PACIFIC SALMON COMMISSION
JOINT COHO TECHNICAL COMMITTEE

THE EFFECTS OF MANAGEMENT UNIT (MU) SIZE
FOR PST COHO:ONE VS. FIVE MUS
IN PUGET SOUND AND THE INTERIOR FRASER

REPORT TCCOHO (10)–1

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Abstract

The Coho Technical Committee was given the task of analyzing the effects of management unit (MU) size on harvest, escapement, and fishery management processes for coho salmon under the Pacific Salmon Treaty (PST). Puget Sound is currently comprised of five separate wild coho MUs and Interior Fraser is comprised of five separate Canadian Wild Salmon Policy conservation units (CU), but is managed as a single MU. To analyze the effects of lumping or splitting these component units, we examined three hypothetical management regimes for both Puget Sound and Interior Fraser River:

    1) Manage coho from each region as a single MU in all fisheries (i.e., all Puget Sound MUs would be lumped into a single MU),

    2) Manage each as five separate MUs in all fisheries (i.e., each Interior Fraser CU would be managed as a seperate MU), or

    3) Manage each as one aggregate MU to set PSC ceilings, but as five separate MUs in domestic fishery management processes.

We simulated these regimes under a range of abundance scenarios for each population within the MU, and projected the total harvestable numbers by using the Comprehensive Coho abundance breakpoints and exploitation rate (ER) ceilings for Puget Sound coho, and by using arbitrary breakpoints and ER ceilings for the Interior Fraser conservation units. We used the sharing formulae in the current PST Coho Annex to calculate the portion of each unit's ER that would have been harvested in each country and we also examined the management processes that would be required if the current MU configurations were changed. We drew the following general conclusions from these results:

- The current 5-MU configuration for Puget Sound coho can provide efficient management potential to achieve maximum sustainable harvest (MSH) on all populations, lower chance of under escaping weak populations, and is consistent with U.S. federal court orders. It is the preferred configuration.

- If Interior Fraser coho *can* be managed as five separate MUs (i.e., fisheries are able to target component CUs), it could result in similar management benefits as Puget Sound coho, but will require establishment of escapement objectives, harvest rates, and abundance breakpoints for the component stocks, as well as methods for measuring them.

- If fisheries can *not* separately target the five Interior Fraser coho populations effectively, then managing them as five MUs could result in under harvests of the more productive populations (and escapements above goals for these more productive populations). Managing them as one MU would be acceptable provided that diversity within the MU is maintained and care taken to ensure that weak CUs would not be over harvested and under escaped.

Introduction

The Pacific Salmon Treaty (PST) is a cooperative agreement for management of Pacific salmon by the governments of Canada and the United States. As such, the Treaty describes actions to be performed by the respective governments in order to "prevent overfishing and provide optimum production" of salmon stocks subject to the Treaty (PSC 2009; Article III). For example, the Conduct of Fisheries (Article IV) specifies the annual exchange of information between Parties and the Commission regarding the status of salmon stocks and fisheries. To implement the Treaty, each Party must enact and enforce necessary legislation and exchange fisheries statistics and other relevant information (e.g., catch, effort, and related data; Article XIV).

For coho salmon, the Treaty instructs the U.S. and Canada to develop an abundance-based management regime for Washington and Southern British Columbia fisheries. The primary feature of this regime is the establishment of management units (MUs) of naturally spawning coho populations defined by geographic area, upon which all management actions are focused (PST 2009, Annex IV, Chapter 5). Under the treaty, the status of MUs establishes annual allowable exploitation rate constraints.

The Treaty also instructs the joint Coho Technical Committee (CoTC) to consider the criteria and standards used by both Parties to identify management units to ensure they accomplish the goals of the Treaty without compromising benefits to either Party. The coho salmon MUs for Canada (southern British Columbia) and U.S. (Washington State) identified in the 2009 PST agreement are presented in Table 1.

Table 1. Coho salmon management units (PSC 2009).

Southern B.C. Management units	U.S. Management units
Interior Fraser (including Thompson)	Skagit
Lower Fraser	Stillaguamish
Strait of Georgia Mainland	Snohomish
Strait of Georgia Vancouver Island	Hood Canal
	Strait of Juan de Fuca
	Quillayute
	Hoh
	Queets
	Grays Harbor

The CoTC discussions regarding possible coho MUs have centered on the relative sizes of MUs in Canada and the U.S. In particular, MUs in Canada encompass much larger geographic areas and contain many more stocks than U.S. MUs, which often correspond to the boundaries of a single river basin. These discussions have focused on how MU size affects the ability of each Party to meet the primary goal of the Treaty to "prevent overfishing and provide optimum production."

This document summarizes discussions held within the CoTC regarding MU size. To substantiate these discussions, we also provide a quantitative example of how management will be impacted by exploring two hypothetical situations: 1) if both Puget Sound and the Upper Fraser are managed as a single MU, and 2) if both Puget Sound and the Upper Fraser are managed as five MUs. Based on the

discussions and the example, we identify factors that must be considered in any decisions on MU configurations under PST.

Management Unit Size and Fisheries Management

A MU is a group of fish that, in the aggregate, is managed for a particular escapement objective, whether expressed as a spawning escapement level or allowable exploitation rate. Because there is no logical reason to set a spawning escapement objective for a unit smaller than a single breeding population, the minimum feasible size of a MU is a single breeding population. However, for practical, logistical, economic, social, or legal reasons, MUs often contain more than one population.

As the number of populations included within a MU (i.e., the size of the management unit) changes, so does a variety of attributes associated with the MUs and its management. For example, smaller MUs will likely result in the ability to emphasize terminal (vs. mixed) fisheries, which would increase the maximum sustainable harvest, and in decreased within- but increased between-MU diversity. By contrast, larger MUs require fewer total numbers of indicator stocks and will likely have less expensive assessment programs and less complex management (because there are fewer indicator stocks) than a regime with many small MUs. These tradeoffs will be discussed in greater detail as they apply to the one vs. five MU examples.

One of the largest issues when considering MU size is whether management can respond to a particular MU configuration. Management operates at the scale of aggregate escapement and/or abundance, but if MUs are too small, constraining fishing impacts on individual MUs can become extremely complex. This situation is exacerbated when MUs consisting of highly productive populations are adjacent to (or share ocean distribution patterns with) MUs with less productive populations. Accordingly, MU size should be determined, in large part, by the ability to effectively manage for escapement at the MU scale.

Case Study: One vs. Five MUs for Puget Sound and Interior Fraser Coho

To examine the effect of MU size on harvest, escapement, and management processes under the PST, we created a case study using Puget Sound and Interior Fraser River coho management under two hypothetical configurations[1] for both Puget Sound and Interior Fraser coho: each as either one MU or as five MUs. Included in the case study were three management regimes (whether managed as 1 or 5 MUs for domestic and/or PST needs—see below) and three abundance scenarios (differing aggregate abundances and numbers of strong or weak stocks). These regimes and scenarios were designed to represent the range of possible conditions encountered by those managing coho salmon from the region. All runs employed existing rules/limitation on Exploitation Rates (ERs), breakpoints, and U.S.-Canada allocations. We estimated the U.S. and Canadian catch and escapement for component stocks under each management regime and abundance scenario, and compared it to target escapement and harvest under the Coho Annex (PST 2009, Annex IV, Ch. 5). Comparisons of harvest and escapement across runs allowed us to determine the strengths and weakness of each management system, and draw conclusions regarding costs and benefits of each MU configuration.

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[1] Note: These regimes are for illustrative purposes only, and do not imply any endorsement or proposal.

Methods

The case study considered two hypothetical configurations for both Puget Sound and Interior Fraser River coho salmon: 1) Manage each as a single MU, or 2) Manage each as five MUs[2]. It's also possible to manage for five MUs domestically, but to consider them to be one MU for PSC purposes (i.e., their aggregate abundance would determine the PSC interceptions ceiling, but they would still be managed domestically for five separate escapement goals). Thus, we examined three types of management regimes[3]:

> The 5 MU Regime: Manage each as five MUs for both PSC and domestic management (this is the current regime for Puget Sound coho);

> The 1 MU Regime: Manage each as one MU for both PSC and domestic management (this is the current regime for Interior Fraser); and

> The 1-To-5 MU Regime: Manage each as one (aggregate abundance) MU to set PSC ceilings, but as five MUs for domestic management. The ER on the aggregate must achieve the PSC ceiling for the aggregate.

For Canadian domestic management, we analyzed the 5 MU and 1-To-5 MU Regimes (manage domestically for 5 MUs) under two different assumptions:

> 1) that Canada *can* target individual Interior Fraser populations separately; or

> 2) that Canada *can not* target individual populations separately (i.e., the Canadian ER is the same on all Interior Fraser populations), and the Canadian ER must therefore be set at the ER applicable to the weakest population.

To realistically analyze exploitation rates and escapements under these three regimes, we set the ER ceilings for intercepting fisheries according to the formulae in the 2002 PSC Coho Agreement[4] (Table 2). The total ER ceilings for Puget Sound MUs were the Comprehensive Coho ceilings[5]. The total ER ceilings for Interior Fraser were entirely arbitrary, and are for example purposes only.

The abundance breakpoints for the Puget Sound aggregate MU (under the 1 MU and 1-To-5 MU Regimes) were the sums of the breakpoints of each of the five Puget Sound MUs, and the Puget Sound aggregate's total ceiling ER at each abundance level was calculated as the complement of the sum of escapement breakpoints divided by the sum of recruitment breakpoints (Table 3). The escapement breakpoints for the Interior Fraser populations were set to total 50,000 at the Low/Moderate breakpoint, and 100,000 at the Moderate/Abundant breakpoint, and the corresponding ER ceilings for Interior Fraser were varied to illustrate the effects of different productivities between populations, and were calculated the same way as for the Puget Sound MUs (Table 3).

