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Susan Farlinger Director General – Pacific Region Fisheries and Oceans Canada
Brian Riddell – Pacific Salmon Foundation
Josh Korman – UBC Fisheries Department
Karl English – LGL

Re: Skeena Sockeye Benchmarks

The purpose of this letter is multi-fold: to provide benchmark process recommendations to DFO, to increase the understanding of Skeena sockeye CU benchmarks, and to clarify assumptions regarding data, methodology, and analysis supporting the development of Skeena sockeye lake CU benchmarks. The MCC have concerns that focus on:

- Clearly understanding the inputs to Skeena salmon CU stock-recruitment analysis and benchmarks;
- How the process components and steps leading up to the preliminary analysis are described in order for non-scientists to easily understand what is being expressed;
- An adequate description of assumptions and uncertainties that support identifying benchmarks;
- Preliminary plan to monitor abundance and distribution of the remaining 15 Skeena sockeye lake CUs in order to determine escapement, catch, run timing, age composition, and stock-recruitment relationships.

Recommendations

Wild vs. Enhanced Populations

In order to be consistent with the WSP (i.e., according to the sidebar on page 1: "Salmon that originate directly from hatcheries and managed spawning channels are not considered wild in this policy, and are called “enhanced salmon”), **the enhanced portions of the Babine CU should be removed from benchmark analysis and process for this CU.**

Metrics

We propose that 3 metrics – stock recruitment, lake productivity, and long-term abundance - be used to assess and delineate benchmarks for Skeena sockeye CUs. As was identified in the Fraser sockeye benchmark delineation process, the appropriateness of a specific metric depended largely on the availability and quality of data for a specific CU. Applying and discussing the 3 different metrics in relation to the quality of the data for a specific CU enabled

flexibility to place more weight on those metrics which were the most scientifically rigorous; which will result in more accurate outcomes.

During the January 25th Skeena data review / benchmark workshop, the limitations of relying solely on the stock recruit analysis became evident to participants - especially for several CUs with limited data points, low abundance, and apparent productivity overestimations. Developing benchmarks with a suite of metrics would assist technical experts in overcoming such shortcomings for any single metric. Furthermore, developing the proposed metrics is possible within the timelines set out by MSC conditions, and participant expectations. Stock recruitment analysis (Dr. Korman's analysis) is nearly complete for the 16 sockeye CUs currently in discussion. A Lake Productivity analysis has been performed by Cox-Rogers et al. (2010), providing the necessary baseline information to define benchmarks within this metric. Long-term abundance was a key metric used in the Fraser analysis. This methodology could be applied to the 16 sockeye CUs using resources already existing within PSF, DFO, or SFC within the next few months.

Short Term Process & Timeline

It is important that benchmarks be established for key Skeena sockeye CUs in the short term to ensure DFO and industry meet their MSC commitments. The MCC is committed to working with DFO and industry to ensure MSC deadlines, and the intent of the conditions, are met. **We recommend that PSF initiate a work plan within the next few weeks to develop benchmark recommendations under each of the three proposed metrics. Additionally, we recommend setting a date for a 3 to 5 day CSAP workshop before the end of April to designate benchmarks for key sockeye CUs**, to ensure MSC deadlines and conditions are properly achieved**.**

The precedent-setting CSAP workshop for designating Fraser sockeye benchmarks, which took place in November 2011, provides a pragmatic approach for designating benchmarks for the 16 data sufficient Skeena sockeye CUs. This process ensured a minimum level of scientific rigor, while producing timely results in a collaborative manner among technical experts from government and interest groups. **Designating CUs into red, yellow, and green zones was a significant outcome of the Fraser process, and must be a key objective for the Skeena benchmark process.**

Medium - Long Term Process

Through the short-term process, many data gaps and research priorities have, and will be, identified. This information will necessarily re-define monitoring priorities. Once benchmarks have been established for the 16 data sufficient sockeye CUs, **a work plan for prioritizing monitoring and research for these CUs should be developed. A process for re-evaluating benchmarks at regular intervals (3-5 years was discussed for Fraser CUs), using new information from research and monitoring, should be established and agreed upon up-front.** A workshop for establishing such a review process should be undertaken in the fall of 2012.

