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Compte rendu 2010/013

Région du Pacifique

**Regional Science Advisory Process on
Cultus Lake Sockeye Stock Status,
2010 Barkley Sound Sockeye Forecast,
2010 West Coast Vancouver Island
Chinook Abundance Forecast, and
Fraser River Sockeye Spawning
Initiative**

**May 26-27, 2010
Nanaimo, British Columbia**

**Chairperson
Michael Chamberlain**

**Processus de consultation scientifique
régional sur l'état du stock de saumons
rouges du lac Cultus, les prévisions
relatives au saumon rouge du détroit
Barkley en 2010, les prévisions relatives
à l'abondance des saumons quinnats de
la côte ouest de l'île de Vancouver en
2010 et le projet de reproduction du
saumon rouge du fleuve Fraser**

**Les 26 et 27 mai 2010
Nanaimo, Colombie-Britannique**

**Président de la réunion
Michael Chamberlain**

Fisheries & Oceans Canada/Pêches et Océans Canada
3190, route Hammond Bay Road
Nanaimo, BC/C.-B.
V9T 6N7

October 2011

Octobre 2011

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made by the meeting. Proceedings also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenus dans le présent rapport puissent être inexacts ou propres à induire en erreur, ils sont quand même reproduits aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considéré en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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Pacific Region

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Regional Science Advisory Process on Cultus Lake Sockeye Stock Status, 2010 Barkley Sound Sockeye Forecast, 2010 West Coast Vancouver Island Chinook Abundance Forecast, and Fraser River Sockeye Spawning Initiative

Processus de consultation scientifique régional sur l'état du stock de saumons rouges du lac Cultus, les prévisions relatives au saumon rouge du détroit Barkley en 2010, les prévisions relatives à l'abondance des saumons quinnats de la côte ouest de l'île de Vancouver en 2010 et le projet de reproduction du saumon rouge du fleuve Fraser

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200, rue Kent Street
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<http://www.dfo-mpo.gc.ca/csas-sccs>

CSAS@DFO-MPO.GC.CA



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SUMMARY

These Proceedings summarize the relevant discussions and key conclusions that resulted from a Fisheries and Oceans Canada (DFO), Canadian Science Advisory Secretariat (CSAS) Regional Advisory meeting of May 26-27, 2010 at the Pacific Biological Station in Nanaimo, B.C. Two working papers were reviewed: Status of Cultus Lake Sockeye Salmon and Updated Methods for Assessing Harvest Rules for Fraser River Sockeye Salmon. Two Science Advisory Reports were also reviewed: 2010 assessment and 2011 forecast for West Coast Vancouver Island Chinook Salmon and Barkley Sound (Area 23) Sockeye Salmon.

In-person and web-based participation included Fisheries and Oceans Canada (DFO) Science and Fisheries and Aquatic Management Sectors staff; and external participants from First Nations organizations, the commercial and recreational fishing sectors, environmental non-governmental organizations, and academia.

The conclusions and advice resulting from this review will be provided in the form of Science Advisory Reports to Fisheries and Aquaculture management to inform salmon fishery planning for the above-noted stocks.

The four Science Advisory Reports and two supporting Research Documents will be made publicly available on the CSAS Science Advisory Schedule at <http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm>

SOMMAIRE

Le présent compte rendu résume les discussions et les principales conclusions tirées d'une réunion de consultation scientifique régionale du Secrétariat canadien de consultation scientifique (SCCS) de Pêches et Océans Canada (MPO) qui a eu lieu les 26 et 27 mai 2010, à la Station biologique du Pacifique, en C.-B. Deux documents de travail ont été passés en revue au cours de la réunion, à savoir : État du stock de saumon rouge du lac Cultus et Méthodes mises à jour pour l'évaluation des règles de prélèvement pour le saumon rouge du fleuve Fraser. Deux avis scientifiques ont également été passés en revue : Évaluation de 2010 et prévisions pour 2011 du stock de saumon quinnat de la côte ouest de l'île de Vancouver et du stock de saumon rouge de la baie Barclay (zone 23).

Parmi les participants, en personne et sur le Web, mentionnons du personnel des secteurs des Sciences et de la Gestion des pêches et de l'aquaculture de Pêches et Océans Canada ainsi que des participants externes provenant d'organisations autochtones, des secteurs des pêches commerciales et récréatives, d'organisations environnementales non gouvernementales et d'universités.

