approaches for 2014 are provided in Table 3 below for consideration, with analyses using the aforementioned preseason planning models presented in the appendices.

In Option 1 impacts are consistent with the management approach that has been in place since the early 2000's which were designed to limit domestic exploitation rate on IFR coho to 3%. The exploitation rates identified for Option 1 in Table 3 reflects the relative harvest levels of the 4 categories of fisheries from 2010 (most recent similar year) within a 3% limit. In this option all fisheries where Interior Fraser Coho are prevalent are conducted with a non-retention restriction for coho with the exception of the small Fraser tributary fisheries in a few locations in the BC Interior where counting fences are used to identify surplus coho for harvest. Estimates of marine commercial and recreational fishery impacts are based on the effort levels exerted in 2010 while in-river impacts are determined using the in-river decay model. As in 2010 it is unlikely the full TAC of Sockeye would be harvested in 2014 in this scenario unless the actual run size is considerably lower than the p50 forecast of 23 million.

In Option 2 retention of coho bycatch is permitted in First Nations food, social and ceremonial fisheries for more abundant species such as Fraser sockeye and chum salmon; in addition increased harvests are permitted in tributaries in the BC Interior where abundance permits. The increased impacts in marine and in-river commercial fisheries are due to an increase in fishing opportunities over those in Option 1. In the marine and in-river recreational fisheries marginal increases in impacts may be permitted in areas and times when Interior Fraser Coho are present in very low levels. More of the Sockeye TAC is expected to be harvested than in Option 1 but not all unless the run size is well below the p50 level.

In Option 3, First Nations food, social and ceremonial fisheries in the BC Interior and the lower Fraser would be provided increased fishing opportunities in more tributaries in the BC Interior and relaxation of the coho window closure period in mainstem Fraser fisheries. First Nation economic, demonstration and commercial fisheries within the Fraser River and tributaries are provided increased fishing opportunities, resulting in increased impacts on coho as release mortalities while similar increases are projected for marine commercial fisheries. In the marine recreational fishery, retention of one wild coho could be allowed in some/all South Coast areas while in freshwater fisheries relaxation of the coho window could occur to allow for additional retention of marked coho.

Prior to the development of the final SC Salmon IFMP, the Department will consider different options for addressing coho impacts for each of the fisheries identified above taking into account the various policies and principles identified on page 8 of this document. These discussions will occur through the normal advisory processes conducted over the next several weeks to assist in the development of the final South Coast Salmon Integrated Fisheries Management Plan.

The Department is seeking feedback by April 7th on two specific questions:

1. Which of the three Interior Fraser Coho exploitation rate Options for Canadian fisheries (Table 3) does your organization support for the 2014 salmon season; and
2. Which of the more specific fisheries scenarios in the attached appendices or other scenarios would your organization recommend for Options 2 or 3.

Feedback on these questions can be directed to any of the local Area Directors identified below.

South Coast – Andrew Thomson
(250) 756-7280
Andrew.Thomson@dfo-mpo.gc.ca>

Lower Fraser – Jennifer Nener
(604) 666-6478
Jennifer.Nener@dfo-mpo.gc.ca>

BC Interior – Les Jantz
(250) 851-4892
Lester.Jantz@dfo-mpo.gc.ca

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Table 3. Potential exploitation rates and management options for domestic fisheries management

	Option 1 - up to 3% ER		Option 2 – 4 to 9% ER		Option 3 -10 to 16% ER	
	Management Characteristics	**% ER**	**Management Characteristics**	**% ER**	**Management Characteristics**	**% ER**
Food, Social and Ceremonial	Incidental catch or non-retention in fisheries directed on other species. Small tributary harvests where abundances are identified.	**0.7**	Retention of wild coho bycatch in fisheries directed on other species and increased tributary harvests where abundances are identified.		Retention of wild coho bycatch in fisheries directed on other species, relaxation of the coho window closure dates and additional directed harvest opportunities in tributaries.	
Economic Op/FN Demo	Non-retention of wild coho in fisheries directed on other species or stocks.	**0.4**	Non-retention of wild coho in fisheries directed on other species or stocks. Additional fishing effort/time compared to Option 1 results in increased release mortality.		Non-retention of wild coho in fisheries directed on other species or stocks. Additional fishing effort/time compared to Option 2 resulting in increased release mortality.	
Commercial	Non-retention of wild coho in fisheries directed on other species or stocks.	**0.9**	Non-retention of wild coho in fisheries directed on other species or stocks. Additional fishing effort/times compared to Option 1 results in increased release mortality.		Non-retention of wild coho in fisheries directed on other species or stocks. Additional fishing effort/times compared to Option 2 results in increased release mortality.	
Recreational	Non-retention of wild coho in fisheries directed on other species or marked coho. Retention of unmarked coho only in areas and times where impacts on Interior Fraser Coho are minimal.	**0.6**	Increased impacts in areas and times when Interior Fraser Coho are present in very low levels		In marine recreational fisheries, retention of one wild coho permitted in some/all South Coast areas while in-river fisheries may allow additional retention of marked coho through relaxation of window closure.	
Test Fisheries		**0.4**		**0.4**		**0.4**
Total All		**3.0**		**4-9.**		**10-16.**

