

## Area G/UFAWU Questions for Paul Ryall

These questions refer to the “Fixed Escapement” range referred to on pages 8 and 10 of the FRSSI Overview found on the DFO website at <http://www.pac.dfo.mpo.gc.ca/consultation/fisheries-peche/smon/docs/frssi.pdf> (“Overview”) [CAN182452] and the “spawning escapement targets” set using the FRSSI that are referred to in Staley, October 2010, FRSSI Review for the Cohen Commission (“Staley”) [CAN285380, Exhibit 400].

1. Does “Fixed Escapement” in Overview bear the same meaning as “spawning escapement targets” in Staley? If not, please explain.

The term “Fixed Escapement” on slide 10 of the Overview presentation means that the amount of spawners that would remain constant at about 400,000 between a run size of 400,000 and 1.0 million. This slide was developed in order to demonstrate the linkage between the TAM rule on slide 9 and escapement (i.e. the number of spawners). The two slides were developed to illustrate the concept of how a TAM rule changes over a range of run sizes. The **Fraser River sockeye escapement strategy 2009** memo (p. 9) [CAN15976, Exhibit 322] provides a more detailed explanation of figures on slides 9 and 10 of the Overview presentation.

In reviewing Staley (2010) I see the term “escapement target” used a number of times as a general term to describe how targets could be set. It is my view that the term is not being used to solely describe a “Fixed Escapement” approach. “Fixed Escapement” on page 6 of Overview has the same meaning as “fixed escapement target” on page 26 of Staley (second paragraph) under “Total Allowable Mortality (TAM) Rules” – i.e., both are describing the middle section of a Total Allowable Mortality rule where the escapement goal remains the same over a range of run sizes

Staley uses “spawning escapement targets” in the context of the years when the escapement goal was set by the FRSSI process to represent: the 4 TAM rules that were used to establish the escapement targets for the Early Stuart, Early Summer, Summer, and Late Run timing aggregates in a given year the full time series of escapement targets (for each run timing aggregate) through the season, which are established through using the TAM rules referred to above. These escapement targets change through the summer months as the run size estimates and management adjustments change with updated information, in-season. The final escapement target of the year, which would be the last escapement target from the series described above for each run timing aggregate

2. What is the level of “Fixed Escapement” in the illustration at p. 10 of Overview?

Approximately 0.4 million fish assuming there is no management adjustment applied. Note that this diagram is for illustrative purposes only and does not represent any given run timing group

See answer 1 for a more comprehensive explanation.

3. What is the level of “Fixed Escapement” in the illustration at p. 11 of Overview?

The level of “Fixed Escapement” in slide 11 of the Overview is 108,000. The TAM at the 50p forecast is about 58%. The figure represents option 3 of the **2009 escapement memo** for Early Stuart sockeye. The strategy describes a 60% total allowable mortality above a 270,000 run size and a fixed escapement of 108,000 below that run size. If the run size falls below 108,000 the strategy prescribes no harvest except test fishing. The 2009 escapement memo at pages 15, 21 and 22 provide additional detail on this approach.

4. Does the illustration at p. 11 of Overview represent the actual 2009 escapement strategy proposed for Early Stuart?

It represents Option 3 out of the suite of options laid out in the **2009 South Coast Salmon IFMP** [CAN004024, Exhibit 325] and the 2009 escapement memo. (cut back point = 270,000 and no fishing point/fixed escapement target = 108,000).

5. What was the level of Fixed Escapement (or escapement target) ultimately adopted in the FRSSI model in 2009 for Early Stuart for the guidance of harvest managers?

The FRSSI model does not adopt fixed escapement levels; neither does the FRSSI model adopt TAM rules. The FRSSI model generates a series of TAM rule options that are compared against a number of biological and socio-economic indicators.