Les conclusions et l'avis tirés de cet examen seront fournis, sous la forme d'avis scientifiques, à Gestion des pêches et de l'aquaculture pour soutenir la planification des stocks susmentionnés.

Les quatre avis scientifiques et les deux documents de recherche connexes seront publiés sur le calendrier des avis scientifiques du SCCS à l'adresse : <http://www.dfo-mpo.gc.ca/csas-sccs/index-fra.htm>.

INTRODUCTION

A Fisheries and Oceans Canada (DFO) Canadian Science Advisory Secretariat (CSAS), Regional Advisory Process (RAP) meeting was held on May 26 and 27, 2010 at the Pacific Biological Station in Nanaimo to review two working papers: Status of Cultus Lake Sockeye Salmon and Updated Methods for Assessing Harvest Rules for Fraser River Sockeye Salmon. Two Science Advisory Reports were also reviewed: 2010 assessment and 2011 forecast for West Coast Vancouver Island Chinook Salmon and Barkley Sound (Area 23) Sockeye Salmon.

The Terms of Reference (TOR) for the science review (Appendix A) were developed in response to a request for advice from Fisheries Management (FAM). Notifications of the science review and conditions for participation were sent to representatives with relevant expertise from First Nations, commercial and recreational fishing sectors, environmental non-governmental organizations and academia.

Two working papers (WP) and draft two Science Advisory Reports (SAR) were prepared and made available to meeting participants prior to the meeting as follows (summaries provided in Appendix B):

Status of Cultus Lake Sockeye Salmon. Bradford, M.J., Hume, J.M.B., Withler, R.E., Lofthouse, D., Barnetson, S. Grant, S., Folkes, M., Schubert, N., Huang, A-M. (WP)

Updated Methods for Assessing Harvest Rules for Fraser River Sockeye Salmon
G. Pestal, A-M. Huang, A. Cass (WP)

Draft Assessment of West Coast Vancouver Island Chinook and 2010 Forecast
D. Dobson and W. Luedke (SAR)

Draft Assessment of Area 23 Sockeye and 2010 Forecast (Barkley Sound, Alberni Inlet)
D. Dobson and K. Hyatt (SAR)

Meeting Chair Michael Chamberlain welcomed participants, reviewed the role of CSAS in the provision of peer-reviewed advice, and gave a general overview of the CSAS process. The Chair discussed the role of participants, the purpose of the various RAP publications (Science Advisory Report, Proceedings and Research Document), and the definition and process around achieving consensus decisions and advice. Everyone was invited to participate fully in the discussion and to contribute knowledge to the process, with the goal of delivering scientifically defensible conclusions and advice. It was confirmed with participants that all had received copies of the Terms of Reference, working papers, and draft SARs.

The Chair reviewed the Agenda (Appendix C) and the Terms of Reference for the meeting, highlighting the objectives and identifying the Rapporteur for each review. The Chair then reviewed the ground rules and process for exchange, reminding participants that the meeting was a science review and not a consultation. The room was equipped with microphones to allow remote participation by web-based attendees, and in-person attendees were reminded to address comments and questions so they could be heard by those online.

Members were reminded that everyone at the meeting had equal standing as participants and that they were expected to contribute to the review process if they had information or questions relevant to the paper being discussed. In total, forty-one people participated in the RAP (Appendix D).

Participants were informed that Blair Holtby and Josh Korman had been asked before the meeting to provide detailed written reviews for the Harvest Rules working paper to assist everyone attending the peer-review meeting. Similarly, Steve Latham provided a written review of the Cultus Lake Sockeye working paper. Participants were provided with copies of the written reviews.

The conclusions and advice resulting from this review will be provided in the form of Science Advisory Reports to Fisheries and Aquaculture management to inform salmon fishery planning for the above-noted stocks. The four Science Advisory Reports and two supporting Research Documents will be made publicly available on the CSAS Science Advisory Schedule at <http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm>

DETAILED COMMENTS FROM THE REVIEWERS

WORKING PAPER: STATUS OF CULTUS LAKE SOCKEYE SALMON

Bradford, M.J., Hume, J.M.B., Withler, R.E., Lofthouse, D., Barnetson, S. Grant, S., Folkes, M., Schubert, N., Huang, A-M.