In calculating harvests and escapements, it was assumed that the intercepting party's fisheries have the same ER on all five intercepted populations. Similarly, when managing domestically for one

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[2] For this exercise, we defined the five Interior Fraser MUs as: Lower Thompson/Nicola, North Thompson, South Thompson, Fraser Canyon, and Upper Fraser.
[3] There is a fourth combination – manage as five MUs for PSC management, and as one MU for domestic management -- but that combination is illogical, and was not included in this analysis.
[4] Although, to simplify the analysis, we used only the Normal Low and Normal Moderate ERs for MUs at Low or Moderate status.
[5] Available in Terminal Area Management Module (TAMM), spreadsheet Coho 0824.xls, Washington Dep. Fish and Wildlife and Puget Sound Indian Tribes.

aggregate MU (1 MU Regime), it was assumed that the domestic ER was the same on all five populations.

We examined these regimes under three different abundance scenarios:

> Scenario 1: 1 strong population and 4 weak populations (either "Low" or "Moderate" abundance), with an aggregate abundance of "Abundant";

> Scenario 2: 4 strong populations and 1 weak population, with an aggregate abundance of "Abundant"; and

> Scenario 3: 1 strong population and 4 weak populations (either "Low" or "Moderate" abundance), with an aggregate abundance of "Low".

To simulate the effects of these regimes and scenarios, we built a simple spreadsheet with the appropriate abundance and ER rates for each regime/scenario and determined the harvest that would be taken in each country's fisheries under the rules in the Coho Annex as described above.

To examine the effect of MU size on management processes, we started with a simple management process:

> Preseason
> 1. Forecast run size
> 2. Determine abundance category (Llow, Moderate, Abundant)
> 3. Set harvest rates and allocation strategy

> Mid season
> 4. Monitor harvest & escapement, adjust harvest as appropriate

> Post season
> 5. Determine harvest and escapement
> 6. Revise rules (reference points, harvest rates) as needed

We then considered how this management regime would influence harvest and escapement under the two configurations: one MU each in Puget Sound and Interior Fraser, and five MUs each in Puget Sound and Interior Fraser.

Results and Discussion

Harvest and Escapement

Resulting harvest and escapement from the simulations using the three abundance scenarios are shown in Figures 1-2 (Abundance Scenario 1), Figures 3-4 (Abundance Scenario 2), and Figures 5-6 (Abundance Scenario 3); the data is provided in Appendix Tables 1-6. Primary conclusions that can be drawn from these results are:

The 5 MU Regime (5 MUs for both PSC and domestic purposes)

- Least likely to allow under-escapement to separate river systems, and most likely to result in recovery of depressed MUs to Abundant levels, provided that management error in terminal fisheries is no greater than management error in mixed-stock fisheries.

- Allows harvests targeted on productive populations. Maximizes total harvest, if harvests can be directed at separate MUs.

- When the MUs have different allowable total ERs, the intercepting country will not harvest its full share of the more productive MUs.

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- If Canada's domestic management cannot target individual Interior Fraser populations, managing for five MUs will significantly under-harvest the more productive MUs. Even if harvests can be targeted at the more productive MUs, by restricting harvest to locations or times that protect the weakest MU, this harvest may be limited to shortly before spawning.

Summary: This regime has a higher ability to achieve MSH on all populations, a lower chance of under-escaping weak populations, and a lower ability for the intercepting nation to achieve its allowable harvest of each MU.

The 1 MU Regime (1 MU for both PSC and domestic purposes):

- When the aggregate allowable total ER is *greater* than the ER applicable to a river system, both countries will over-harvest their shares of that river system.

- Most likely to allow under-escapement to separate river systems, and consequent loss of future production, especially when the aggregate abundance status is higher than the status of one or more separate river systems (Scenarios 1 and 2).

- When the aggregate allowable total ER is *less* than the ER applicable to a river system, both countries will under-harvest their shares of that river system.

- In situations where the aggregate abundance status is *less* than that of a separate river system (see Scenario 3), the 1 MU Regime is actually the most *conservative* strategy, and can cause significant over-escapement (and under-harvest) in the more productive river system(s). If the spawner-recruit relation follows a hockey-stick or Beverton-Holt curve, however, this will not result in loss of future production (but if it follows a Ricker curve, over-escapement might cause a loss of future production).

Summary: This regime is most likely to result in population under-escapements. Depending on the aggregate abundance, it allows either mutual over-harvests or mutual under-harvests of individual populations by each country.

The 1-To-5 MU Regime (1 MU for PSC and 5 MUs domestically):

- Managing Puget Sound coho under this regime runs the risk of over-harvesting one or more MUs in Canadian fisheries alone, because Canadian ERs could be around 25%, while the total ER ceiling for MUs at Low abundance is only 20%. This circumstance would require closures of all U.S. fisheries that harvest the Low abundance MUs, and escapements would still be less than the Low threshold.

- The consequence of this circumstance would be increased risk of chronic Low status for the over-harvested MU(s), with resulting long-term loss of future production.

- To avoid this circumstance, Canadian ERs at the Abundant level would have to be reduced from the levels allowed in the current Coho Agreement to or below the Low abundance ceiling for U.S. stocks.

- For Interior Fraser coho, this regime would not cause quite as dire of results for Canadian fisheries, because the maximum U.S. ER is 15% at the Abundant level, which is less than the total Low abundance ceiling of 20%.

- When the aggregate allowable total ER is *greater* than the ER applicable to a river system, the intercepting country will over-harvest its share of the less productive MUs, and the producing

country will under-harvest its share of those MUs. This could eliminate terminal harvest in some areas.

- When the aggregate allowable total ER is *less* than the ER applicable to a river system, the country of origin may not be able to harvest the surplus available in that river system, without exceeding the aggregate allowable total ER.

Summary: This regime is most likely to constrain the country of origin. Under current allowable ERs, this could eliminate U.S. fisheries. The risk of stock over harvest and resulting under escapement is intermediate between one MU and five MU regimes.

Management Process

Application of the management framework to the two configurations (one or five MUs) is described in Table 4. As envisioned, the largest difference between the two configurations is the amount of variability between populations that make up each MU, and how this variability is dealt with by managers. In the first configuration (one MU for Puget Sound and one for Interior Fraser), it is expected that the populations within the MU will vary in productivity, requiring less complexity when determining forecasted abundance and categories of abundance (because only one value is needed) than in the second configuration (five MUs for both Puget Sound and Interior Fraser).

In general, the 5-MU configuration requires more technical detail than the 1-MU configuration (Table 4). However, because U.S. federal court orders that resulted from the U.S. vs. Washington ruling specify the allocation units in Puget Sound, and require that harvestable fish be made available on an allocation unit basis to place-oriented terminal area tribal fisheries, a 1-MU Regime applied domestically within Puget Sound (which ignores those allocation requirements), would violate those court orders.

The requirements for monitoring and evaluations also vary under the two configurations, again reflecting expectations for differences in within-MU variability between the two configurations (Table 4). In the first configurations (1 MU), the focus of PST monitoring is on the overall aggregate of populations within the MU, to ensure that harvest and escapement were appropriate over the aggregate. Less attention can be paid to individual stocks, although domestic harvest specifically targeting these populations will require monitoring. By contrast, the second configuration (five MUs) requires monitoring of each primary river system or sub-region, because each represents a MU. At present, Canada has not defined escapement objectives, harvest rates, or abundance breakpoints for individual Interior Fraser River stocks; these metrics must be developed before each stock can be managed as a separate MU.

If status quo is maintained and stocks continue to be managed using the existing management unit structure, the results will be a mixture of the modeling reported here. The single Canadian Interior Fraser River MU will run the risk of having weak stocks overharvested while both parties will lack the ability to harvest strong stocks within the MU. The five Puget Sound MUs will each experience more appropriate exploitation rates, at a higher cost for monitoring and management. With an ability to emphasize terminal fisheries, benefits of high abundance of individual MUs will likely accrue to the US.

Conclusions

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The CoTC provides the following conclusions regarding the configurations examined in this analysis for Puget Sound and Interior Fraser coho under PST:

- The current 5-MU configuration for Puget Sound coho can provide efficient management potential to achieve maximum sustainable harvest (MSH) on all populations, lower chance of under escaping weak populations, and is consistent with U.S. federal court orders. It is the preferred configuration.

- If Interior Fraser coho *can* be managed as five separate MUs (i.e., fisheries are able to target component stocks), it could provide efficient management potential to achieve MSH on all populations and can lower the chance of under-escaping weak populations. This configuration requires the establishment of escapement objectives, harvest rates, and abundance breakpoints for the component stocks, as well as methods for measuring them.
- If fisheries can *not* separately target the five Interior Fraser coho populations effectively, then managing them as five MUs could result in underharvests of the more productive populations, but conversely increase escapement to terminal areas. This *status quo* situation also risks overharvesting weak IFC stocks within the MU.

References

Pacific Salmon Commission (PSC). 2009. Treaty between the Government of Canada and the Government of the United States of American concerning Pacific salmon. Updated 27 January 2009. Available from www.psc.org.

Table 2. Exploitation rate ceilings for Puget Sound and Interior Fraser coho used in the case study. Values in **_bold italics_** are made up, for example purposes only.

Puget Sound Stocks

MU Status	Fishery	Strait of Juan de Fuca	Hood Canal	Skagit	Stillaguamish	Snohomish	Puget Sound Aggregate
Low	Total	0.20	0.20	0.20	0.20	0.20	0.20
	Canadian	0.11	0.11	0.11	0.11	0.11	0.11
Moderate	Total	0.40	0.45	0.35	0.35	0.40	0.39
	Canadian	0.18	0.21	0.17	0.17	0.18	0.17
Abundant	Total	0.60	0.65	0.60	0.50	0.60	0.60
	Canadian	0.25	0.27	0.25	0.22	0.25	0.25

Interior Fraser Stocks

MU Status	Fishery	Lower Thompson	North Thompson	South Thompson	Fraser Canyon	Upper Fraser	Interior Fraser Aggregate
Low	Total	0.20	0.20	0.20	0.20	0.20	0.20
	U.S.	0.10	0.10	0.10	0.10	0.10	0.10
Moderate	Total	**_0.30_**	**_0.35_**	**_0.40_**	**_0.30_**	**_0.40_**	0.35
	U.S.	0.12	0.12	0.12	0.12	0.12	0.12
Abundant	Total	**_0.55_**	**_0.60_**	**_0.65_**	**_0.55_**	**_0.65_**	0.61
	U.S.	0.15	0.15	0.15	0.15	0.15	0.15

Table 3. Abundance breakpoints for Puget Sound and Interior Fraser coho used in the case study. Values in **_bold italics_** are made up, for example purposes only.