Biological indicators reflect the intent of the **Wild Salmon Policy** [Exhibit 8] and the **CSAS Science Advisory report 2006/023** [CAN002122] describes the minimal requirements for harvest strategies to be compliant with the precautionary approach. Biological indicators emphasize comparisons to stock-specific escapement benchmarks (e.g. How often does the 4-yr average escapement fall below the benchmark?). Stock-specific escapement benchmarks need to be robust against uncertainty in escapement data, parameter estimates (e.g. capacity), and alternative definitions. The Spawning Initiative explored a range of alternative benchmarks, using the largest and smallest value to bookend the performance measures. As formal benchmarks are developed for each Conservation Unit under the **Wild Salmon Policy**, these stock-specific benchmarks will be revised.

Socio-economic indicators focus on stability in total harvest (e.g. How often is the realizable harvest less than 1 Million fish?).

The exact shape of the escapement strategy for each management group (i.e. the run sizes at which it changes from no fishing to fixed escapement and then to fixed mortality rate) is selected based on simulated performance and reviewed in public consultation.

6. Were similar Fixed Escapement levels used for FRSSI simulation modelling purposes for all the 19 modeled stocks in 2009?

Fixed escapement levels are not used for FRSSI simulation modelling. My answer to question 5 provides an outline of how the FRSSI model is used. Currently TAM rules are developed for four Management Groups: Early Stuart, Early Summer, Summer and Late. The FRSSI model has data from 19 stocks that are grouped into the four major management groups. Birkenhead, Cultus and Harrison are included in the assessment, but for a number of reasons that are documented on page 19-20 of the 2009 escapement memo are assessed individually.

| Management Group | Stock   |
|------------------|---|
| Early Stuart     | Early Stuart  |
| Early Summer     | Bowron, Fennell, Gates, Nadina, Pitt, Raft, Scotch, Seymour |
| Summer           | Chilko, Late Stuart, Quesnel, Stellako                      |
| Late             | Portage, Weaver, Late Shuswap                               |

7. At p. 5 in Staley it is stated that spawning escapement targets for the 2007 through 2010 seasons were set using the FRSSI. What were they for Chilko, Quesnel and Late Shuswap for each year from 2007 to 2010?

TAM rules are set at the level of Management groups (i.e., Early Stuart, Early Summer, Summer & Lates), not at individual stocks (e.g., Chilko, Quesnel, Late Shuswap)

8. What was the spawning escapement target for Late Shuswap in 2006?

TAM rules are set at the level of Management groups (i.e., Early Stuart, Early Summer, Summer & Lates), not at individual stocks (e.g., Chilko, Quesnel, Late Shuswap). Table 10 in the 2006 South Coast IFMP (page 53) [CAN002644] shows the TAM rule for Late run stocks. Applying that TAM rule to the final run size for Late runs produces a escapement target of 2,078,000 (Birkenhead 190,000+ Late 1,888,000 FRP Annual Report Table 2).

9. Was the Quesnel Lake component of the 2009 run the predominant contributor to the 2009 decline in Fraser River sockeye?

I was not part of the 2009 Fraser River sockeye management. This question is best addressed by those directly involved.

10. What was the spawning escapement target for Quesnel Lake sockeye in 2001 and 2005?

Escapement Targets are set at the level of Management groups (i.e., Early Stuart, Early Summer, Summer & Lates), not at individual stocks (e.g., Chilko, Quesnel, Late Shuswap). Table 2 in the 2001 Fraser River Panel reports [CAN002563] how the escapement targets for Summer runs, of which Quesnel is a component, was determined in 2001. For 2005 the South Coast IFMP (page 56) [CAN000437] shows the TAM rule for Summer run stocks. Applying that Escapement and TAM rule to the final run size for

Summer runs produces an escapement target of 3,929,000 ( 2001 FRP Annual Report Table 14) and 4,006,000 (2005 FRP Annual Report Table 2) [CAN002567, Exhibit 74] in 2001 and 2005, respectively for Summer Run Management group.

11. What was the actual spawning escapement for Quesnel Lake sockeye in 2001 and 2005?

The actual number of spawners in 2001 and 2005 for Quesnel was 3,510,789 and 1,450,171, respectively.