Setting benchmarks for the remaining 14 data deficient Skeena sockeye CUs remains a priority for the MCC. **A strategic plan for developing benchmarks for these CUs should be developed by Fall 2012.** Such a plan should investigate the potential for applying Blair Holtby's data deficient benchmark methodology, and other potential methods. **A research and**

monitoring plan should also be developed for data deficient CUs, paralleling efforts to improve information for data sufficient CUs. This could be integrated into the research and monitoring workshop outlined above for data sufficient CUs.

Other

- A major omission in English et al. (2011) is a detailed list of the assumptions and data uncertainties inherent in the run-reconstruction estimates, which will strongly influence subsequent benchmark analyses. **We recommend that an additional section of the report be included as an appendix that outlines all model assumptions and data uncertainties for stakeholders to assess.**

- **Productivity estimates for most Skeena lake sockeye CUs need to be adjusted to more accurately reflect current situations.**

- **Dr. Korman's benchmark analysis needs peer-review**; ideally, this would involve Dr. Holt and Dr. Grant.

- **Risk tolerance should be developed on an individual CU basis after consultation with First Nations and other stakeholders.**

- **The conservation community feels strongly that any benchmark process respects bilateral processes between DFO and First Nations.**

The MCC beleive our recommendations are consistent with concerns raised during the January 25th Skeena data / benchmark workshop, and the benchmark process outlined in both the WSP, and the regional approach undertaken in the Fraser sockeye benchmark process. We ask that DFO provide written responses to these recommendations, and the process questions we have included as an attachment to this letter. We also ask that LGL and Dr. Korman provide written responses to our questions related to their respective work (*Indicator Streams, Escapement, and Run-reconstruction,* and *Stock Recruit Benchmark Analysis*; see additional attachments).

Thank you for the opportunity to participate in implementing this key step in strategy 1 of the Wild Salmon Policy.

Sincerely,

Craig Orr, Ph.D.
on behalf of the MCC Salmon Committee

CC:
Dave Peacock, Steven Cox-Rogers, Jeff Grout, Mark Saunders, Blair Holtby, Kristine Ciruna, Brad Ack, Steven Devitt, Katrina Connors

Literature Cited

Cox-Rogers, S., Hume, J., Shortreed, K., and Spilsted, B. 2010. A Risk Assessment Model for Skeena River Sockeye Salmon. Canadian Manuscript Report of Fisheries and Aquatic Sciences 2920.

English, K.K., Mochizuki, T., and Robichaud, D. 2011. Review of north and central coast salmon indicator streams and estimating escapement, catch and run size for each salmon Conservation Unit. Prepared by LGL Limited Environmental Research Associates for Pacific Salmon Foundation, Sidney, BC.

Process Questions (DFO)

1. The WSP states that benchmarks will include risk tolerance, and that risk tolerance will be developed on a case-by-case basis after consultation with First Nations and other stakeholders. Will this approach be complied with in the development of benchmarks for north coast and central coast CUs?

2. Will Dr. Korman's work be peer-reviewed, and will reports be prepared equivalent to what is being prepared for Fraser sockeye benchmarks?

3. Benchmark development in the Fraser watershed provided a technical explanation for why specific indicators were used, and others were not. Of the four stock status indicators identified by Holt et al. (2009) to evaluate Conservation Unit (CU) status - *stock/recruit relationships or abundance, distribution of spawners, fishing mortality, and current abundance relative to long term abundance - Distribution and Long term abundance* are not considered in the current report. Will other metrics be used to derive benchmarks for Skeena CUs?

4. Benchmark development in the Fraser included a 3-day workshop that involved prominent scientists, researchers, and stakeholders in an attempt to address how various metrics should be weighed in the development of benchmarks for Fraser CU's. The workshop encouraged the inclusion of a diversity of scientific and technical knowledge, and considered the status of CU's relative to COSEWIC guidelines. Will the current process for the north and central coasts be the same?