Presentation by M. Bradford

**** Paper accepted subject to minor revisions****

Rapporteur: M. Mortimer

This working paper outlines the status of Cultus lake Sockeye and the efficacy of the recovery measures and represents the first formal review of Cultus Lake Sockeye salmon status since being classified as endangered by COSEWIC in 2003. The intent of the working paper was to provide an update on the status of the Cultus Lake Sockeye stock and an evaluation of the conservation breeding program, harvest management and predator control programs initiated to aid in the recovery of the stock.

There were two formal reviewers for the paper, one internal and one external. Both reviewers and participants agreed that the authors conducted a reasonably thorough analysis of stock status and the conclusion that Cultus Lake Sockeye Salmon had not yet met recovery objectives was valid. Specifically, reviewers found that the purpose and objectives of the paper along with the methodologies used to assess the objectives were clearly stated and appropriate. The data used to assess the status of Cultus sockeye was also deemed appropriate. It was recognized by the reviewers that considerable assessment work was done to provide appropriate data and that the level of assessment conducted on the Cultus Lake stock may not be available for other threatened salmon populations.

Reviewers and participants identified the treatment of pre-spawning mortality in the analysis as an important factor for determining the success of hatchery intervention activities on the recovery of the stock. Reviewers felt that pre-spawn mortality (PSM) may have been minimized (although it was unclear what the results may be in doing so) and that better understanding the success of spawners within the system may be needed. This view was reinforced when reviewers evaluated the productivity of the stock from a spawner to smolts relationship instead of a smolt-recruit relationship. From this perspective the observations from the authors of an increasing productivity trend in the later years may not be supported.

Reviewers identified the influence of PSM as a potentially important parameter in evaluating stock status and suggested further investigation into its role in Cultus Lake. It was also recognized that information on successful spawners in the wild may be difficult to obtain given an apparent shift in spawning locations within the lake (to deeper water) and the adverse weather encountered during key recovery periods (November and December).

Considerable discussion was spent on the captive brood program and the contribution of captive brood off-spring to the recovery of the stock. The captive brood stock program has been successful with over 600 adults annually raised to maturity in captivity. However, an increasing incidence of Bacterial Kidney Disease (BKD) outbreaks in the captive population has been observed. Furthermore, assessment data suggested that there was apparent lower survival of hatchery raised smolts compared to the wild stock supplementation program. Risks associated with continuing the captive brood program were debated and it was concluded that given the risk to the population associated with continuing the captive brood stock program from both a genetic and fish culture perspective, that the captive breeding program be phased out of the recovery strategy. It was also recommended that the hatchery supplementation program continue but should be monitored to evaluate the relative reproductive success of hatchery fish in the wild.

Reviewers concluded that the predator control actions undertaken on pike minnow within Cultus Lake have been successful in reducing the numbers within Cultus Lake (and may have aided in halting the decline of the population); however it was cautioned that care must be taken to evaluate the long term implications of predator control on the Cultus Lake Sockeye.

The group reviewed and agreed with the findings of the results of the population viability analysis (PVA) model which showed that the recovery of the Cultus population rests largely on the return of smolt-recruit survival rates to values more similar to those observed historically. The group noted that the reproductive success of hatchery fish is also critical because most of the adults expected to return to the lake in the next few years are of hatchery origin. Further to smolt survival was the recommendation that continued regulation of fishing mortality, and successful implementation of other recovery measures, are all needed to maximize the likelihood of persistence of Cultus sockeye salmon. The group did not provide advice on suitable harvest levels for the stock.

The group agreed with the authors' assessment that the decline of Cultus Lake Sockeye salmon has been halted, but that the prospects for the long term sustainability of the population are still highly uncertain.

WORKING PAPER: UPDATED METHODS FOR ASSESSING HARVEST RULES FOR FRASER RIVER SOCKEYE SALMON

G. Pestal, A-M. Huang, A. Cass

** Paper accepted subject to minor revisions**

Rapporteur: D. McHugh

This paper provided an update of a quantitative modeling tool first introduced in 2003, to evaluate harvest control rules for Fraser River sockeye salmon. The main changes introduced in this version of the tool are that it considers different assumptions about the stock-recruitment relationship, includes a broader range of allowable mortality rules, accounts for the mixed-stock nature of the fishery, and includes several additional biological phenomena. Although some results from the model are presented it was understood that they were only a small sample of

the complete results, and were shown to demonstrate the methods and not to evaluate management options. A full evaluation of scenarios and allowable mortality rules will be completed in a series of workshops with stakeholders at a future date.