Puget Sound Stocks

Breakpoint	Quantity	Strait of Juan de Fuca	Hood Canal	Skagit	Stillaguamish	Snohomish	Puget Sound Aggregate
Low/Moderate	Escapement	7,000	10,750	16,000	6,100	31,000	70,850
	Recruitment	11,667	19,545	24,615	9,385	51,667	116,879
Moderate /Abundant	Escapement	11,000	14,350	25,000	10,000	50,000	110,350
	Recruitment	27,500	41,000	62,500	20,000	125,000	276,000

Interior Fraser Stocks

Breakpoint	Quantity	Lower Thompson	North Thompson	South Thompson	Fraser Canyon	Upper Fraser	Interior Fraser Aggregate
Low/Moderate	Escapement	**_10,000_**	**_10,000_**	**_10,000_**	**_10,000_**	**_10,000_**	50,000
	Recruitment	14,286	15,385	16,667	14,286	16,667	77,289
Moderate /Abundant	Escapement	**_20,000_**	**_20,000_**	**_20,000_**	**_20,000_**	**_20,000_**	100,000
	Recruitment	44,444	50,000	57,143	44,444	57,143	253,175

Table 4. The effect of two management unit (MU) configurations on management processes: either Interior Fraser and Puget Sound each consist of one MU, or each consist of five MUs. The 1 MU Regime applies both internationally and domestically; the 5 MU regimes apply domestically, and may or may not apply internationally.

|	Regime	
Domestic Management	1 MU in Interior Fraser 1 MU in Puget Sound	5 MUs in Interior Fraser 5 MUs in Puget Sound
Adoption of Regime	Puget Sound configuration violates existing federal court orders. Court orders would have to be changed before PSC could consider adoption of regime. Regime would require bilateral agreement on abundance breakpoints and ERs for both MUs.	Canada must develop escapement objectives for each Interior Fraser MU. To apply internationally would require bilateral agreement on Interior Fraser abundance breakpoints and ERs.
Number of Indicator Stocks needed	At least one per MU (minimum 1 in Canada, 1 in U.S.)	At least one per MU (minimum 5 in Canada, 5 in U.S.)
Preseason		
1. Forecast run size	Consider forecasted abundance of aggregate run. Need not forecast the run size of each population. *- many populations per MU*	Consider forecasted abundance of a greater number of units. *- fewer populations per MU*
2. Determine abundance category (low, medium, abundant)	Determine MU abundance category for each aggregate using prescribed methods. Need not consider abundance of separate populations, unless there's a domestic management constraint that restricts domestic fisheries if an individual population has an abundance below a critical level. *- only one aggregate abundance to consider.*	Determine MU abundance category for each MU separately using prescribed methods. Assesses fewer number of populations for each MU, so abundance category better reflects MU abundance (less variability). *- five abundances to consider*
3. Set harvest rates and allocation strategy	Prescribed by treaty formulae, but Interior Fraser breakpoints are still needed, and new rates must be set and agreed to for Puget Sound. Even if within-MU productivity is diverse, ERs on weak stocks can be just as high, or higher, than ERs on strong stocks. *- Emphasis on mixed-stock fisheries*	Prescribed by treaty for Puget Sound, but new rates must be set and agreed to for Interior Fraser. Terminal fisheries emphasized in order to harvest productive target MUs without impacting adjacent weak MUs. If terminal fisheries are not available, then there may be problems catching the full harvestable surplus. *- Emphasis on terminal fisheries*

Table 4 (Cont.)

Mid season		
4. Monitor harvest & escapement, adjust harvest as appropriate	Harvest and escapement monitoring focused on aggregate of populations. PST harvest impacts can be greater than under 5 MU Regime. Less emphasis on gathering catch data by subarea in-season. *- Opportunity for domestic harvest may be either higher or lower than under 5 MU Regime, depending on level of foreign interceptions.*	Escapement monitoring focused on weakest population. More opportunity for significant domestic harvest because PST harvest tied more directly to population status. *- Opportunity for more domestic harvest in terminal areas of more productive MUs, but potentially less terminal harvest than under 1 MU Regime in less productive terminal areas.*
Post season		
5. Determine harvest and escapement	Focus on aggregate of populations. Ensure non-PST exploitation appropriate for aggregate of populations. Few indicators required to characterize many populations. *- Monitoring focused on aggregate of populations, and, if domestic management requires, single populations with critically low escapements.*	Focus on all 5 MUs. Ensure harvest not impacting adjacent MUs. Many indicators required to characterize many populations. *- Monitoring focused on 5 separate MUs, and, if domestic management requires, single populations with critically low escapements*
6. Revise rules (categories, harvest rates) as needed	Set ERs to ensure that region as a whole receives adequate escapement *- Focus on aggregate abundance across region*	Ensure weakest system receives adequate escapement *- Focus on all river systems*

Puget Sound MUs

Abundance Scenario 1: Aggregate 'Abundant', 1 strong and 4 weak stocks
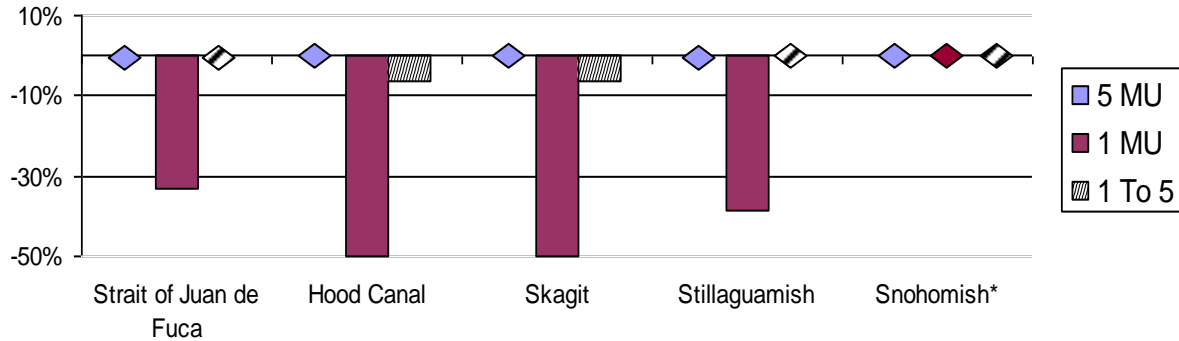
Escapement

Canadian Catch
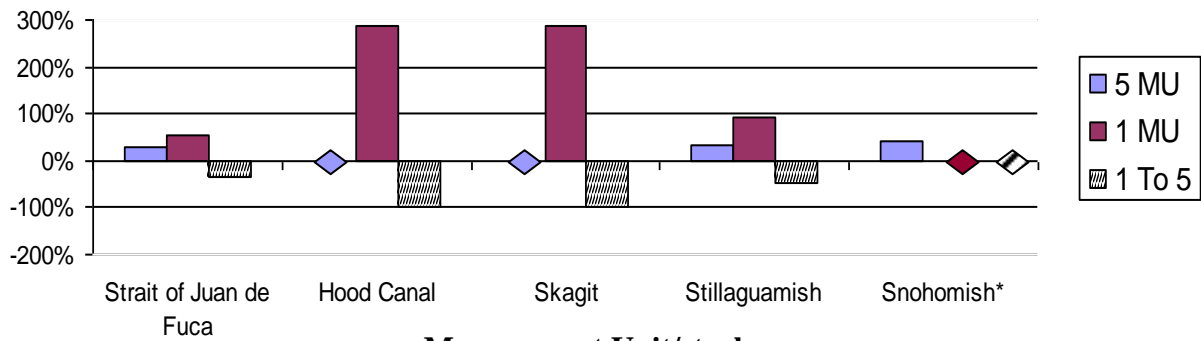
U.S. Catch

Management Unit/stock

Figure 1. Escapement (top) and Canadian (middle) and U.S. catch (bottom) for Puget Sound management units (MUs), under Abundance Scenario 1 (the sole strong MU [Snohomish] is indicated by an asterisk), managed under the three scenarios: as five separate MUs (5 MU), as 1 MU (1 MU), or as five MUs for domestic fisheries and one for PST fisheries (1 To 5). Escapement and catch are given as percent of target (Annex) values. Diamonds indicate zero values. The abundance categories for each MU or stock were: Strait of Juan de Fuca: moderate; Hood Canal: low; Skagit: low; Stillaguamish: moderate; Snohomish: abundant.
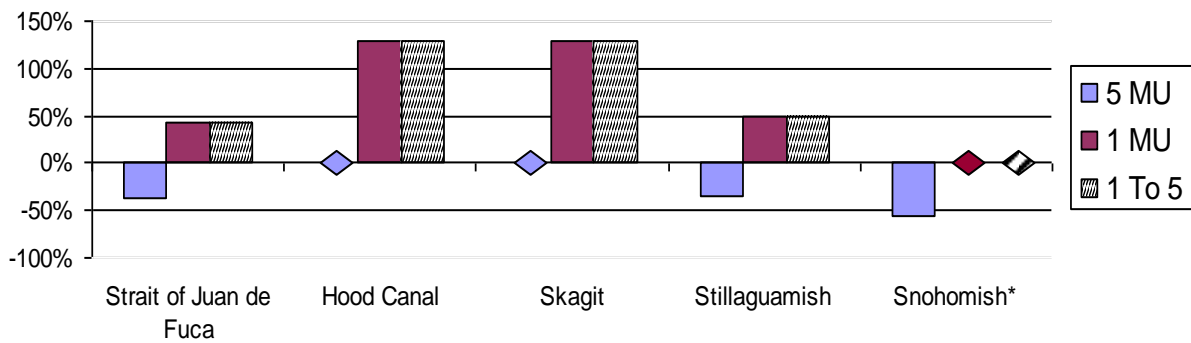
Interior Fraser MUs