5. Will the process categorize Skeena sockeye CU's as being red", "amber", or "green" as per the WSP?

6. Will Dr. Holtby's synoptic analysis be incorporated as a reference measure for the identified stock statuses?

7. Holtby and Ciruna (2007) established lake-type sockeye CUs based on distribution, spawn timing, life history, and individual lakes. However, in the Skeena drainage, that rationale does not appear consistent or clear. For example, Ecstall and Lower lakes are noted as a single CU; as are Tahlo and Morrison lakes, upper and lower Kluatantan lakes, and upper and lower Sicintine lakes. Additionally, Onerka Lake located at the headwaters of Nilkitkwa River is not listed as a CU. Why are these sockeye rearing lakes not categorized as separate CUs?

Literature Cited

Holt, C.A., Cass, A., Holtby, B., and Riddell, B. 2009. Indicators of status and benchmarks for Conservation Units in Canada's Wild Salmon Policy. Canadian Science Advisory Secretariat 2009/058.

Holtby, L.B. and Ciruna, K.A. 2007. Conservation Units for Pacific salmon under the Wild salmon policy. CSAS Research Document 2007/070. Fisheries and Oceans Canada.

Indicator Streams, Escapement, and Run-reconstruction Questions (LGL)

1. The foundation for the escapement estimates presented in English et al. (2011) is the nuSEDS database and a list of appropriate indicator streams.
a) What indicator streams are used for each species and CU (i.e., please provide the complete list of indicator streams used)?
b) How were indicator streams selected (i.e., what guidelines were used: ≥5 enumeration records in a given decade?)?
c) What effect did the change in indicator stream selection have on CU escapement estimates (i.e., do the CU escapement estimates in this report differ from previous estimates, such as Cox-Rogers et al. 2004; English et al. 2004, 2006; Gazey 2009)?
d) How were escapement count expansion factors estimated, were they applied to NuSEDS escapement estimates or before being entered in NuSEDS, and how large are the uncertainties in these estimates (i.e., have the expansion factors been ground-truthed)?
e) How were specific periods of escapement data for CUs chosen in place of decadal averages as shown in Appendix Table A2?
f) How will the relative quality of the escapement estimates for each indicator stream (i.e., data uncertainty) be incorporated into the run-reconstruction estimates?
g) Considering that escapement and catch data are the only real numbers we have for some Skeena lake sockeye populations, why are data restricted to 1980-2010 and not inclusive of data as far back as 1950?

2. Run-timing assumptions.
a) There appears to be an underlying assumption that the run timing of stocks in a given Skeena CU varies in unison with other CUs both in-season and inter-annually. This is unlikely to hold true for all lake sockeye CUs in all years. For example, Kitwanga appears to run outside the normal curve approximations in some years. How is the actual timing variation of stocks (CUs) like Kitwanga, and the uncertainties associated with assigning exploitation rates, accounted for?
b) There is some evidence to suggest that run timing is affected by fishing pressure. Have harvest impacts on run timing been accounted for? If so, what is the degree of impact? Has there been a sensitivity analysis as to the impact should the mean of the un-enhanced CU's be shifted towards the mean of the aggregate abundance? Have the uncertainties discussed in Gazey (2009) been incorporated in the analysis?
c) Genetic data sample sizes for many of the small lake sockeye populations are poor. How is the uncertainty accounted for when constructing run-timing distributions and assigning exploitation rates for these CUs?
d) Do any sockeye CUs lack DNA or biological characteristics data that affects specific run-timing and abundance data or outcomes? If so, how is this uncertainty accounted for?
e) How will run-reconstructions be performed for the numerous river-type sockeye populations (CUs) that remain without genetic baseline data?

f) Current stock status is estimated relative to the potential abundance of a CU. If the potential abundance of the CU is calculated, in part, through recent recruitment estimates, and recent recruitment timing, abundance, and distribution has been impacted by fishing pressure, won't estimates of the potential abundance of the CU be confounded? If so, how will this be accounted for?

3. Given the paucity of age-class data for all species, how will you account for the bias in the resulting higher productivity estimates that are produced when an average age composition is used in place of year-specific age composition?