Appendix I. Commercial fishery impact (Exploitation Rate or ER) associated with various scenarios of Fraser sockeye TAC and migration pattern (Outside mainly through Juan de Fuca or Inside mainly through Johnstone Strait).

COMMERCIAL FISHERY EXPLOITATION (ER) IMPACT ON INTERIOR FRASER COHO											
	Scenario 1.	2010 effort for most commercial fisheries and Area G effort from 2013									
	Scenario 2-6.	Assumed Outside Diversion resulting in increased harvest in Area 20 and Area 29, Area G effort from 2013									
	Scenario 7-11.	Assumed Inside Diversion resulting in increased effort in JST and Area G effort from 2013									
Scenario	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 5**	**Scenario 6**	**Scenario 7**	**Scenario 8**	**Scenario 9**	**Scenario 10**	**Scenario 11**
Fraser sockeye TAC	10500000	11550000	12600000	13650000	14700000	15750000	11550000	12600000	13650000	14700000	15750000
Migration		Outside	Outside	Outside	Outside	Outside	Inside	Inside	Inside	Inside	Inside
JST-Gillnet	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%
JST-Purse Seine	0.24%	0.24%	0.24%	0.24%	0.24%	0.24%	0.30%	0.36%	0.40%	0.45%	0.49%
JST-Troll	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%
JdF-Purse Seine	0.12%	0.64%	1.03%	1.46%	1.94%	2.32%	0.12%	0.12%	0.12%	0.12%	0.12%
Gulf-Purse Seine	0.43%	0.74%	0.87%	1.08%	1.30%	1.51%	0.43%	0.43%	0.43%	0.43%	0.43%
Gulf-Troll	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%
WCVI-Troll (CN)	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%
WCVI-Troll (SK)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Total Area B	0.79%	1.61%	2.14%	2.78%	3.48%	4.08%	0.85%	0.91%	0.95%	1.00%	1.05%
Total Area D	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%	0.12%
Total Area H	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Total Area G	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%
Total Commercial	1.03%	1.85%	2.37%	3.01%	3.72%	4.31%	1.09%	1.14%	1.18%	1.23%	1.28%
	Assumptions:	Effort required to catch TAC is proportional to the catch. For example, Scenario 6 fishery = 1.5 x Scenario 1 fishery.									
		Note that WCVI troll includes the T'aaq-wiihak mixed stock fisheries.									

Appendix I cont'd. Commercial fishery impact (Exploitation Rate or ER) associated with various scenarios of Fraser sockeye TAC and migration pattern (Outside mainly through Juan de Fuca or Inside mainly through Johnstone Strait). Assumed net fishery effort for each scenario, for Area G assume same as 2013.

		Boatdays/Area/Month			
Scenario	**Sockeye TAC**	**Area 20 PS Aug**	**Area 29 PS Sept**	**JST PS Augus**	**JST PS Sept**
1	10,500,000	40	100	474	170
2	11,550,000.0	210	145	474	170
3	12,600,000.0	340	200	474	170
4	13,650,000.0	480	250	474	170
5	14,700,000.0	640	300	474	170
6	15,750,000.0	765	350	474	170
7	11,550,000.0	40	100	574	214
8	12,600,000.0	40	100	669	260
9	13,650,000.0	40	100	699	335
10	14,700,000.0	40	100	769	395
11	15,750,000.0	40	100	834	455

Appendix II. Predicting impact (Exploitation Rate *or* ER) for Interior Fraser River coho in the southern BC marine recreational fishery. Option 1 status quo with some boundary changes along the WCVI inside areas.