The following is a summary of the formal reviewer comments which formed the basis for discussion and evaluation by participants. Prior to the meeting, the authors provided detailed comments to each of the specific points identified by the two reviewers so these points could be fully discussed within the RAP. The main topics of discussion were of a highly technical nature related to the assumptions and uncertainties associated with choosing stock-recruit models for salmon stocks, and the appropriate means to parameterise and to evaluate those models. Much of the discussion involved questions regarding the appropriateness of methods, but also served as an opportunity to provide observations and recommendations to the authors to improve the modelling tool.

Both reviewers recognized that the manuscript which was presented for review was incomplete or in draft for some sections and as such provided the review in a form that addressed the main limitations of the analysis and provided recommendations to the authors. Within the review, necessary clarifications ranged from broad background (e.g. scope of the model) to the technical details (e.g. selecting spawner-recruit models, Bayesian estimation, en-route mortality, PSM, compensatory mortality, run-timing overlap, alternative productivity scenarios). The following additional analyses were discussed during the meeting:

- Choose a suite of candidate SR models and complete a full evaluation of each (rather than the step-wise selection presented in the draft paper). There was a lengthy discussion about the suite of alternative models that should be included, but no agreed-upon shortlist was identified. The authors propose to perform one of three potential options to deal with those options, but will leave it up to the FRSSI working group to decide which option to choose (or identify an alternative):
 - Option 1: Evaluate “all possible variations” for a single stock in the working paper and with the understanding that the remaining 18 stocks will be evaluated as part of the process for 2011 escapement options planning. This would include 8 basic forms (Ricker plus 7 possible variations of lag terms) under several alternative assumptions (total spawners vs. effective females, and alternative priors identified during the meeting).
 - Option 2: Evaluate a shortlist of model variations for all 19 stocks in the working paper with the understanding that the remaining variations will be evaluated as part of the process for 2011 escapement options planning. This would include 3 basic forms (Ricker, Larkin, 1yr lag) under several alternative assumptions (total spawners vs. effective females, alternative priors identified during the meeting).
 - Option 3: More comprehensively evaluate alternative assumptions for the 2 bookends (Ricker and Larkin) for all 19 stocks in this working paper (e.g. link priors to lake information) and identify the numerous possible variations as a deliverable for a future paper.
- Explore alternative error structures in spawner-recruit models (additive normal vs. multiplicative lognormal).
- Fit spawner-recruit model with explicit compensatory parameters.
- Add the option of quasi-extinction thresholds to the model.

Key uncertainties identified within the review and within the model itself include; non-stationarity (declining productivity), PSM, en route mortality (DBEs), run-timing differential exploitation (overlap) and the spawner-recruit model structure. Other sources of uncertainty are inherent within population dynamics and those include: parameter estimation biases, depensation and age composition.

SCIENCE ADVISORY REPORT: ASSESSMENT OF WEST COAST VANCOUVER ISLAND CHINOOK AND 2010 FORECAST

Diana Dobson and Wilf Luedke

** Paper accepted subject to minor revisions**

Rapporteur: P. Van Will

The assessment of the West Coast Vancouver Island (WCVI) Chinook management unit and the 2010 forecast was presented to participants. As the methods used within this annual assessment and forecast had been previously reviewed by the Pacific Science Advisory Committee (PSARC), no formal review was conducted on the SAR.

Ms. Dobson provided some context around WCVI Chinook to the group which included: contribution to mixed stock fisheries, significant hatchery production (~90%), WCVI wild Chinook is a stock of concern, CDN management restrictions have been in place since 1995, Robertson Creek Chinook is a key indicator for determining exploitation rate and distribution patterns for WCVI populations, and forecasts are key inputs for the CTC model.