12. What was the recruit to spawner productivity for Quesnel Lake sockeye for the 2001 and 2005 brood year?

The actual recruit to spawner ratio for the 2001 and 2005 brood year Quesnel sockeye was 1.15 recruits/effective total spawners (2.12 recruits/effective female spawners and 0.145 recruits/effective total spawners (0.29 recruits/effective female spawner), respectively (see Appendix 1).

13. What was the spawning escapement target for Quesnel Lake sockeye in 2002 and 2006?

Escapement Targets and TAM rules are set at the level of Management groups (i.e., Early Stuart, Early Summer, Summer & Lates), not at individual stocks (e.g., Chilko, Quesnel, Late Shuswap). Table 2 (page 39) in the 2002 South Coast IFMP [CAN056696] shows how the escapement targets for Summer runs, of which Quesnel is a component, was determined in 2002. For 2006 the Table 10 (page 53) South Coast IFMP shows the TAM rule for Summer run stocks. Applying that Escapement and TAM rule to the final run size for Summer runs produces an escapement target of 2,377,000 (2002 FRP Annual report Table 15) [CAN002564, Exhibit 70] and 1,792,000 (2006 FRP Annual report Table 6) in 2002 and 2006, respectively for Summer Run Management group.

14. What was the actual spawning escapement for Quesnel Lake sockeye in 2002 and 2006?

The actual number of spawners in 2002 and 2006 for Quesnel was 3,062,151 and 169,768, respectively.

15. What was the recruit to spawner productivity for Quesnel Lake sockeye for the 2002 and 2006 brood year?

The actual recruit to spawner ratio for the 2002 and 2006 brood year Quesnel sockeye was 0.22 recruits/effective total spawners (0.49 recruits/effective female spawner and 3.92 recruits/effective total spawner (6.96 recruits. effective female spawner), respectively. The recruitment from the 2006 brood year is preliminary, does not include

the age-5 recruitment. The final recruit per spawner estimates for the 2006 brood year will be available after the 2011 season.

16. What is DFO's estimate of the number of early migrating late-run sockeye in each year from 2001 to 2009?

DFO does not make an estimate of the number of late run sockeye that migrate up the Fraser River without a period of delay in their migration by holding in the Strait of Georgia adjacent to the mouth of the Fraser River. Pacific Salmon Commission staff is tasked with providing an estimate of Late run which delay their migration to the Fraser River Panel. They do this on a regular basis in order to assist the in-season management of Fraser River sockeye.

17. Do you (or does DFO generally) accept that when adult sockeye enter the Lower Fraser River, they are especially susceptible to the *Parvicapsula minibicornis* parasite, which can sometimes cause fatal kidney failure?

I am not an expert on the *Parvicapsula minibicornis* parasite and its effect on Fraser River sockeye. Others in DFO are better positioned to provide you a more informed answer to the question you have posed. In particular a number of DFO scientists have published papers on *Parvicapsula minibicornis* that cover the incidence of the parasite in the Fraser River, Columbia River and Okanagan Rivers and potential effects this parasite has on salmon in general and Fraser River sockeye in particular. Their studies have indicated that transmission occurs in the Fraser River and both severity and prevalence of infection in sockeye salmon increase during freshwater migration of the adult sockeye and are at a maximum on the spawning grounds.

18. Do you (or does DFO generally) accept that upper lake Fraser sockeye who pick up the *Parvicapsula minibicornis* parasite can survive for only about 6 weeks after contracting the parasite?

I am not an expert on the *Parvicapsula minibicornis* parasite and its effect on Fraser River sockeye. Others in DFO are better positioned to provide you a more informed answer to the question you have posed. I am not aware of any results that would indicate upper Lake Fraser River sockeye could only survive for about 6 weeks after contracting the parasite.

19. Do you (or does DFO generally) accept that upper lake Fraser sockeye have genetically evolved so that they can tolerate exposure to fresh water for no more than about 6 weeks?

I am not an expert on whether upper lake Fraser sockeye have genetically evolved so that they can only tolerate exposure to freshwater for no more than about 6 weeks. Others in DFO are better positioned to provide you a more informed answer to the question you have posed.