Predicted ER = Predicted ER kept fish + Predicted ER released fish
Predicted ER kept fish = Predicted ER all encounters x bag limit scalar x scalars for changes in gear efficiency
Predicted ER released fish = Predicted ER all encounters x (1-bag limit scalar)
Predicted ER all encounters = Base Period ER x effort scalar
where effort scalar = anticipated effort / base period effort
where bag limit scalar = proposed daily limit of wild coho / historic catch per angler under 4 coho per day limit

Base Period Exploitation (Mean 87-97)

	Month												
Region	1	2	3	4	5	6	7	8	9	10	11	12	Total
JST			0.000%	0.000%	0.000%	0.000%	0.159%	0.139%	0.000%	0.000%	0.000%		0.298%
GSN	0.051%	0.129%	0.048%	0.170%	1.117%	2.423%	2.028%	0.993%	0.453%	0.010%	0.000%	0.000%	7.423%
GSS	0.000%	0.000%	0.052%	0.705%	0.754%	0.261%	0.165%	0.097%	0.195%	0.390%	0.000%	0.000%	2.619%
JdF	0.000%	0.043%	0.036%	0.075%	0.000%	0.079%	1.133%	1.237%	2.053%	0.079%	0.000%	0.000%	4.735%
WCVI inside surfline	0.000%	0.000%	0.000%	0.000%	0.000%	0.014%	0.149%	0.167%	0.000%	0.000%	0.000%		0.330%
WCVI outside surfline	0.000%	0.000%	0.000%	0.000%	0.000%	0.156%	0.736%	1.659%	0.310%	0.184%			3.045%
Total	0.051%	0.172%	0.136%	0.951%	1.871%	2.934%	4.370%	4.291%	3.010%	0.663%	0.000%	0.000%	18.450%

Base Period Mean Effort (Boat Trips)

	Month												
Region	1	2	3	4	5	6	7	8	9	10	11	12	
JST						6498	11285	14872					
GSN	1693	1692	2478	5028	27552	52935	65114	63130	31717	5911	1470	1433	
GSS	2990	2965	3859	7923	16589	18866	23823	26332	17582	7448	3035	3028	
JdF	3525	3523	3864	3513	5901	13744	18056	17479	15849	7285	1610	1610	
WCVI inside surfline						2982	8361	25259	11305				
WCVI outside surfline													

Anticipated Effort

	Month												
Region	1	2	3	4	5	6	7	8	9	10	11	12	%Change fr
JST						1186	4626	5361					0%
GSN				0	0	15240	11866	15418	3722	0			0%
GSS			79	120	25	6280	7840	10410	89	51			0%
JdF			2451	2021	2246	8954	11158	16287	7416	3236			0%
WCVI inside surfline						2982	8361	9812	1546				0%
WCVI outside surfline													

Daily catch limit (Wild)

	Month												
Region	1	2	3	4	5	6	7	8	9	10	11	12	
JST	0	0	0	0	0	1	1	0	0	0	0	0	
GSN	0	0	0	0	0	0	0	0	0	0	0	0	
GSS	0	0	0	0	0	0	0	0	0	0	0	0	
JdF	0	0	0	0	0	0	0	0	0	0	0	0	
WCVI (inshore)	0	0	0	0	0	4	4	4	4	4	4	4	
WCVI (offshore)	0	0	0	0	0	0	0	0	0	0	0	0	

Daily catch limit scalar

	Month												
Region	1	2	3	4	5	6	7	8	9	10	11	12	
JST	0	0	0	0	0	0.57037	0.560802834	0	0	0	0	0	
GSN	0	0	0	0	0	0	0	0	0	0	0	0	
GSS	0	0	0	0	0	0	0	0	0	0	0	0	
JdF	0	0	0	0	0	0	0	0	0	0	0	0	
WCVI (inshore)	0	0	0	0	0	1	1	1	1	1	1	1	
WCVI (offshore)	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	

Release Mortality

	Month												
Region	1	2	3	4	5	6	7	8	9	10	11	12	
JST	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	
GSN	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	
GSS	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	
JdF	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	
WCVI inside surfline	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	
WCVI outside surfline													