In AABM fisheries, WCVI Chinook comprise ~20% of the catch in SEAK fisheries and less in NBC and WCVI fisheries due to management actions. In ISBM fisheries much of the catch is hatchery stocks and some Fraser stocks. There is some uncertainty in catch reporting from some groups. Escapements to the 14-system PSC index streams have been variable and under the rebuilding target most years. Overall, there are less stocks contributing in recent years and wild WCVI in SCVI are of particular concern (A24). Survival rates, based on the Robertson Creek indicator, are on average ~ 6% and ~ 2-3% recently.

The 2010 pre-fishery forecast total return to Stamp River/RCH Chinook to Canada is projected to be approximately 48,700. After Canadian ocean fisheries, the forecast return to adult Stamp River/RCH chinook, to the terminal area of Barkley Sound and Alberni Inlet, is projected to be in the order of 42,900, similar to levels observed in 2009. WCVI Chinook remain a stock of concern. Of particular concern are populations from SWVI especially those in A24. The bulk of the WCVI Chinook stocks are of hatchery origin and the high production may result in high catches of wild stocks.

Participants then discussed points of clarification and questions regarding the assessment and forecast provided in the SAR. Of main concern to the group was the alignment of the assessment of the WCVI aggregate to the conservation units identified under the Wild Salmon Policy (WSP), and how assessment and forecasts addressed the issue. Further to this was the identification of a large proportion of hatchery fish within the aggregate's index streams and how that may impact the evaluation of the number of natural Chinook spawners. Additionally, it was noted that the current hatchery and assessment practices make it difficult to discern the current state of wild WCVI Chinook, relative to WSP benchmarks currently under development.

It was recommended that future documents include WSP implementation and hatchery supplementation details. As this would be outside the scope of the current SAR, it was

suggested that a new research document may be needed which includes the forecast, target exploitation rates, hatchery versus wild escapements, and how assessment data fits in with CU and the WSP.

The group also discussed issues around the uncertainties and distribution of mortality on the stock and discussed the contribution of enhanced systems to the majority of the production out of WCVI. It was recognized that the current management system of mass production from WCVI hatcheries increases the allowable catches in PST-regulated fisheries, which in turn increases the harvest pressure on wild WCVI Chinook in mixed stock fisheries.

Participants concluded by agreeing with the findings that WCVI chinook are still a stock of concern and recommended adopting the 2010 forecasted total return of Stamp River/RCH Chinook to Canada of 48,700.

SCIENCE ADVISORY REPORT: ASSESSMENT OF BARKLEY SOUND SOCKEYE AND 2010 FORECAST (BARKLEY SOUND, ALBERNI INLET)

Diana Dobson

** Paper accepted subject to minor revisions**

Rapporteur: P. Van Will

Ms. Dobson provided some context around Barkley Sound sockeye to the group which included: contribution to mixed stock fisheries, harvest rate strategies, reference points and provisional targets, WSP framework, enhancement, and the stock groups involved.

Stock trends for Area 23 Sockeye stocks have been variable with returns having a downwards trend for the last decade with a rebound last year (2009). Acoustic trawl indices in Sprout Lake have declined during the same period and marine survival has been variable and lower than average. Escapements to the two Somass populations have been variable and depend on abundance/harvest. Escapements have been lower than the average for Great Central and Sproat Lakes (655,000 averaged annually), while Henderson Lake (30,000 average annual escapement) has benefited from the harvest strategy and has rebounded in recent years. Current status of the two Somass sockeye populations is moderate. Exploitation rates for the Great Central and Sproat Lake systems are similar while the exploitation rate for Henderson sockeye is much lower; the average exploitation rate for A23 fisheries are 29%, 33% and 13% respectively.

There are currently four approved methods used for forecasting in this paper: the Survival Stanza Method (SStM), the Surface Salinity Method (SSM), the Salmonid Enhancement Program Biostandard Method (SEPB), and the Coho Leading Indicator Method (CLI). Recently two other methods have been added to forecast Barkley sockeye: the Euphausiid Forecast and a sibling based forecast which have not been approved by a CSAP Advisory Process, but can help inform forecast decisions. Strengths and weaknesses of each model generally prevent the adoption of a single model derived estimate as all can represent plausible estimates. Instead, a point estimate and range of possible returns are generated for all models and are presented by DFO Science as a pre-season management forecast. The forecasts are generated to guide fisheries planning processes prior to the adoption of an in-season run size estimate.

Based on the integration of information from all the forecasts, a pre-season management forecast of 600,000 (range from 350,000 to 850,000) for Barkley Sound sockeye was recommended by the authors for 2010.