*Abundance Scenario 1: Aggregate 'Abundant', 1 strong and 4 weak stocks*

Escapement

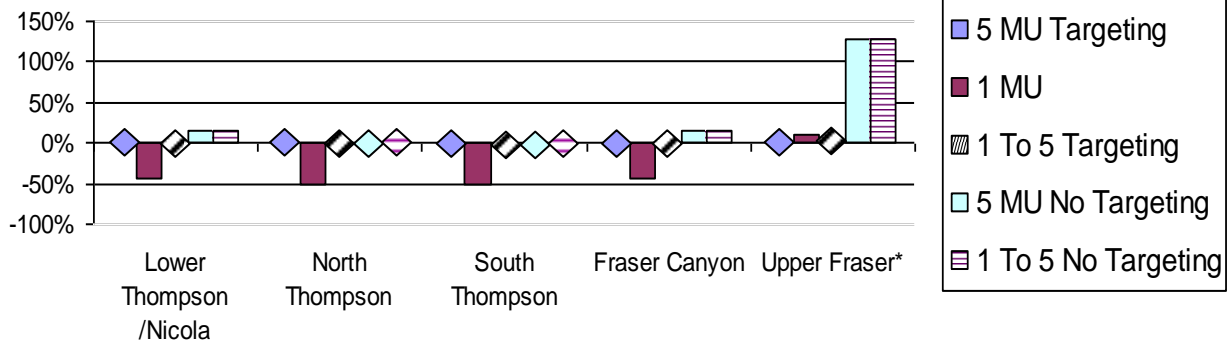

Canadian Catch
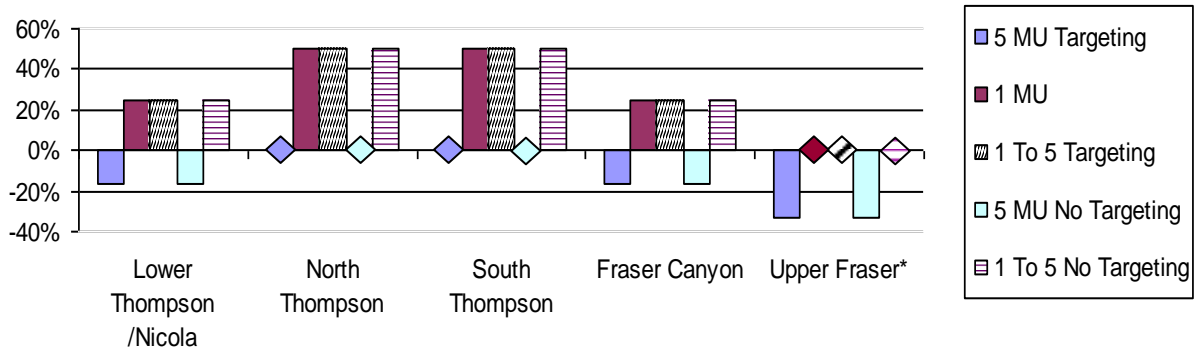
U.S. Catch

Management Unit/Stock

Figure 2. Escapement (top) and Canadian (middle) and U.S. catch (bottom) for Interior Fraser management units (MUs), under Abundance Scenario 1 (the sole strong MU [Upper Fraser] is indicated by an asterisk), managed under the three scenarios: as five separate MUs (5 MU), as 1 MU (1 MU), or as five MUs for domestic fisheries and one for PST fisheries (1 To 5). Also included are results when each MU can either be individually targeted or not targeted. Escapement and catch are given as percent of target (Annex) values. Diamonds indicate zero values. The abundance categories for each MU or population were: Lower Thompson/Nicola: moderate; North Thompson: low; South Thompson: low; Fraser Canyon: moderate; Upper Fraser: abundant.

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Puget Sound MUs

Abundance Scenario 2: Aggregate 'Abundant', 4 strong and 1 weak stocks

Escapement

Canadian Catch

U.S. Catch

Figure 3. Escapement (top) and Canadian (middle) and U.S. catch (bottom) for Puget Sound management units (MUs), under Abundance Scenario 2 (four strong MUs are indicated by asterisks), managed under the three scenarios: as five separate MUs (5 MU), as 1 MU (1 MU), or as five MUs for domestic fisheries and one for PST fisheries (1 To 5). Escapement and catch are given as percent of target (Annex) values. Diamonds indicate zero values. The abundance categories used in the run for each MU or stock was "abundant" except Snohomish, which was "low."
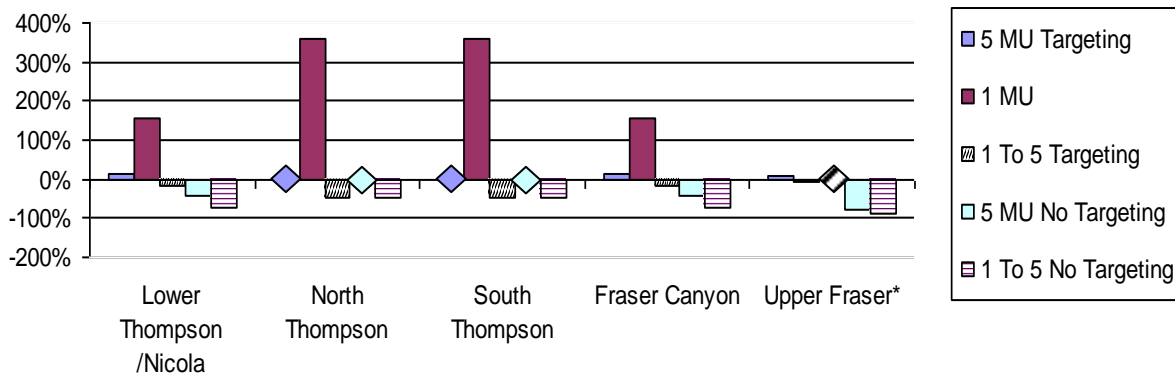
Interior Fraser MUs

Abundance Scenario 2: Aggregate 'Abundant', 4 strong and 1 weak stocks

Escapement
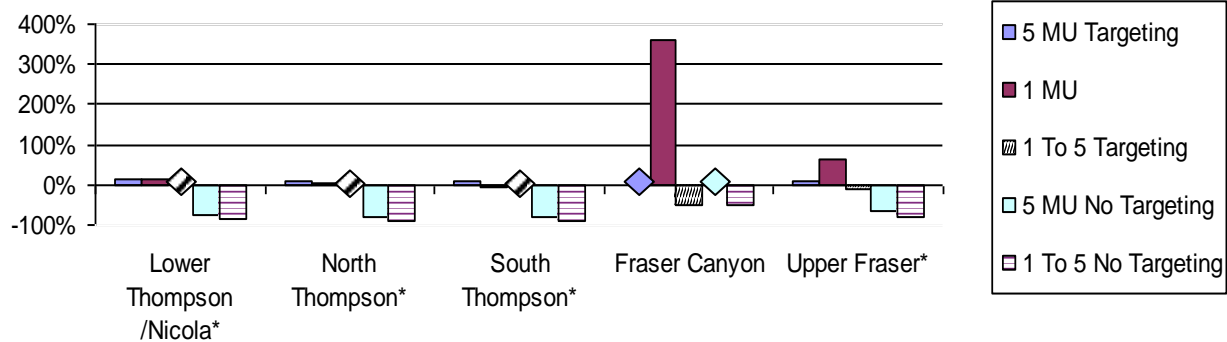
Canadian Catch
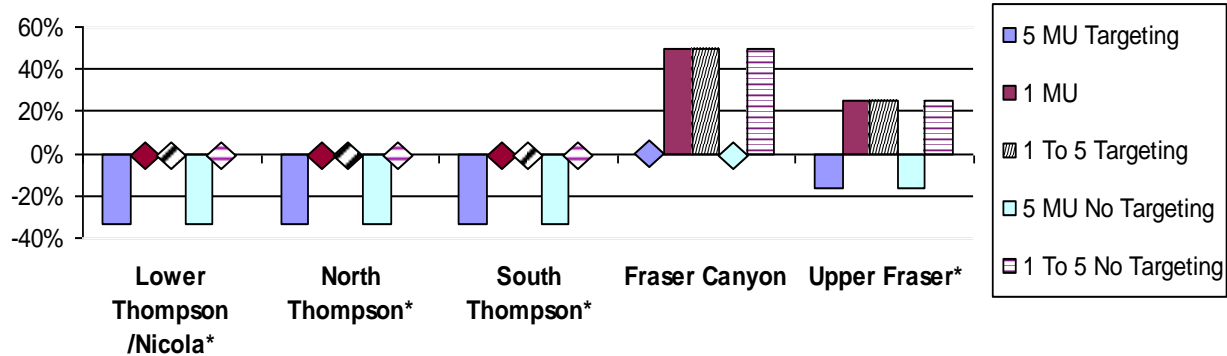
U.S. Catch

Management Unit/Stock

Figure 4. Escapement (top) and Canadian (middle) and U.S. catch (bottom) for Interior Fraser management units (MUs), under Abundance Scenario 2 (4 strong MUs are indicated by asterisks), managed under the three scenarios: as five separate MUs (5 MU), as 1 MU (1 MU), or as five MUs for domestic fisheries and one for PST fisheries (1 To 5). Also included are results when each MU can either be individually targeted or not targeted. Escapement and catch are given as percent of target (Annex) values. Diamonds indicate zero values. The abundance categories for each MU or stock were "abundant" except Fraser Canyon, which was "low."