Predicted Exploitation

	Month												
Region	1	2	3	4	5	6	7	8	9	10	11	12	Total
JST						0.000%	0.040%	0.005%					0.04%
GSN	0.000%	0.000%	0.000%	0.000%	0.000%	0.070%	0.037%	0.024%	0.005%	0.000%	0.000%	0.000%	0.14%
GSS	0.000%	0.000%	0.000%	0.001%	0.000%	0.009%	0.005%	0.004%	0.000%	0.000%	0.000%	0.000%	0.02%
JdF	0.000%	0.000%	0.002%	0.004%	0.000%	0.005%	0.070%	0.115%	0.096%	0.004%	0.000%	0.000%	0.30%
WCVI inside surfline						0.014%	0.149%	0.065%	0.000%				0.23%
WCVI outside surfline						0.016%	0.074%	0.166%	0.031%				0.29%
												Total	1.01%

Appendix II cont'd.. Predicting impact (Exploitation Rate *or* ER) for Interior Fraser River coho in the southern BC marine recreational fishery. Example of Option 3. Wild retention (1/day) in all areas starting June 1.

Predicted ER = Predicted ER kept fish + Predicted ER released fish
Predicted ER kept fish = Predicted ER all encounters x bag limit scalar x scalars for changes in gear efficiency
Predicted ER released fish = Predicted ER all encounters x (1-bag limit scalar)
Predicted ER all encounters = Base Period ER x effort scalar
where effort scalar = anticipated effort / base period effort
where bag limit scalar = proposed daily limit of wild coho / historic catch per angler under 4 coho per day limit

Base Period Exploitation (Mean 87-97)

Region	1	2	3	4	5	6	7	8	9	10	11	12	Total
JST			0.000%	0.000%	0.000%	0.000%	0.159%	0.139%	0.000%	0.000%	0.000%		0.298%
GSN	0.051%	0.129%	0.048%	0.170%	1.117%	2.423%	2.028%	0.993%	0.453%	0.010%	0.000%	0.000%	7.423%
GSS	0.000%	0.000%	0.052%	0.705%	0.754%	0.261%	0.165%	0.097%	0.195%	0.390%	0.000%	0.000%	2.619%
JdF	0.000%	0.043%	0.036%	0.075%	0.000%	0.079%	1.133%	1.237%	2.053%	0.079%	0.000%	0.000%	4.735%
WCVI inside surfline	0.000%	0.000%	0.000%	0.000%	0.000%	0.014%	0.149%	0.167%	0.000%	0.000%	0.000%		0.330%
WCVI outside surfline	0.000%	0.000%	0.000%	0.000%	0.000%	0.156%	0.736%	1.659%	0.310%	0.184%			3.045%
Total	0.051%	0.172%	0.136%	0.951%	1.871%	2.934%	4.370%	4.291%	3.010%	0.663%	0.000%	0.000%	18.450%

Base Period Mean Effort (Boat Trips)

Region	1	2	3	4	5	6	7	8	9	10	11	12
JST						6498	11285	14872				
GSN	1693	1692	2478	5028	27552	52935	65114	63130	31717	5911	1470	1433
GSS	2990	2965	3859	7923	16589	18866	23823	26332	17582	7448	3035	3028
JdF	3525	3523	3864	3513	5901	13744	18056	17479	15849	7285	1610	1610
WCVI inside surfline						2982	8361	25259	11305			
WCVI outside surfline												

Anticipated Effort

Region	1	2	3	4	5	6	7	8	9	10	11	12	%Change fr
JST						1186	4626	5361					0%
GSN				0	0	15240	11866	15418	3722	0			0%
GSS			79	120	25	6280	7840	10410	89	51			0%
JdF			2451	2021	2246	8954	11158	16287	7416	3236			0%
WCVI inside surfline						2982	8361	9812	1546				0%
WCVI outside surfline													

Daily catch limit (Wild)

Region	1	2	3	4	5	6	7	8	9	10	11	12
JST	0	0	0	0	0	1	1	1	1	1	1	1
GSN	0	0	0	0	0	1	1	1	1	1	1	1
GSS	0	0	0	0	0	1	1	1	1	1	1	1
JdF	0	0	0	0	0	1	1	1	1	1	1	1
WCVI (inshore)	0	0	0	0	0	4	4	4	4	4	4	4
WCVI (offshore)	0	0	0	0	0	1	1	1	1	1	1	1