20. Do the early migrating late-run sockeye generally take more than 6 weeks to reach the spawning grounds and spawn?

Migration rates of sockeye vary greatly depending upon the health of the fish and the environmental conditions they face in their upstream migration. Sockeye salmon generally prefer a temperature range of about 10-15 Celsius. Temperatures that are greater than 15C will lead to a slower migration speed and above 21C can cause elevated mortality. Also elevated water flow due to increased rain or rapid snow melt will slow the upstream migration and deplete their energy levels resulting in en-route mortality and elevated pre-spawn mortality.

21. Do the early migrating late-run sockeye experience a very high incidence of en-route mortality and pre-spawning mortality due to the effect of, among other things, increased time in freshwater, the *Parvicapsula minibicornis* parasite, higher water temperatures at that time of migration and higher river discharges at that time of migration?

I am not an expert in this area and others are better positioned to provide a more comprehensive answer. There has been an extensive study of *Parvicapsula minibicornis* by scientists (e.g. DFO, UBC) who could address your question. Research by Simon Jones and others have provided evidence that indicates transmission of the parasite occurs in the Fraser River near the estuary. Their studies have demonstrated both prevalence and severity of infection in sockeye salmon increase during freshwater migration of the adult host and are at maximum levels when the fish are on the spawning grounds.

22. Has the early migrating phenomenon referred to in the preceding paragraph caused DFO to restrict the harvest of summer-run sockeye, including Quesnel Lake sockeye, which co-migrate with the early migrating late-run stocks?

There have been restrictions of harvest on co-migrating sockeye salmon in order to achieve Late run sockeye conservation objectives. These management measures to protect Late run sockeye have resulted in reduced harvest of Summer run sockeye.

23. Do you (or does DFO generally) accept the general accuracy of the following statement (from exhibit 72, p. 6)

The costs to the fishery of this abnormal behavior and ensuing mortality have been substantial. Not only have present day catches and future production of late-run stocks been reduced, catches of summer-run sockeye, which co-migrate with the late-run stocks, have also been restricted to minimize incidental by-catch of late-run stocks (Lapointe 2002). We estimate the cost in lost fish production/harvest was approximately 7.2 million fish in 2002. Using a very conservative estimate of the ex-vessel price of \$10 per fish, the losses just to fishermen associated with this problem likely exceeded \$72 million dollars last year.

I agree that there has been reduced harvest of Fraser River sockeye as a result of the need to meet conservation objectives for Late run sockeye.

24. What is DFO's best information as to the numbers of early migrating late-run stocks that successfully spawned in 2001 and 2002?

This question is best addressed by DFO stock assessment staff and PSC biological staff.

25. Do you (or does DFO generally) accept that in Quesnel Lake, fall fry collected in the fall of 2002 and 2003 were among the smallest ever recorded (2.7 g. and 1.9 g. respectively) from Quesnel Lake as noted in exhibit 417, p. 28?

This question is best addressed by DFO stock assessment staff and PSC biological staff.

26. Dr. Riddell said on December 1, 2010 (transcript p. 78, line 21) that he expected the upper escapement benchmarks to change as a result of the publication of Exhibit 184 (Draft Working Paper 2010/P14). Have they changed, and if so, how?

The present cap on total mortality of 60% at larger run sizes has not changed. This cap on the total mortality at larger run sizes was implemented as a precautionary measure against uncertainty in population dynamics and in-season information. There is ongoing scientific analysis that will likely lead to adjustment of the lower/upper benchmarks. There is ongoing review of the TAM rules that are used for setting Fraser River sockeye escapement targets. Extensive consultation is undertaken with First Nations and others who have an interest in ensuring conservation objectives are met and opportunities for sustainable fisheries are provided. One of the challenges in managing Fraser River sockeye is that the majority of the harvest of Fraser River sockeye occurs in time and locations where there are many sockeye stocks co-migrating. Not all of these stocks have the same productivity and nor do they all experience the same conditions. As a result recruitment can be quite variable across Fraser River sockeye stocks within a year. As a result the health/status of the stocks that are intermingled may not be able to withstand the same harvest impact.