Puget Sound MUs

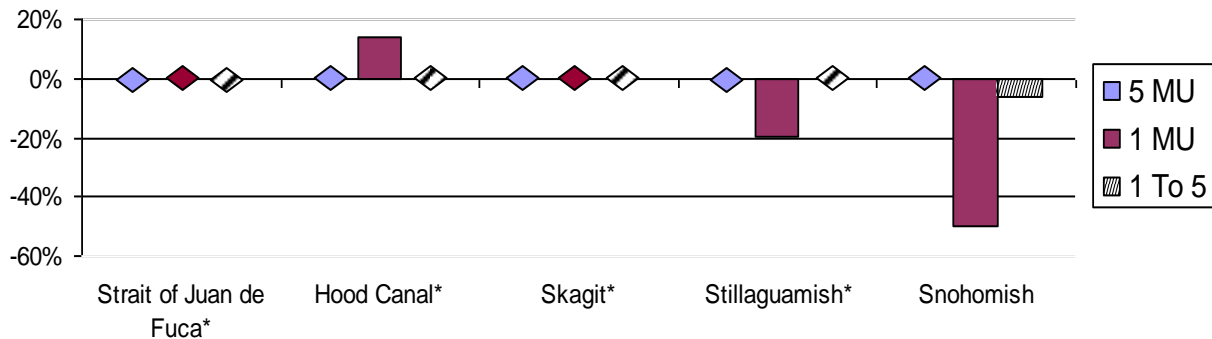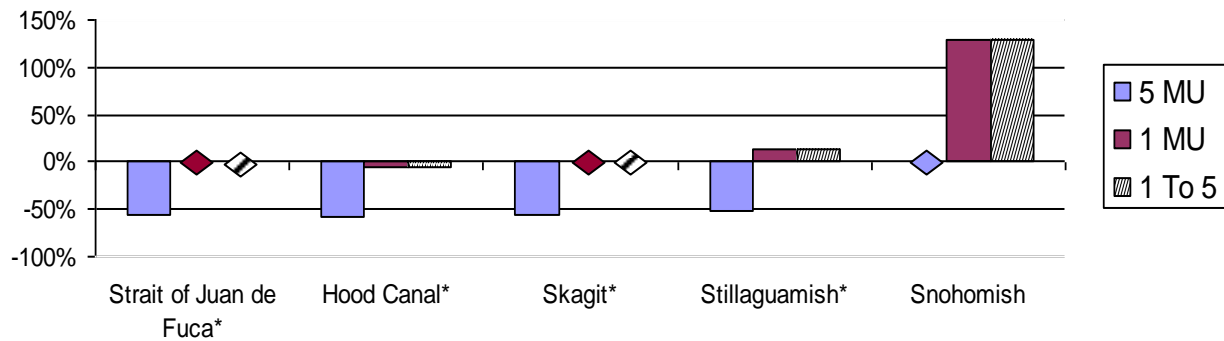*Abundance Scenario 3: Aggregate 'Low', 1 strong and 4 weak stocks*
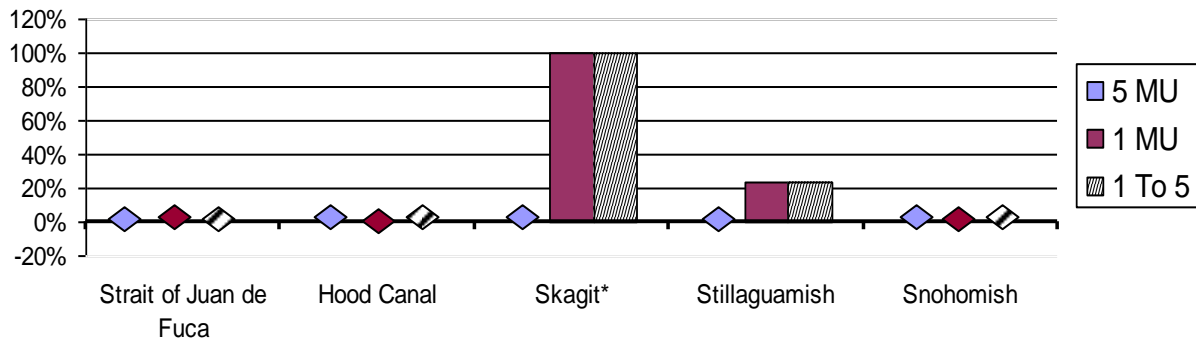
Escapement
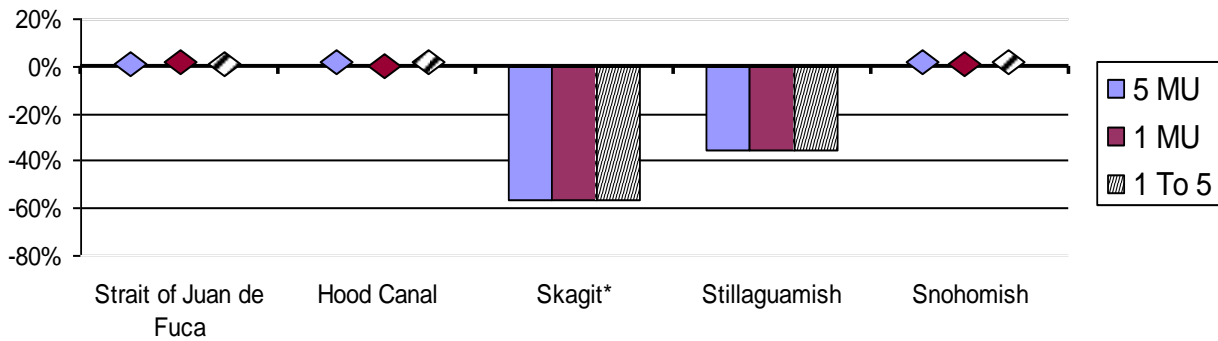
Canadian Catch
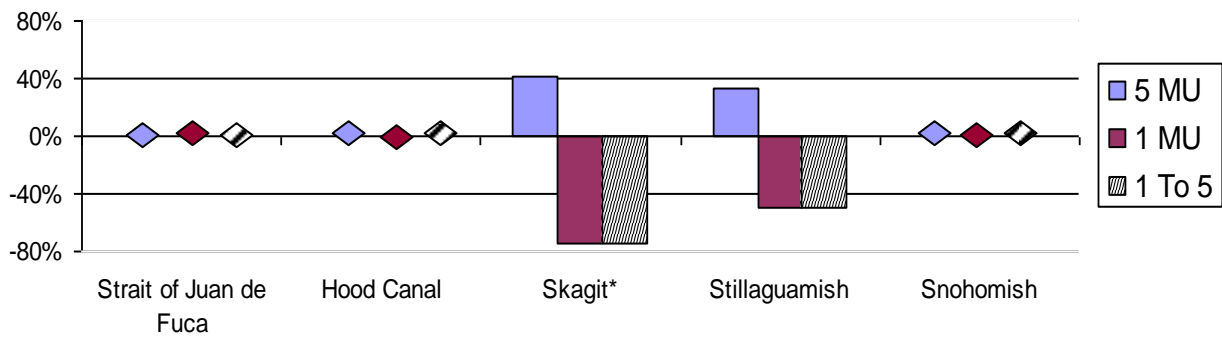
U.S. Catch

Management Unit/stock

Figure 5. Escapement (top) and Canadian (middle) and U.S. catch (bottom) for Puget Sound management units (MUs), under Abundance Scenario 3 (the sole strong MU [Skagit] is indicated by an asterisk), managed under the three scenarios: as five separate MUs (5 MU), as 1 MU ()1 MU), or as five MUs for domestic fisheries and one for PST fisheries (1 To 5). Escapement and catch are given as percent of target (Annex) values. Diamonds indicate zero values. The abundance categories for each MU or stock were: Strait of Juan de Fuca: low; Hood Canal: low; Skagit: abundant; Stillaguamish: moderate; Snohomish: low.