Participants recommended adding some language around model/forecast selection for greater transparency and suggested changing the forecast from a specific abundance forecast. Providing forecasts in a probability framework was suggested as a potential solution.

APPENDIX 1 : WORKING PAPER AND SAR SUMMARIES

Working Paper: Status of Cultus Lake Sockeye Salmon

Bradford, M.J., Hume, J.M.B., Withler, R.E., Lofthouse, D., Barnetson, S. Grant, S., Folkes, M., Schubert, N., Huang, A-M.

Sockeye salmon (*Oncorhynchus nerka*) from Cultus Lake, British Columbia, were assessed as endangered in 2003 as a result of a long term decline in abundance that began in the 1970s. Recovery measures that include a conservation breeding program, harvest management and a predator control program in Cultus Lake have been implemented. The report reviews the current status of the population and the efficacy of the recovery measures.

The authors found that the status of the population has not improved since 2003, largely because of poor smolt-adult survival, and the average number of spawners remains at about 1000 fish. Harvest rates have been reduced since the 1990s and the predator control program appears to have increased the survival of juveniles in the lake. The hatchery program has been successful in producing adults that have returned to the lake, but their success as spawners in the wild remains unknown. Modelling suggests that under the current low smolt survival rates, recovery is only possible with the successful implementation of all recovery measures. The authors concluded that the recovery of the Cultus Lake sockeye salmon population is highly uncertain and that continued monitoring is needed to determine if the recovery actions are indeed reducing risks to the population.

There were two reviewers of the working paper, one internal and one external. Reviewers agreed with the assessment that Cultus Sockeye have not met the recovery objectives for the stock and that a continuation of recovery actions are warranted. There was concern that the effects of PSM on the population was not adequately highlighted and that the mechanisms which may lead to PSM are not fully known and should be investigated further. There was agreement that the captive breeding program can be discontinued, but not the hatchery supplementation. It was also recommended that predator control activities continue with a recommendation that monitoring be in place to evaluate its impact on the ecosystem.

Working Paper: Updated Methods for Assessing Harvest Rules for Fraser River Sockeye Salmon

G. Pestal, A-M. Huang, A. Cass

The Fraser River Sockeye Spawning Initiative (FRSSI) has been an 8-year process to develop guidelines for setting annual escapement and exploitation targets for Fraser sockeye stocks. The initiative began in early 2002, and has since evolved through a series of workshops and on-going feedback from stakeholders. A quantitative modeling tool has been used to support the planning process, and was reviewed by Pacific Science Advice Review Committee (PSARC) in 2003. The model has evolved substantially since then, and this Working Paper provides an update on model expansions and revisions. Changes include assumptions about spawner-recruit relationships (e.g. delayed density effects), the range of strategies that can be explored (e.g. allowable mortality rules), mixed-stock simulations (i.e. 19 stocks in 4 management groups), and additional biological mechanisms (e.g. environmental management adjustments, PSM, and future patterns in productivity).

There were two reviewers of the working paper, one internal and one external, who, with participants intensively debated methodological details. Both reviewers and RAP participants

where generally supportive of the scope and intent of the FRSSI model, and those alternative assumptions currently available in the FRSSI model establish reasonable bookends on plausible scenarios and allow end-users to explore a comprehensive suite of “what-if” scenarios in a collaborative planning process.

Scientific Advisory Report: Assessment of Area 23 Sockeye and 2010 Forecast (Barkley Sound, Alberni Inlet)

D. Dobson and K. Hyatt

Barkley Sound Sockeye abundance forecasts are requested annually by Fisheries and Aquaculture management for pre-season fisheries planning activities. Quantitative abundance forecasts have been produced annually by DFO. The last review was conducted by PSARC in 2005. The interim assessment update was based on a previously CSAP approved methodology, and was presented to participants as a Science Advisory Report. A technical working paper was not presented.