Daily catch limit scalar

Region	1	2	3	4	5	6	7	8	9	10	11	12
JST	0	0	0	0	0	0.57037	0.560802834	0.579937304	0	0	0	0
GSN	0	0	0	0	0	0.646177	0.756980689	0.82499335	0.799482439	0.792898231	0.6279107	0.4450704
GSS	0	0	0	0	0	0.673348	0.8373623	0.850167089	0.870022042	0.904648829	0.6632537	0.8658847
JdF	0	0	0	0	0	0.654305	0.621036362	0.795671454	0.672686231	0.719330111	0.9430894	0.7731469
WCVI (inshore)	0	0	0	0	0	1	1	1	1	1	1	1
WCVI (offshore)	0.100	0.100	0.100	0.100	0.100	0.250	0.250	0.250	0.250	0.250	0.250	0.250

Release Mortality

Region	1	2	3	4	5	6	7	8	9	10	11	12
JST	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
GSN	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
GSS	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
JdF	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
WCVI inside surfline	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
WCVI outside surfline												

Predicted Exploitation

Region	1	2	3	4	5	6	7	8	9	10	11	12	Total
JST						0.000%	0.040%	0.031%					0.07%
GSN	0.000%	0.000%	0.000%	0.000%	0.000%	0.476%	0.289%	0.204%	0.044%	0.000%	0.000%	0.000%	1.01%
GSS	0.000%	0.000%	0.000%	0.001%	0.000%	0.061%	0.046%	0.033%	0.001%	0.002%	0.000%	0.000%	0.15%
JdF	0.000%	0.000%	0.002%	0.004%	0.000%	0.036%	0.462%	0.940%	0.678%	0.026%	0.000%	0.000%	2.15%
WCVI inside surfline						0.014%	0.149%	0.065%	0.000%				0.23%
WCVI outside surfline						0.039%	0.184%	0.415%	0.078%				0.72%
												Total	4.32%

Appendix III. Lower Fraser First Nations FSC sockeye fishing plan options and associated Interior Fraser Coho exploitation rates.

			FN FSC (Gillnet)			
	Week Ending Date		2010 Sox Catch	Plan A	Plan B	Plan C
Week	2010	2014	Gillnet	0.00%	0.03%	0.03%
27	3-Jul-10	5-Jul-14	10	x	x	x
28	10-Jul-10	12-Jul-14	147	x	x	x
29	17-Jul-10	19-Jul-14	135	x	x	x
30	24-Jul-10	26-Jul-14	306	x	x	x
31	31-Jul-10	2-Aug-14	36,330	x	x	x
32	7-Aug-10	9-Aug-14	94,411	x	x	x
33	14-Aug-10	16-Aug-14	87,139	x	x	x
34	21-Aug-10	23-Aug-14	37,048	x	x	x
35	28-Aug-10	30-Aug-14	9,211	x	x	x
36	**4-Sep-10**	**6-Sep-14**	**6,033**	**closed**	**x**	**x**
37	**11-Sep-10**	**13-Sep-14**	**5,418**	**closed**	**x**	**x**
38	**18-Sep-10**	**20-Sep-14**	**0**			**open**
39	**25-Sep-10**	**27-Sep-14**	**0**			**open**
40	**2-Oct-10**	**4-Oct-14**	**0**			

Notes

1. Weeks highlighted in tan indicate a similar fishing plan to 2010.
2. Weeks highlighted in red indicate a reduced fishery from 2010.
3. Weeks highlighted in green indicate an increased fishery from 2010.
4. The Interior Fraser coho “window closure” occurs from weeks 36 to 40 (noted in bold in table).
5. The fishing plan and associated impacts in this table are based on the assumption that there will also be an Economic Opportunity fishery in 2014, similar in scope to that which occurred in 2010.

Appendix III cont'd. Lower Fraser First Nations Economic Opportunity sockeye fishing plan options and associated Interior Fraser Coho exploitation rates.