27. In Exhibit 601 prepared for DFO by GSGislason & Associates the conclusion is drawn at s. 5.4 that "DFO needs to integrate the FRSSI modelling results with the socio-economic results of this report. This will highlight the tradeoffs between classes of indicators and enhance decision-making e.g., higher catches and economic activity are associated with lower escapement levels." Has that integration taken place and, if so, explain how, when and with what results?

It is important to keep in mind the statements at 5.2 and .5.3 in the same report.

*"5.2 This pilot study was constrained by severe data deficiencies for First Nations, recreational and commercial fisheries, specifically in describing their economic dimensions. Specific research needs to support future application of the socio-economic framework include:*

- *financial parameters related to commercial salmon harvesting and processing*

- *the dimensions and importance of First Nations FSC activities e.g., gear utilized, preservation techniques, social & cultural components/importance (by region, community and/or First Nation)*
- *a survey/profile of broad-based community interests and values related to Fraser salmon*

*Addressing these research needs, in our opinion, is critical to more refined socio-economic analysis of Fraser River fisheries management alternatives.”*

*“5.3 DFO will be conducting further analysis in 2006/07 in order to better determine the relationship between spawning stock size and productivity. The new formulation of the model will then be utilized to explore additional harvest scenarios in order to determine those that will meet the goals of the Wild Salmon Policy and generate improved economic performance.”*

There have been significant improvements to the FRSSI model since 2006. However, the socio-economic analysis has not presently occurred.

28. In Pestal, Ryall, and Cass, 2008 (“Collaborative Development of Escapement Strategies for Fraser River Sockeye: Summary Report 2003-2008”) at p. 65 (Ringtail 0073) there is a discussion of a “simplified sharing rule for Fraser Sockeye”. Under this strategy, if commercial TAC is greater than 5 million, then 8% is shared with Area G (see bottom of page).

The salmon allocation policy guides the calculation of salmon shares on an annual basis. There have been significant efforts undertaken by DFO and commercial fishermen to address ongoing concerns with salmon allocation. The CSAB struck a subcommittee to develop options for revitalizing the commercial salmon industry. The department in a letter to **the CSAB dated August 13, 2007** [CAN006616, Exhibit 482] requested advice on a management framework that would include:

- Has the flexibility to respond effectively to conservation objectives in an economically viable and sustainable manner, including the ability to fund associated fishery monitoring programs in the long run;
- Includes defined catch shares for all commercial salmon fishing fleets to provide for greater certainty and stability, and additional flexibility in structuring fisheries, including the potential for inter-fleet transfers under mutually beneficial circumstances;
- Can be delivered in an integrated manner with share based commercial fisheries conducted by First Nations (ie, all parties have an equal opportunity to harvest their shares under similar rules and common conservation objectives); and
- Contains a mechanism to permit transfers of catch shares, through voluntary license retirement in a fair and transparent manner.

This work resulted in a March 16, 2008 report submitted to DFO and the Province of BC. by the CSAB. The report represented over 2 years of work by many people and a significant sum of funds. The report was clear that consensus on all points was not



possible. The majority of the CSAB wished to move towards a defined share management strategy and that an individual transferable quota appeared to be the model that held the most promise. The minority report members are opposed to quotas and were seeking an alternative model.

Further work will be required in order to modernize the salmon allocation policy as it pertains to the commercial sector.

a) Has this strategy ever been adopted? Please explain fully.

The simplified strategy on p. 65 has not been adopted and was developed as a rule to explore socio-economic indicators for Fraser River sockeye for a particular case study in 2006.