4. Can the uncertainties outlined in the questions above be incorporated into the run-reconstruction analyses so as to derive confidence intervals (rather than point estimates) for Dr. Korman's subsequent benchmark work?

Literature Cited

Cox-Rogers, S., Hume, J.M.B., and Shortreed, K.S. 2004. Stock Status and Lake Based Production Relationships for Wild Skeena River Sockeye Salmon. Canadian Science Advisory Secretariat Research Document 2004/010.

English, K.K., Gazey, W. J., Peacock, D., and Oliver, G. 2004. Assessment of the Canadian and Alaskan Sockeye Stocks harvested in the northern boundary fisheries using run reconstruction techniques, 1982-2001. Pacific Salmon Commission Technical Report 13.

English, K.K., Peacock, D., and Spilsted, B. 2006. North and central coast core stock assessment program for salmon. Prepared for Pacific Salmon Foundation and Fisheries and Oceans, Canada by LGL Limited Environmental Research Associates and Fisheries and Oceans, Canada, Sidney, B.C.

English, K.K., Mochizuki, T., and Robichaud, D. 2011. Review of north and central coast salmon indicator streams and estimating escapement, catch and run size for each salmon Conservation Unit. Prepared by LGL Limited Environmental Research Associates for Pacific Salmon Foundation, Sidney, BC.

Gazey, W.J. 2009. Interception of Skeena River Sockeye salmon stocks in northern boundary marine fisheries. Report for SkeenaWild Conservation Trust, Terrace, BC.

Benchmark Analysis Questions (Josh Korman)

1. Why is the current Benchmark status restricted to 2004-2008 data? Can the analyses be expanded to at least 2010, as well as prior to 2004? The 2004-2008 data may not be representative of longer-term abundance given the relatively short, 5-year escapement period, and differential marine production associated with Pacific Decadal Oscillations and inter-annual factors. There was also a dramatic change in fishing patterns during these periods, concentrating and increasing fishing impacts in a relatively short timing window. This period also included years of relatively little fishing. How might this impact the analysis?

2. The parameter "a" estimates (productivity) for most Skeena lake sockeye CUs appear to be well above what they likely are. How will future analyses be adjusted so as to more accurately approximate productivity?

3. Does the current approach assume "stationary" mean stock–recruitment relationships? If so, how are the effects of persistent environmental change (i.e., future changes in ocean productivity), or changes in trophic relationships accounted for?

4. Has the risk of persistent depensatory effects that develop with a time-lag following periods of adult stock depletion been accounted for? In other words, have depensatory effects been incorporated into spawner-recruitment models for very small populations?

5. Has a time-series of deviations from stock-recruitment relationships been run for each CU to examine whether any CUs show evidence of such a deviation since 1980? If not, can this be performed?

6. The Photosynthetic Rate (PR) for many lakes is based on a single measurement. How have the uncertainties in the PR estimates for each lake been accounted for, and how will future changes to the PR rates be accounted for? Can these estimates be bound by confidence intervals so as to more effectively capture the range in estimates?

7. Given that evidence for compensatory density dependence at existing spawner abundance is minimal in most of the datasets presented, is the value of additional spawners (i.e., beyond Smax) both to productivity and the ecosystem, being significantly under represented (if not misrepresented)?

8. Dr. Korman uses Sgen as a precautionary lower benchmark in his preliminary analysis. It has been suggested (see Holt 2009) that the use of Sgen as a lower benchmark only applies for CUs with a carrying capacity above 15,000 to 25,000. How applicable is the use of Sgen for small un-enhanced Skeena CUs?

9. How have the uncertainties associated with the various assumptions and bias during both run-reconstruction and modeling outputs been evaluated, and how might they be included in a given CUs buffer? Can these assumptions and uncertainties be made explicit for stakeholders to consider?

Literature Cited

Holt, C.A. 2009. Evaluation of Benchmarks for Conservation Units in Canada's Wild Salmon Policy: Technical Documentation. Canadian Science Advisory Secretariat Research Document 2009/059.