Interior Fraser MUs

Abundance Scenario 3: Aggregate 'Low', 1 strong and 4 weak stocks
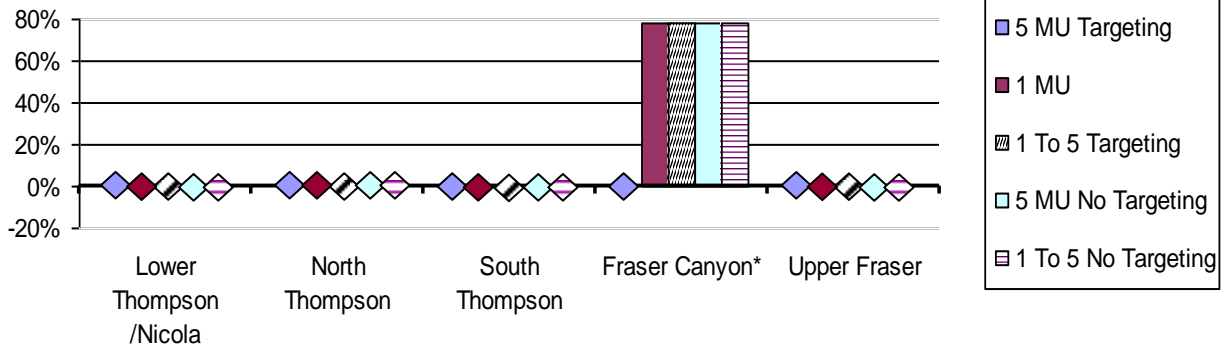
Escapement
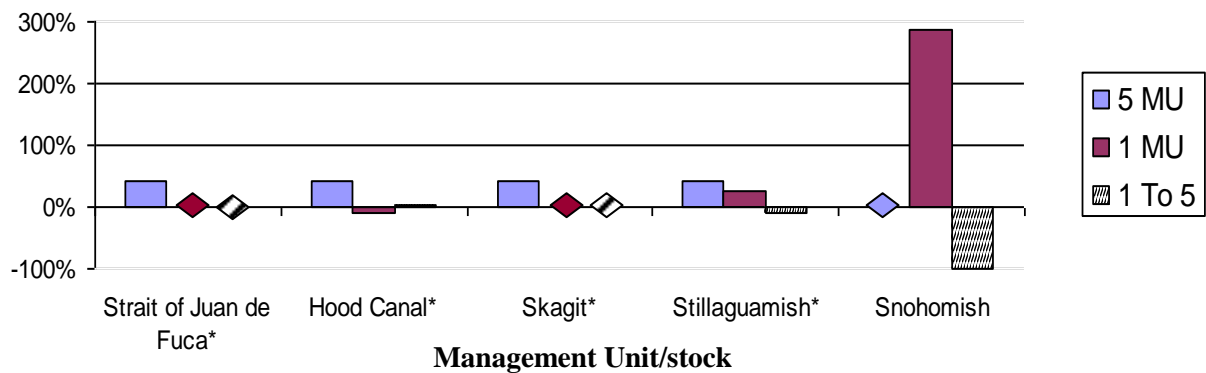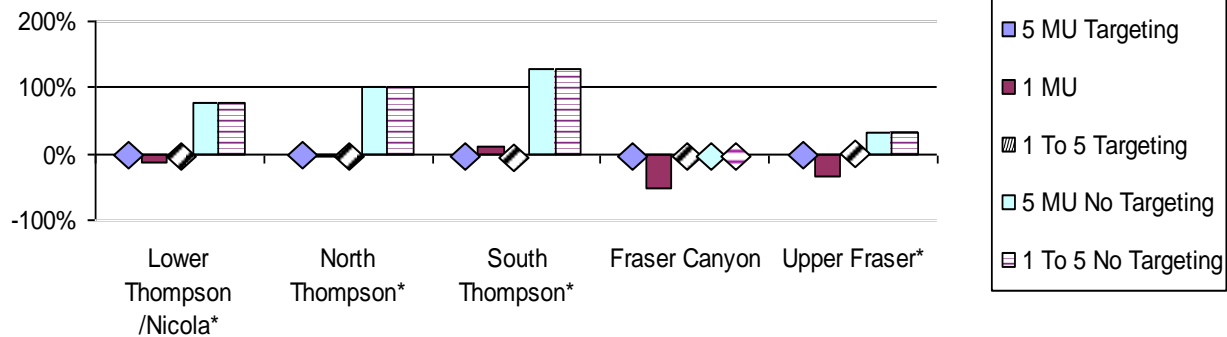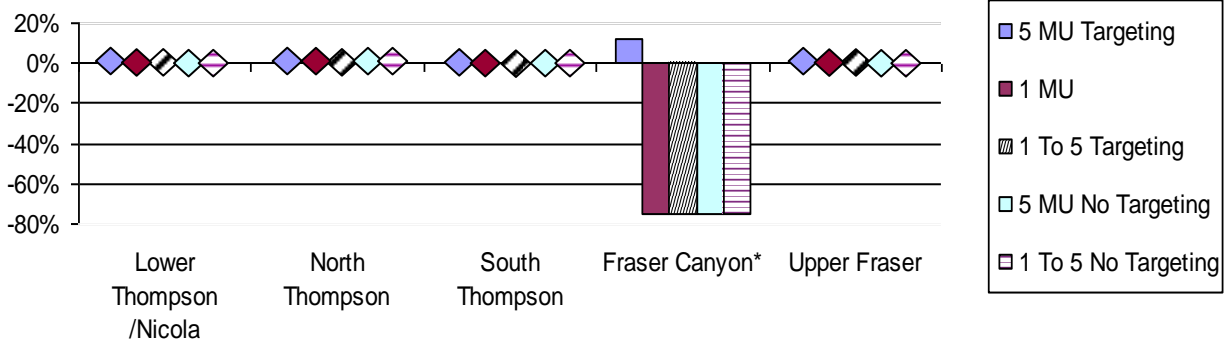

Canadian Catch
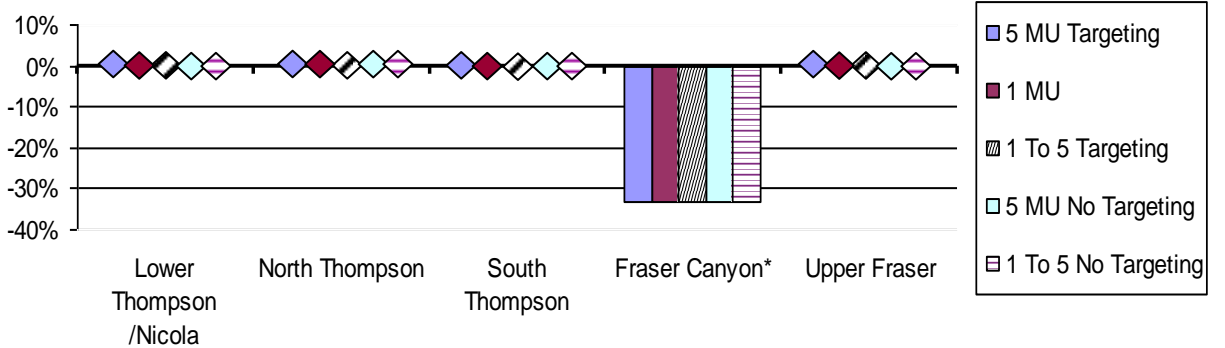
U.S. Catch

Management Unit/Stock

Figure 6. Escapement (top) and Canadian (middle) and U.S. catch (bottom) for Interior Fraser management units (MUs), under Abundance Scenario 3 (the sole strong MU [Fraser Canyon] is indicated by an asterisk), managed under the three scenarios: as five separate MUs (5 MU), as 1 MU (1 MU), or as five MUs for domestic fisheries and one for PST fisheries (1 To 5). Also included are results when each MU can either be individually targeted or not targeted. Escapement and catch are given as percent of target (Annex) values. Diamonds indicate zero values. The abundance categories for each MU or stock were "low," except Fraser Canyon, which was "abundant."

Appendix Table 1. Harvests and escapements of Puget Sound coho under different MU size regimes under Abundance Scenario 1 (1 strong population [Skagit] and 4 weak populations, with an aggregate abundance of "Abundant").

|	Strait of Juan de Fuca	Hood Canal	Skagit	Stillaguamish	Snohomish	Sum of Puget Sound
Management Scenarios						
Key Assumption: Canadian Fisheries have the same ER on all populations.						
Scenario 1 -- 1 Strong Population & 4 Weak (Aggregate is "Abundant")						
Recruitment	15000	15000	15000	15000	300000	360,000
Population-appropriate ER	0.40	0.20	0.20	0.35	0.60	0.60
Canadian ER (per Annex formula)	0.176	0.11	0.11	0.1695	0.252	
Remaining U.S. ER	0.224	0.09	0.09	0.1805	0.348	
Population-appropriate Catch	6000	3000	3000	5250	180000	197,250
Canadian Catch at formula in Annex	2640	1650	1650	2542.5	75600	84,083
Remaining U.S. Catch	3360	1350	1350	2707.5	104400	113,168
Population-appropriate Escapement	9000	12000	12000	9750	120000	162,750
5 MU Regime: 5 MUs for Both PSC & Domestic (Current Annex)						
Allowable Total ER	0.40	0.20	0.20	0.35	0.60	
Population-Specific Canadian ER	0.176	0.11	0.11	0.1695	0.252	
Applicable Canadian ER (Minimum ER)	0.11	0.11	0.11	0.11	0.11	
Remaining US ER	0.29	0.09	0.09	0.24	0.49	
Catch	6000	3000	3000	5250	180000	197,250
Canadian Catch vs. Annex Formula Catch (Difference)	-990	0	0	-892.5	-42600	-44,483
U.S. Catch vs. Annex Formula (Difference)	990	0	0	892.5	42600	44,483
Escapement	9000	12000	12000	9750	120000	162,750
Overharvest/Underescapement of Population	0	0	0	0	0	0
1 MU Regime: 1 MU for Both PSC & Domestic -- Assume NO TARGETING on individual populations:						
Allowable Total ER	0.60	0.60	0.60	0.60	0.60	0.60
Canadian ER	0.252	0.252	0.252	0.252	0.252	0.252
Remaining US ER	0.348	0.348	0.348	0.348	0.348	0.348
Catch	9000	9000	9000	9000	180000	216,000
Canadian Catch vs. Annex Formula Catch (Difference)	1140	2130	2130	1237.5	0	6,638
U.S. Catch vs. Annex Formula (Difference)	1860	3870	3870	2512.5	0	12,113
Escapement	6000	6000	6000	6000	120000	144,000
Overharvest/Underescapement of Population	-3000	-6000	-6000	-3750	0	-18,750
1-To-5 MU Regime: 1 MU for PSC; 5 MUs Domestic						
Allowable Total ER	0.40	0.20	0.20	0.35	0.60	0.60
Canadian ER	0.252	0.252	0.252	0.252	0.252	0.252
Remaining US ER	0.148	-0.052*	-0.052*	0.098	0.348	0.348
Catch	6000	3780	3780	5250	180000	198,810
Canadian Catch vs. Annex Formula Catch (Difference)	1140	2130	2130	1237.5	0	6,638
U.S. Catch vs. Annex Formula (Difference)	-1140	-1350	-1350	-1237.5	0	-5,078
Escapement	9000	11220	11220	9750	120000	161,190
Overharvest/Underescapement of Population	0	-780	-780	0	0	-1,560

*US ER is less than 0: No SUS fishing!

Appendix Table 2. Harvests and escapements of Interior Fraser coho under different MU size regimes under Abundance Scenario 1 (1 strong population [Upper Fraser] and 4 weak populations, with an aggregate abundance of "Abundant"). Guidelines shown here are made up for example purposes only.