What the actual allocation would be for any of the fleets in a particular year would depend upon harvest of other species and their relative value. Principles 5, 6 and 7 outline the application of the **Salmon Allocation policy** [CAN007857] of salmon within the commercial sector. It also outlines a planning schedule for determination of commercial salmon shares by gear and individual area:

#### *“Planning Schedule*

*A multi-year and annual planning schedule is required to improve the timeliness of decisions made with respect to the commercial salmon fishery. Annual dates need to be set for accomplishing the following activities:*

- *Review previous year's harvest and allocation results;*
- *Identification and resolution of disputes;*
- *Presentation of conservation objectives and expected catches; and,*
- *Target allocations by gear will be translated into target allocations by specie and individual licence area to guide the development of the annual salmon fishing plans.*

To accomplish this staff will work with First Nations, commercial and recreational representatives with a view to adapting such a schedule of timelines for implementation prior to the year 2001 salmon season.”

As a result of the application of salmon allocation policy to the commercial sector in 2006 the shares for Fraser River sockeye as identified in Appendix 1 of the **2006 South Coast Salmon IFMP** [CAN002644] are:

|        |       |
|--------|-------|
| Area B | 47.5% |
| Area D | 18.5% |
| Area E | 22.0% |
| Area G | 4.5%  |
| Area H | 7.5%  |

## Appendix 1 notes:

*“This document describes anticipated licence area allocations for each gear type and for each species of salmon. These anticipated licence area allocations are intended to guide fishing arrangements at the local level and are not fixed entitlements. Application of these sharing arrangements is subject to meeting all conservation objectives, First Nations obligations, international commitments, deliverability and manageability constraints and other management considerations including all conservation measures currently in effect. Where appropriate the potential harvest identified is a range that reflects the most recent PSARC approved forecasts for each stock grouping at a 50 percent and 75 percent probability level. In other cases, the potential harvest represents the informed point estimate of fisheries managers based upon historic average return rates and available PSARC approved analysis.*

*Although best efforts will be made to achieve these coast-wide allocation targets, no guarantees are offered that target allocations will actually be achieved in any given year. The achievement of these targets will depend upon the ability to fish selectively and the conservation needs of the resource. In the event that target allocations are not achieved, no compensatory adjustments will be made to future allocations. Specifically, as in 2005, “catch up/make up” adjustments to future target allocations will not be considered in the event that a gear type does not meet its target allocation.*

*The following specific operational guidelines for 2006 are noted:*

- *Individual licence holders and groups of licence holders will not be permitted to make their own allocation transfer arrangements.*
- *As in 2005, there will be no directed commercial fisheries for Fraser River sockeye or Fraser River pink salmon in the north (i.e. area licence categories A, C and F).*
- *Harvest from both full and limited fleet exploratory and assessment fisheries intended to obtain information that will benefit a specific fleet will be considered part of the allocation of the fleet conducting the exploratory fishery.*
- *Harvest from experimental or selective fisheries, designed to test (new or modified) more selective fishing gear and methods, in most cases will be considered part of the five percent allocation set aside to encourage selective fishing. This will be determined preseason based on approved selective fishing proposals.*
- *The target allocations for gill net D and gill net E area licences will attempt to equalize the relative average catch per licence in sockeye equivalents.*
- *The target allocations for troll G and troll H area licences will attempt to equalize the relative average catch per licence in sockeye equivalents.*

- *If after spawning escapement objectives are met, and despite best efforts, it becomes apparent that an area licence group is unable to achieve its target allocation, subject to conservation requirements, uncaught balances will be given first to the same gear type in a different licence area and, second to different gear types in a manner that reflects their relative target allocations.*

*It is noted that these are not fixed entitlements but are a projection of available fishing opportunities given present forecasts of stock abundance and best efforts to achieve coast-wide target allocations by gear type. These represent the intentions of fisheries management if abundance is as expected and all other things are equal. However, in many cases in-season adjustments will be necessary to address conservation concerns or other unforeseen events.”*

b) What was the commercial TAC in 2010?

The commercial TAC of Fraser River sockeye in 2010 was 15,160,760 (Canadian commercial TAC 12,561,640 and U.S. TAC 2,599,120 (2010 FRP Post-season meeting report).

c) Why was Area G restricted to a 0% share in 2010?