			FN Economic Opportunity						
	Week Ending Date		2010 Sox Catch		Plan A	Plan B	Plan C	Plan D	Plan E
Week	2010	2014	Gillnet	Selective	0.01%	0.05%	0.26%	0.63%	2.23%
27	3-Jul-10	5-Jul-14	0						
28	10-Jul-10	12-Jul-14	0						
29	17-Jul-10	19-Jul-14	0						
30	24-Jul-10	26-Jul-14	0						
31	31-Jul-10	2-Aug-14	0						
32	7-Aug-10	9-Aug-14	0		GN open	GN open	GN open	GN open	GN open
33	14-Aug-10	16-Aug-14	79,796		x	x	x	x	x
34	21-Aug-10	23-Aug-14	146,477	554	x	x	x	x	x
35	28-Aug-10	30-Aug-14	154,594	4,265	x	x	x	x	x
36	**4-Sep-10**	**6-Sep-14**	**147,601**	**0**	**closed**	**selective**	**x**	**x**	**x**
37	**11-Sep-10**	**13-Sep-14**	**245,951**	**54,070**	**closed**	**selective**	**selective**	**x**	**x**
38	**18-Sep-10**	**20-Sep-14**	**0**	**109,083**		**selective**	**selective**	**selective**	**GN open**
39	**25-Sep-10**	**27-Sep-14**	**0**						
40	**2-Oct-10**	**4-Oct-14**	**0**						

Notes

1. Weeks highlighted in tan indicate a similar fishing plan to 2010.
2. Weeks highlighted in red indicate a reduced fishery from 2010.
3. Weeks highlighted in green indicate an increased fishery from 2010.
4. The Interior Fraser coho "window closure" occurs from weeks 36 to 40 (noted in bold in table).
5. "Selective" indicates that only those gears which are considered to be selective are to be fished in those weeks. Estimates of exploitation rates for those weeks assumes that beach seine gear will be used. While other selective gears may be considered, the exploitation rate associated with using those gears may change from that provided above.Appendix III cont. Area E Gillnet Fraser River sockeye fishing plan options and associated Interior Fraser Coho exploitation rates.

Appendix III cont'd. Area E Gillnet Fraser River sockeye fishing plan options and associated Interior Fraser Coho exploitation rates.

			Area E (Gillnet)				
	Week Ending Date		2010 Sox Catch	Plan A	Plan B	Plan C	Plan D
Week	2010	2014	2010	0.02%	0.57%	1.20%	1.85%
27	3-Jul-10	5-Jul-14	0				
28	10-Jul-10	12-Jul-14	0				
29	17-Jul-10	19-Jul-14	0				
30	24-Jul-10	26-Jul-14	0				
31	31-Jul-10	2-Aug-14	0				
32	7-Aug-10	9-Aug-14	0	open	open	open	open
33	14-Aug-10	16-Aug-14	84,400	x	x	x	x
34	21-Aug-10	23-Aug-14	140,583	x	x	x	x
35	28-Aug-10	30-Aug-14	586,451	x	x	x	x
36	**4-Sep-10**	**6-Sep-14**	**1,006,130**	**closed**	**x**	**x**	**x**
37	**11-Sep-10**	**13-Sep-14**	**302,805**	**closed**	**closed**	**x**	**full open**
38	**18-Sep-10**	**20-Sep-14**	**0**				
39	**25-Sep-10**	**27-Sep-14**	**0**				
40	**2-Oct-10**	**4-Oct-14**	**0**				

Notes

1. Weeks highlighted in tan indicate a similar fishing plan to 2010.
2. Weeks highlighted in red indicate a reduced fishery from 2010.
3. Weeks highlighted in green indicate an increased fishery from 2010.
4. The Interior Fraser coho "window closure" occurs from weeks 36 to 40 (noted in bold in table).

Appendix III cont'd. Lower Fraser recreational fishing plan options and associated Interior Fraser Coho exploitation rates.