The group was presented with a summary of the status of the Area 23 Sockeye stocks and an overview of the stock biology, historic abundance and harvest information as well as a summary of data sources and the forecasted abundance for the 2010 return year. The SAR indicated that for the two Somass sockeye populations the current status is moderate. Although there were some declines in abundance over the last 10 years, the populations are well above levels that would threaten their long-term viability. The decline in production is largely related to marine conditions, although there is some evidence of decreased lake productivity of Sproat Lake. There was a significant decline in abundance of Henderson Lake sockeye from year 2000 to about 2006 with estimated escapements below 5000 in each year from 2002 to 2006. Since 2007, there has been some improvement in abundance and the escapement was estimated at about average levels of 30,000 in 2010. Recent return years are still benefiting from hatchery operations that ceased after 2007.

The 2010 forecast total return of sockeye to the Somass River system is 600,000 - an increase of about 35% over observed 2009 returns. For 2010, expectations for Henderson Lake sockeye are for low abundance given that spawner levels were particularly low for the contributing brood years. However, in the past two years, escapements have been well above expected levels.

Scientific Advisory Report: Assessment of West Coast Vancouver Island Chinook and 2010 Forecast

D. Dobson and W. Luedke

West Coast Vancouver Island Chinook abundance forecasts are requested annually by Fisheries and Aquaculture management and the Pacific Salmon Commission Chinook Technical Committee for pre-season fisheries planning activities. Quantitative abundance forecasts have been produced annually by DFO since 1996 with a framework describing the methodology last reviewed by PSARC in 2002. The interim assessment update was based on a previously CSAP approved methodology, and was presented to the group as a Science Advisory Report. A technical working paper was not presented.

Based on the information received in the SAR, the status of wild WCVI Chinook remains poor, with a continued decline observed in wild populations in south-west Vancouver Island populations over the last 15 years despite management actions. Wild populations from north-west Vancouver Island are more stable; however they are only stable at low levels and show no signs of rebuilding. Many of the other index systems, which have not declined, are dependent

on hatchery supplementation to maintain current spawner levels. Sampling of escapement for hatchery marks indicates that a high proportion of spawners in some systems in some years are hatchery origin fish. Of particular concern are wild populations originating from the south-west area of Vancouver Island. Wild spawner populations in Area 24 (Clayoquot Sound) have declined an average of 53% over the last three generations despite relatively pristine freshwater habitat and harvest reductions.

The 2009 terminal return to the Stamp River/RCH indicator stock was estimated at about 43,200 adults and 5000 jacks (age-2 males), approximately 8% less than forecast. The 2010 forecast total return of Stamp River/RCH Chinook to Canada is 48,700. After Canadian ocean fisheries, the forecast return of adult Stamp/RCH chinook to the terminal area of Barkley Sound and Alberni Inlet is 42,900, similar to levels observed in 2009. In 2010, the age-4 component is forecast to comprise 41% of the terminal run (27% age-3, 41% age-4, and 31% age-5), with an expected sex ratio of 46% female. For 2010, expectations for WCVI natural stocks are similar to the 2009 observed return.

APPENDIX 2: AGENDA

Centre for Science Advice Pacific (CSAP) Salmon Subcommittee Meeting

- Agenda -

May 26 - 27, 2010

Pacific Biological Station
Seminar Room
Nanaimo, BC

Wednesday, May 26	
Introduction and procedures	9:00 - 9:15
Review of Cultus Lake Sockeye Salmon Stock Status Report	9:15 - 12:00
Lunch Break	12:00 - 1:00
Review of 2010 Barkley Sound Sockeye Forecast	1:00 - 2:15
Review of 2010 WCVI Chinook Abundance Forecast	2:15 - 4:00
Thursday, May 27	
Introduction and procedures	9:00 - 9:15
Review of Updated Methods for Assessing Harvest Rules For Fraser River Sockeye Salmon	9:15 - 12:00
Lunch Break	12:00 - 1:00
Continued Review of Updated Methods for Assessing Harvest Rules For Fraser River Sockeye Salmon	1:00 - 4:00
Adjournment	4:00