	L Thompson /Nicola	North Thompson	South Thompson	Fraser Canyon	Upper Fraser	Sum of Interior Fraser
Management Scenarios						
Key Assumption: U.S. Fisheries have the same ER on all populations.						
Assumptions about targeting abilities of Canadian fisheries specified below.						
Scenario 1 -- 1 Strong Population & 4 Weak (Aggregate is "Abundant")						
Recruitment	15000	15000	15000	15000	300000	360,000
Population-appropriate ER	0.30	0.20	0.20	0.30	0.65	0.61
U.S. ER (per Annex formula)	0.12	0.10	0.10	0.12	0.15	
Remaining Canadian ER	0.18	0.10	0.10	0.18	0.50	
Population-appropriate Catch	4500	3000	3000	4500	195000	210,000
U.S. Catch at formula in Annex	1800	1500	1500	1800	45000	51,600
Remaining Canadian Catch	2700	1500	1500	2700	150000	158,400
Population-appropriate Escapement	10500	12000	12000	10500	105000	150,000
5 MU Regime: 5 MUs for Both PSC & Domestic						
Allowable Total ER	0.30	0.20	0.20	0.30	0.65	
Population-Specific U.S. ER	0.12	0.10	0.10	0.12	0.15	
Applicable U.S. ER (Minimum ER)	0.10	0.10	0.10	0.10	0.10	
Remaining Canadian ER	0.20	0.10	0.10	0.20	0.55	
Assume Canada CAN target individual populations in terminal fisheries:						
Applicable Canadian ER	0.20	0.10	0.10	0.20	0.55	
Catch	4500	3000	3000	4500	195000	210,000
U.S. Catch vs. Annex Formula Catch (Diff)	-300	0	0	-300	-15000	-15,600
Canadian Catch vs. Annex Formula (Diff)	300	0	0	300	15000	15,600
Escapement	10500	12000	12000	10500	105000	150,000
Overharvest/Underescapement of Population	0	0	0	0	0	0
Assume Canada CANNOT target individual populations:						
Applicable Canadian ER	0.10	0.10	0.10	0.10	0.10	
Catch	3000	3000	3000	3000	60000	72,000
U.S. Catch vs. Annex Formula Catch (Diff)	-300	0	0	-300	-15000	-15,600
Canadian Catch vs. Annex Formula (Diff)	-1200	0	0	-1200	-120000	-122,400
Escapement	12000	12000	12000	12000	240000	288,000
Overharvest/Underescapement of Population	1500	0	0	1500	135000	138,000
1 MU Regime: 1 MU for Both PSC & Domestic (Current Annex) -- Assume NO TARGETING on individual populations:						
Allowable Total ER	0.61	0.61	0.61	0.61	0.61	0.61
U.S. ER	0.15	0.15	0.15	0.15	0.15	0.15
Remaining Canadian ER	0.46	0.46	0.46	0.46	0.46	0.46
Catch	9150	9150	9150	9150	183000	219,600
U.S. Catch vs. Annex Formula Catch (Diff)	450	750	750	450	0	2,400
Canadian Catch vs. Annex Formula (Diff)	4200	5400	5400	4200	-12000	7,200
Escapement	5850	5850	5850	5850	117000	140,400
Overharvest/Underescapement of Population	-4650	-6150	-6150	-4650	12000	-9,600
1-To-5 MU Regime: 1 MU for PSC; 5 MUs Domestic						
Allowable Total ER	0.30	0.20	0.20	0.30	0.65	0.65
U.S. ER	0.15	0.15	0.15	0.15	0.15	0.15
Remaining Canadian ER	0.15	0.05	0.05	0.15	0.50	0.46
Assume Canada CAN target individual populations in terminal fisheries:						
Applicable Canadian ER	0.15	0.05	0.05	0.15	0.50	
Catch	4500	3000	3000	4500	195000	210,000
U.S. Catch vs. Annex Formula Catch (Diff)	450	750	750	450	0	2,400
Canadian Catch vs. Annex Formula (Diff)	-450	-750	-750	-450	0	-2,400
Escapement	10500	12000	12000	10500	105000	150,000
Overharvest/Underescapement of Population	0	0	0	0	0	0
Assume Canada CANNOT target individual populations:						
Applicable Canadian ER	0.05	0.05	0.05	0.05	0.05	
Catch	3000	3000	3000	3000	60000	72,000
U.S. Catch vs. Annex Formula Catch (Diff)	450	750	750	450	0	2,400
Canadian Catch vs. Annex Formula (Diff)	-1950	-750	-750	-1950	-135000	-140,400
Escapement	12000	12000	12000	12000	240000	288,000
Overharvest/Underescapement of Population	1500	0	0	1500	135000	138,000

Appendix Table 3. Harvests and escapements of Puget Sound coho under different MU size regimes under Abundance Scenario 2 (4 strong populations and 1 weak population [Snohomish], with an aggregate abundance of "Abundant").

	Strait of Juan de Fuca	Hood Canal	Skagit	Stillaguamish	Snohomish	Sum of Puget Sound
Management Scenarios						
Key Assumption: Canadian Fisheries have the same ER on all populations.						
Scenario 2 -- 4 Strong Populations & 1 Weak (Aggregate is "Abundant")						
Recruitment	50000	50000	200000	50000	50000	400,000
Population-appropriate ER	0.60	0.65	0.60	0.50	0.20	0.60
Canadian ER (per Annex formula)	0.252	0.266	0.252	0.224	0.11	
Remaining U.S. ER	0.348	0.384	0.348	0.276	0.09	
Population-appropriate Catch	30000	32500	120000	25000	10000	217,500
Canadian Catch at formula in Annex	12600	13300	50400	11200	5500	93,000
Remaining U.S. Catch	17400	19200	69600	13800	4500	124,500
Population-appropriate Escapement	20000	17500	80000	25000	40000	182,500
5 MU Regime: 5 MUs for Both PSC & Domestic (Current Annex)						
Allowable Total ER	0.60	0.65	0.60	0.50	0.20	
Population-Specific Canadian ER	0.252	0.266	0.252	0.224	0.11	
Applicable Canadian ER (Minimum ER)	0.11	0.11	0.11	0.11	0.11	
Remaining US ER	0.49	0.54	0.49	0.39	0.09	
Catch	30000	32500	120000	25000	10000	217,500
Canadian Catch vs. Annex Formula Catch (Difference)	-7100	-7800	-28400	-5700	0	-49,000
U.S. Catch vs. Annex Formula (Difference)	7100	7800	28400	5700	0	49,000
Escapement	20000	17500	80000	25000	40000	182,500
Overharvest/Underescapement of Population	0	0	0	0	0	0
1 MU Regime: 1 MU for Both PSC & Domestic -- Assume **NO TARGETING** on individual populations:						
Allowable Total ER	0.60	0.60	0.60	0.60	0.60	0.60
Canadian ER	0.252	0.252	0.252	0.252	0.252	0.252
Remaining US ER	0.348	0.348	0.348	0.348	0.348	0.348
Catch	30000	30000	120000	30000	30000	240,000
Canadian Catch vs. Annex Formula Catch (Difference)	0	-700	0	1400	7100	7,800
U.S. Catch vs. Annex Formula (Difference)	0	-1800	0	3600	12900	14,700
Escapement	20000	20000	80000	20000	20000	160,000
Overharvest/Underescapement of Population	0	2500	0	-5000	-20000	-22,500
1-To-5 MU Regime: 1 MU for PSC; 5 MUs Domestic						
Allowable Total ER	0.60	0.65	0.60	0.50	0.20	0.60
Canadian ER	0.252	0.252	0.252	0.252	0.252	0.252
Remaining US ER	0.348	0.398	0.348	0.248	-0.052*	0.348
Catch	30000	32500	120000	25000	12600	220,100
Canadian Catch vs. Annex Formula Catch (Difference)	0	-700	0	1400	7100	7,800
U.S. Catch vs. Annex Formula (Difference)	0	700	0	-1400	-4500	-5,200
Escapement	20000	17500	80000	25000	37400	179,900
Overharvest/Underescapement of Population	0	0	0	0	-2600	-2,600

*US ER is less than 0: No SUS fishing!

Appendix Table 4. Harvests and escapements of Interior Fraser coho under different MU size regimes under Abundance Scenario 2 (4 strong populations and 1 weak population [Upper Fraser], with an aggregate abundance of "Abundant"). Guidelines shown here are made up for example purposes only.

	L Thompson /Nicola	North Thompson	South Thompson	Fraser Canyon	Upper Fraser	Sum of Interior Fraser
Management Scenarios						
Key Assumption: U.S. Fisheries have the same ER on all populations.						
Assumptions about targeting abilities of Canadian fisheries specified below.						
Scenario 2 -- 4 Strong Populations & 1 Weak (Aggregate is "Abundant")						
Recruitment	50000	50000	200000	10000	50000	360,000
Population-appropriate ER	0.55	0.60	0.65	0.20	0.40	0.61
U.S. ER (per Annex formula)	0.15	0.15	0.15	0.10	0.12	
Remaining Canadian ER	0.40	0.45	0.50	0.10	0.28	
Population-appropriate Catch	27500	30000	130000	2000	20000	209,500
U.S. Catch at formula in Annex	7500	7500	30000	1000	6000	52,000
Remaining Canadian Catch	20000	22500	100000	1000	14000	157,500
Population-appropriate Escapement	22500	20000	70000	8000	30000	150,500
5 MU Regime: 5 MUs for Both PSC & Domestic						
Allowable Total ER	0.55	0.60	0.65	0.20	0.40	
Population-Specific U.S. ER	0.15	0.15	0.15	0.10	0.12	
Applicable U.S. ER (Minimum ER)	0.10	0.10	0.10	0.10	0.10	
Remaining Canadian ER	0.45	0.50	0.55	0.10	0.30	
Assume Canada CAN target individual populations in terminal fisheries:						
Applicable Canadian ER	0.45	0.50	0.55	0.10	0.30	
Catch	27500	30000	130000	2000	20000	209,500
U.S. Catch vs. Annex Formula Catch (Diff)	-2500	-2500	-10000	0	-1000	-16,000
Canadian Catch vs. Annex Formula (Diff)	2500	2500	10000	0	1000	16,000
Escapement	22500	20000	70000	8000	30000	150,500
Overharvest/Underescapement of Population	0	0	0	0	0	0
Assume Canada CANNOT target individual populations:						
Applicable Canadian ER	0.10	0.10	0.10	0.10	0.10	
Catch	10000	10000	40000	2000	10000	72,000
U.S. Catch vs. Annex Formula Catch (Diff)	-2500	-2500	-10000	0	-1000	-16,000
Canadian Catch vs. Annex Formula (Diff)	-15000	-17500	-80000	0	-9000	-121,500
Escapement	40000	40000	160000	8000	40000	288,000
Overharvest/Underescapement of Population	17500	20000	90000	0	10000	137,500
1 MU Regime: 1 MU for Both PSC & Domestic (Current Annex) -- Assume NO TARGETING on individual populations:						
Allowable Total ER	0.61	0.61	0.61	0.61	0.61	0.61
U.S. ER	0.15	0.15	0.15	0.15	0.15	0.15
Remaining Canadian ER	0.46	0.46	0.46	0.46	0.46	0.46
Catch	30500	30500	122000	6100	30500	219,600
U.S. Catch vs. Annex Formula Catch (Diff)	0	0	0	500	1500	2,000
Canadian Catch vs. Annex Formula (Diff)	3000	500	-8000	3600	9000	8,100
Escapement	19500	19500	78000	3900	19500	140,400
Overharvest/Underescapement of Population	-3000	-500	8000	-4100	-10500	-10,100
1-To-5 MU Regime: 1 MU for PSC; 5 MUs Domestic						
Allowable Total ER	0.55	0.60	0.65	0.20	0.40	0.61
U.S. ER	0.15	0.15	0.15	0.15	0.15	0.15
Remaining Canadian ER	0.40	0.45	0.50	0.05	0.25	0.46
Assume Canada CAN target individual populations in terminal fisheries:						
Applicable Canadian ER	0.40	0.45	0.50	0.05	0.25	
Catch	27500	30000	130000	2000	20000	209,500
U.S. Catch vs. Annex Formula Catch (Diff)	0	0	0	500	1500	2,000
Canadian Catch vs. Annex Formula (Diff)	0	0	0	-500	-1500	-2,000
Escapement	22500	20000	70000	8000	30000	150,500
Overharvest/Underescapement of Population	0	0	0	0	0	0
Assume Canada CANNOT target individual populations:						
Applicable Canadian ER	0.05	0.05	0.05	0.05	0.05	
Catch	10000	10000	40000	2000	10000	72,000
U.S. Catch vs. Annex Formula Catch (Diff)	0	0	0	500	1500	2,000
Canadian Catch vs. Annex Formula (Diff)	-17500	-20000	-90000	-500	-11500	-139,500
Escapement	40000	40000	160000	8000	40000	288,000
Overharvest/Underescapement of Population	17500	20000	90000	0	10000	137,500