			Lower Fraser Recreational		
	Week Ending Date		Plan A	Plan B	Plan C
Week	2010	2014	0.24%	0.30%	0.47%
27	3-Jul-10	5-Jul-14			
28	10-Jul-10	12-Jul-14			
29	17-Jul-10	19-Jul-14	x	x	x
30	24-Jul-10	26-Jul-14	x	x	x
31	31-Jul-10	2-Aug-14	x	x	x
32	7-Aug-10	9-Aug-14	x	x	x
33	14-Aug-10	16-Aug-14	x	x	x
34	21-Aug-10	23-Aug-14	x	x	x
35	28-Aug-10	30-Aug-14	x	x	x
36	**4-Sep-10**	**6-Sep-14**	**x**	**x**	**x**
37	**11-Sep-10**	**13-Sep-14**	**x**	**x**	**x**
38	**18-Sep-10**	**20-Sep-14**	**x**	**x**	**x**
39	**25-Sep-10**	**27-Sep-14**	**x**	**x**	**1 ad clip**
40	**2-Oct-10**	**4-Oct-14**	**x**	**1 ad clip**	**1 ad clip**

1. Weeks highlighted in tan indicate a similar fishing plan to 2010.
2. Weeks highlighted in red indicate a reduced fishery from 2010.
3. Weeks highlighted in green indicate an increased fishery from 2010.
4. The Interior Fraser coho "window closure" occurs from weeks 36 to 40 (noted in bold in table).

Appendix IV. BC Interior Food Social and Ceremonial fishing plan options and associated Interior Fraser Coho exploitation rates.

BCI Food Social and Ceremonial Fisheries							
Plan A		**Plan B**		**Plan C**		**Plan D**	
Sockeye Catch	**230,000**	Sockeye Catch	**290,000**	Sockeye Catch	**290,000**	Sockeye Catch	**300,000**
IF Coho Exp.	**0.39%**	IF Coho Exp.	**0.56%**	IF Coho Exp.	**1.32%**	IF Coho Exp.	**2.36%**

Fishery Description

Plan A	Directed sockeye catch similar to prior cycle average catch and reduced directed coho fishing effort (no directed)
Plan B	Directed sockeye catch similar to 2010 and recent average directed coho harvest
Plan C	Directed sockeye catch similar to 2010 with retention of some bycatch (1/3 of encounters), and increased directed coho harvest
Plan D	Increased directed sockeye catch relative to Plan C, retention of all bycatch and peak observed directed coho harvest

Directed coho harvest is harvest that has been observed on terminal fences or fishways

Coho release mortality rates applied: Dipnet-0%, Gillnet-60%

Appendix IV cont'd. BC Interior Recreational fishing plan options and associated Interior Fraser Coho exploitation rates.

BCI Recreational Fisheries							
Plan A		**Plan B**		**Plan C**		**Plan D**	
Sockeye Catch	**10,000**	Sockeye Catch	**15,000**	Sockeye Catch	**25,000**	Sockeye Catch	**45,000**
IF Coho Exp.	**0.00%**	IF Coho Exp.	**0.01%**	IF Coho Exp.	**0.01%**	IF Coho Exp.	**0.02%**

Fishery Description

Plan A	Reduced directed sockeye catch relative to 2010
Plan B	Directed sockeye fishing effort and catch similar to 2010
Plan C	Increased directed sockeye fishing effort and catch relative to 2010
Plan D	Increased directed sockeye fishing effort and catch relative to Plan C

Fisheries included: Directed sockeye fisheries in the Lower Thompson, South Thompson and Little Shuswap Lake

Coho release mortality rate applied: Rod and Reel-10%

Appendix IV cont'd. BC Interior Demonstration fishery fishing plan options and associated Interior Fraser Coho exploitation rates.

BCI Demonstration Fisheries										
Plan A		Plan B		Plan C		Plan D		Plan E	
Sockeye Catch	75,000	Sockeye Catch	176,110	Sockeye Catch	400,000	Sockeye Catch	735,000	Sockeye Catch	1,010,000
IF Coho Exp.	0.04%	IF Coho Exp.	0.17%	IF Coho Exp.	0.43%	IF Coho Exp.	0.91%	IF Coho Exp.	1.42%

Fishery Description

Plan A	Reduced directed sockeye fishing effort and catch relative to 2010
Plan B	Directed sockeye fishing effort and catch similar to 2010
Plan C	Increased directed sockeye fishing effort and catch relative to 2010
Plan D	Increased directed sockeye fishing effort and catch relative to Plan C
Plan E	Incresed directed sockeye effort and catch to harvest expected TAC

Fisheries inlcuded: Directed sockeye fisheries in the UFFCA Dipnet, NSTC Fishwheels, NSTC Shallow Purse Seine and SFC Shallow Purse Seine

Coho release mortality rates applied: Dipnet-0%, Shallow Purse Seine-10%, Fishwheels-5%