Appendix 4 of the South Coast IFMP [CAN185436] outlines the application of the salmon allocation policy to the commercial sector. What the actual allocation would be for any of the fleets in a particular year would depend upon harvest of other species and their relative value. As a result of the application of salmon allocation policy to the commercial sector in 2010 the shares for Fraser River sockeye identified in **Appendix 1 of the 2006 South Coast Salmon IFMP** are:

|        |       |
|--------|-------|
| Area B | 48.5% |
| Area D | 21.5% |
| Area E | 25.0% |
| Area G | 0.0%  |
| Area H | 5.0%  |

Appendix 1 notes:

*“This document describes anticipated licence area allocations for each gear type and for each species of salmon. These anticipated licence area allocations are intended to guide fishing arrangements at the local level and are not fixed entitlements. Application of these sharing arrangements is subject to meeting all conservation objectives, First Nations, obligations, international commitments, deliverability and manageability constraints and other management considerations including all conservation measures currently in effect. Where appropriate the potential harvest identified is a range that reflects the most recent approved forecasts for each stock grouping. In other cases, the potential harvest represents the informed point estimate of fisheries managers based upon historic average return rates and available PSARC approved analysis.*

*Although best efforts will be made to achieve these coast-wide allocation targets, no guarantees are offered that target allocations will actually be achieved in any given year. The achievement of these targets will depend upon the ability to fish selectively and the conservation needs of the resource. In the event that target allocations are not achieved, no compensatory adjustments will be made to future allocations. Specifically, as in 2009, “catch up/make up” adjustments to future target allocations will not be considered in the event that a gear type does not meet its target allocation.*

*The following specific operational guidelines for 2010 are noted:*

- *Individual licence holders and groups of licence holders will not be permitted to make their own allocation transfer arrangements unless agreed to by DFO under Demonstration Fisheries arrangements.*
- *As in recent years, there will be no directed commercial fisheries for Fraser River sockeye or Fraser River pink salmon in the north (i.e. area licence categories A, C and F).*
- *Harvest from assessment fisheries intended to obtain information that will benefit a specific fleet will be considered part of the allocation of the fleet conducting the exploratory fishery.*
- *The target allocations for gill net D and gill net E area licences will attempt to equalize the relative average catch per licence in sockeye equivalents.*
- *The target allocations for troll G and troll H area licences will attempt to equalize the relative average catch per licence in sockeye equivalents.*
- *If after spawning escapement objectives are met, and despite best efforts, it becomes apparent that an area licence group is unable to achieve its target allocation, subject to conservation requirements, uncaught balances will be given first to the same gear type in a different licence area and, second to different gear types in a manner that reflects their relative target allocations.*

*It is noted that these are not fixed entitlements but are a projection of available fishing opportunities given present forecasts of stock abundance and best efforts to achieve coast-wide target allocations by gear type. These represent the intentions of fisheries management if abundance is as expected and all other things are equal. However, in many cases in-season adjustments will be necessary to address conservation concerns or other unforeseen events.”*

## Appendix 1

### Glossary:

**Effective Female Spawners (EFS)** = number of spawners \* %female\* spawning success

**Effective Total Spawners (ETS)** = number of spawners\* spawning success

**Spawning Success** = [females that have fully spawned + 0.5(half spawned females)]/female spawners

Females that have fully spawned are those that have no eggs left when they die. Females that have only half spawned have retained roughly half their eggs.

Also the recruitment from the 2001 brood year is the return of 2 year olds in 2003 + 3 year olds in 2004 + 4 year olds in 2005 + 5 year olds in 2006, which is why the recruitment from the 2001 brood year will not line up exactly with escapement in 2005. The majority of escapement in 2005 is from the 2001 brood year, but other brood years also contribute.

### Data Sources:

Escapement targets by run-timing group: FRP annual reports, final in-season targets, most values are also available in PPR 10 as the (Final) In-season Target

Actual number of spawners: Sockeye\_ExploitationRate\_by\_Stock.xls (Ringtail document PSC000011), Spawn. Escape.

Recruits, Effective Female Spawners, and Effective Total Spawners by brood year: Quesnel.xls from the Stock Assessment production files (provided by Sue Grant April 21<sup>st</sup>, 2011).