Appendix Table 5. Harvests and escapements of Puget Sound coho under different MU size regimes under Abundance Scenario 3 (1 strong [Skagit] population and 4 weak populations, with an aggregate abundance of "Low").

	Strait of Juan de Fuca	Hood Canal	Skagit	Stillaguamish	Snohomish	Sum of Puget Sound
Management Scenarios						
Key Assumption: Canadian Fisheries have the same ER on all populations.						
Scenario 3 -- 1 Strong Population & 4 Weak (Aggregate is "Low")						
Recruitment	10000	10000	75000	10000	10000	115,000
Population-appropriate ER	0.20	0.20	0.60	0.35	0.20	0.20
Canadian ER (per Annex formula)	0.11	0.11	0.252	0.1695	0.11	
Remaining U.S. ER	0.09	0.09	0.348	0.1805	0.09	
Population-appropriate Catch	2000	2000	45000	3500	2000	54,500
Canadian Catch at formula in Annex	1100	1100	18900	1695	1100	23,895
Remaining U.S. Catch	900	900	26100	1805	900	30,605
Population-appropriate Escapement	8000	8000	30000	6500	8000	60,500
5 MU Regime: 5 MUs for Both PSC & Domestic (Current Annex)						
Allowable Total ER	0.20	0.20	0.60	0.35	0.20	
Population-Specific Canadian ER	0.11	0.11	0.252	0.1695	0.11	
Applicable Canadian ER (Minimum ER)	0.11	0.11	0.11	0.11	0.11	
Remaining US ER	0.09	0.09	0.49	0.24	0.09	
Catch	2000	2000	45000	3500	2000	54,500
Canadian Catch vs. Annex Formula Catch (Difference)	0	0	-10650	-595	0	-11,245
U.S. Catch vs. Annex Formula (Difference)	0	0	10650	595	0	11,245
Escapement	8000	8000	30000	6500	8000	60,500
Overharvest/Underescapement of Population	0	0	0	0	0	0
1 MU Regime: 1 MU for Both PSC & Domestic -- Assume **NO TARGETING** on individual populations:						
Allowable Total ER	0.20	0.20	0.20	0.20	0.20	0.20
Canadian ER	0.11	0.11	0.11	0.11	0.11	0.11
Remaining US ER	0.09	0.09	0.09	0.09	0.09	0.09
Catch	2000	2000	15000	2000	2000	23,000
Canadian Catch vs. Annex Formula Catch (Difference)	0	0	-10650	-595	0	-11,245
U.S. Catch vs. Annex Formula (Difference)	0	0	-19350	-905	0	-20,255
Escapement	8000	8000	60000	8000	8000	92,000
Overharvest/Underescapement of Population	0	0	30000	1500	0	31,500
1-To-5 MU Regime: 1 MU for PSC; 5 MUs Domestic						
Allowable Total ER	0.20	0.20	0.60	0.35	0.20	0.20
Canadian ER	0.11	0.11	0.11	0.11	0.11	0.11
Remaining US ER	0.09	0.09	0.49	0.24	0.09	0.09
Applicable U.S. ER	0.09	0.09	0.09	0.09	0.09	0.09
Catch	2000	2000	15000	2000	2000	23,000
Canadian Catch vs. Annex Formula Catch (Difference)	0	0	-10650	-595	0	-11,245
U.S. Catch vs. Annex Formula (Difference)	0	0	-19350	-905	0	-20,255
Escapement	8000	8000	60000	8000	8000	92,000
Overharvest/Underescapement of Population	0	0	30000	1500	0	31,500

Appendix Table 6. Harvests and escapements of Interior Fraser coho under different MU size regimes under Abundance Scenario 3 (1 strong population [Fraser Caynon] and 4 weak populations, with an aggregate abundance of "Low"). Guidelines shown here are made up for example purposes only.

	L Thompson /Nicola	North Thompson	South Thompson	Fraser Canyon	Upper Fraser	Sum of Interior Fraser
Management Scenarios						
Key Assumption: U.S. Fisheries have the same ER on all populations.						
Assumptions about targeting abilities of Canadian fisheries specified below.						
Scenario 3 -- 1 Strong Population & 4 Weak (Aggregate is "Low")						
Recruitment	5000	5000	5000	55000	5000	75,000
Population-appropriate ER	0.20	0.20	0.20	0.55	0.20	0.20
U.S. ER (per Annex formula)	0.10	0.10	0.10	0.15	0.10	
Remaining Canadian ER	0.10	0.10	0.10	0.40	0.10	
Population-appropriate Catch	1000	1000	1000	30250	1000	34,250
U.S. Catch at formula in Annex	500	500	500	8250	500	10,250
Remaining Canadian Catch	500	500	500	22000	500	24,000
Population-appropriate Escapement	4000	4000	4000	24750	4000	40,750
5 MU Regime: 5 MUs for Both PSC & Domestic						
Allowable Total ER	0.20	0.20	0.20	0.55	0.20	
Population-Specific U.S. ER	0.10	0.10	0.10	0.15	0.10	
Applicable U.S. ER (Minimum ER)	0.10	0.10	0.10	0.10	0.10	
Remaining Canadian ER	0.10	0.10	0.10	0.45	0.10	
Assume Canada CAN target individual populations in terminal fisheries:						
Applicable Canadian ER	0.10	0.10	0.10	0.45	0.10	
Catch	1000	1000	1000	30250	1000	34,250
U.S. Catch vs. Annex Formula Catch (Diff)	0	0	0	-2750	0	-2,750
Canadian Catch vs. Annex Formula (Diff)	0	0	0	2750	0	2,750
Escapement	4000	4000	4000	24750	4000	40,750
Overharvest/Underescapement of Population	0	0	0	0	0	0
Assume Canada CANNOT target individual populations:						
Applicable Canadian ER	0.10	0.10	0.10	0.10	0.10	
Catch	1000	1000	1000	11000	1000	15,000
U.S. Catch vs. Annex Formula Catch (Diff)	0	0	0	-2750	0	-2,750
Canadian Catch vs. Annex Formula (Diff)	0	0	0	-16500	0	-16,500
Escapement	4000	4000	4000	44000	4000	60,000
Overharvest/Underescapement of Population	0	0	0	19250	0	19,250
1 MU Regime: 1 MU for Both PSC & Domestic (Current Annex) -- Assume **NO TARGETING** on individual populations:						
Allowable Total ER	0.20	0.20	0.20	0.20	0.20	0.20
U.S. ER	0.10	0.10	0.10	0.10	0.10	0.10
Remaining Canadian ER	0.10	0.10	0.10	0.10	0.10	0.10
Catch	1000	1000	1000	11000	1000	15,000
U.S. Catch vs. Annex Formula Catch (Diff)	0	0	0	-2750	0	-2,750
Canadian Catch vs. Annex Formula (Diff)	0	0	0	-16500	0	-16,500
Escapement	4000	4000	4000	44000	4000	60,000
Overharvest/Underescapement of Population	0	0	0	19250	0	19,250
1-To-5 MU Regime: 1 MU for PSC; 5 MUs Domestic						
Allowable Total ER	0.20	0.20	0.20	0.55	0.20	0.20
U.S. ER	0.10	0.10	0.10	0.10	0.10	0.10
Remaining Canadian ER	0.10	0.10	0.10	0.45	0.10	0.10
Assume Canada CAN target individual populations in terminal fisheries:						
Applicable Canadian ER	0.10	0.10	0.10	0.10	0.10	0.10
Catch	1000	1000	1000	11000	1000	15,000
U.S. Catch vs. Annex Formula Catch (Diff)	0	0	0	-2750	0	-2,750
Canadian Catch vs. Annex Formula (Diff)	0	0	0	-16500	0	-16,500
Escapement	4000	4000	4000	44000	4000	60,000
Overharvest/Underescapement of Population	0	0	0	19250	0	19,250
Assume Canada CANNOT target individual populations:						
Applicable Canadian ER	0.10	0.10	0.10	0.10	0.10	
Catch	1000	1000	1000	11000	1000	15,000
U.S. Catch vs. Annex Formula Catch (Diff)	0	0	0	-2750	0	-2,750
Canadian Catch vs. Annex Formula (Diff)	0	0	0	-16500	0	-16,500
Escapement	4000	4000	4000	44000	4000	60,000
Overharvest/Underescapement of Population	0	0	0	19250	0	19,250