APPENDIX 3: ATTENDEES AND REVIEWERS

Last Name	First Name	May 26	May 27
EXTERNAL PARTICIPANTS			
Ashton	Chris	√	
Atkinson	Mary-Sue	Web	
Brunet	Elysia	√	√
Elliott	John	√	√
Korman	Josh		√
Latham	Steve	√	
Maynard	Jeremy	√	
Ogden	Athena	√	
Pestal	Gottfried		√
Staley	Mike	√	√
Tsurumi	Maia	Web	Web
Walters	Carl	Web	Web
Wilson	Ken		√
DFO PARTICIPANTS			
Bradford	Mike	√	
Brahniuk	Randy		√
Brown	Gayle	√	
Candy	John	√	
Cass	Al	√	√
Chamberlain	Mike	√	√
Dobson	Diana	√	
Folkes	Michael	√	
Godbout	Lyse		√
Grant	Sue	√	√
Grout	Jeff	√	√
Hargreaves	Brent	√	√
Holt	Carrie		√
Hume	Jeremy	√	
Huang	Ann-Marie	√	√
Joyce	Marilyn	√	√
Lewis	Dawn	√	
McHugh	Diana	√	√
Mortimer	Matt	√	√
Saunders	Mark	√	√
Sawada	Joel	√	√
Scroggie	Jamie	√	√
Supernault	Janine	√	
Tompkins	Arlene	√	√
Wood	Chris	√	
REVIEWERS			
Latham	Steve	Cultus	
Holtby	Blair	Fraser	
Korman	Josh	Fraser	

APPENDIX 4: TERMS OF REFERENCE



Terms of Reference

Regional Advisory Meeting

**Cultus Lake Sockeye Stock Status
2010 Barkley Sound Sockeye Forecast
2010 West Coast Vancouver Island Chinook Abundance Forecast
Updated Methods for Assessing Harvest Rules for Fraser River Sockeye Salmon**

***Centre for Scientific Advice Pacific (CSAP)*
26-27 May 2010
Pacific Biological Station
Nanaimo, BC**

Chairperson: Michael Chamberlain

Context

The CSAP Salmon Standing Committee meets routinely to conduct peer reviews of scientific information and advice related to stock assessments, harvest advice, assessment methodologies and management frameworks for salmon, as requested by Fisheries and Aquaculture Management (FAM) and Oceans, Habitat and Enhancement Branch (OHEB) in support of management decision making.

Objectives

This Regional Advisory Process will review and provide advice based on the assessments and analyses on the following four working papers.

Cultus Lake Sockeye Stock Status

The objective of this working paper is to determine and document the current status of the Cultus Lake Sockeye salmon stock, evaluate how this stock has responded to recovery actions to date (measured against Conservation Strategy objectives) and provide advice regarding the prospects for the recovery of this stock. Specifically, an evaluation of the utility of each recovery action undertaken (e.g. captive breeding, harvest control and predator removal) will be made. Recommendations as to the projected benefits of continuing recovery actions, and in what form, this will continue.

2010 Barkley Sound Sockeye Abundance Forecast & Stock Status Indicators Update

Barkley Sound Sockeye abundance forecasts are requested annually by Fisheries and Aquaculture management for pre-season fisheries planning activities. Quantitative abundance forecasts have been produced annually by DFO. The last review was conducted by PSARC in

2005. This interim assessment update will be based on a previously CSAS approved methodology, and will be presented as a Science Advisory Report. A technical working paper will not be presented.

2010 West Coast Vancouver Island Chinook Abundance Forecast & Stock Status Indicators Update

West Coast Vancouver Island Chinook abundance forecasts are requested annually by Fisheries and Aquaculture management and the Pacific Salmon Commission Chinook Technical Committee for pre-season fisheries planning activities. Quantitative abundance forecasts have been produced annually by DFO since 1996. A framework describing the methodology was last reviewed by PSARC in 2002. This interim assessment update be based on a previously CSAS approved methodology, and will be presented as a Science Advisory Report. A technical working paper will not be presented.

Methods for Assessing Harvest Rules for Fraser River Sockeye Salmon

The Fraser River Sockeye Spawning Initiative is a multi-year, collaboration planning process to develop a long term escapement strategy for Fraser River sockeye stocks. The objective of this working paper is to review the appropriateness of the methods developed and the simulations models used to evaluate alternate control rules associated with setting total allowable mortality targets, at different levels of abundance, for Fraser River Sockeye stocks.

Products

- CSAS Proceedings document summarizing the discussion (1)
- CSAS Science Advisory Report (4)
- CSAS Research Document (2)

Location and Date

Pacific Biological Station, Nanaimo, BC, 26-27 May 2010

Participants

Participants will include internal DFO representatives and potentially participants from the Province of British Columbia, academia, First Nations, NGO's and the fishing industry.