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**Proceedings of the PSARC
Salmon Subcommittee Meeting**

**May 11, 2004
Nanaimo, BC**

G. Thomas

**Fisheries and Oceans Canada
Pacific Scientific Advice Review Committee
Pacific Biological Station
Nanaimo, British Columbia V9T 6N7**

July 2004

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PACIFIC SCIENTIFIC ADVICE REVIEW COMMITTEE (PSARC) SALMON SUBCOMMITTEE MEETING

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SUMMARY

The Pacific Scientific Advice Review Committee (PSARC) Salmon Subcommittee met May 11, 2004 at the Pacific Biological Station, Nanaimo, B.C. to review one Working Paper.

Working Paper S2003-15: Habitat-Based Production Goals for Coho Salmon In Fisheries & Oceans Canada Statistical Area 3

The working paper describes a habitat-based model using estimates of stream length and mean smolt production for coho in the Nass River system. The approach derives estimates of the spawning escapement, S_{max} , that maximizes smolt production capacity. The Subcommittee concluded that the model provides a useful alternative for assessing the relative status of coho stocks in north coast river systems. The salmon subcommittee supported the modeled approach and accepted the working paper with some revisions.

SOMMAIRE

Le sous-comité du saumon du Comité d'examen des évaluations scientifiques du Pacifique (CEESP) s'est réuni le 11 mai 2004 à la Station biologique du Pacifique, située à Nanaimo, en Colombie-Britannique, pour passer en revue un document de travail.

Document de travail S2003-15 : Objectifs de production axés sur l'habitat pour le saumon coho dans le secteur statistique 3 de Pêches et Océans Canada

Ce document décrit un modèle axé sur l'habitat qui utilise des estimations de la longueur des cours d'eau et de la production moyenne de saumoneaux cohos dans le réseau hydrographique de la rivière Nass. Cette méthode permet d'obtenir des estimations de l'échappée de géniteurs S_{\max} , qui maximise la capacité de production de saumoneaux. Le sous-comité a conclu que le modèle une autre façon utile d'évaluer l'état relatif des stocks de saumon coho dans les réseaux fluviaux de la côte nord de la C.-B. Le sous-comité du saumon appuie donc la méthode de modélisation et accepte le document de travail sous réserve de quelques révisions.

INTRODUCTION

DETAILED COMMENTS FROM THE REVIEW

S2003-15: Habitat-Based Production Goals for Coho Salmon In Fisheries & Oceans Canada Statistical Area 3

R.C. Bocking, Dave Peacock

Subcommittee Discussion

The Subcommittee and both reviewers agreed that the habitat-based approach for estimating the spawning escapement (S_{\max}) that maximizes the mean smolt abundance for stream-type coho in Statistical Area 3 is appropriate. One reviewer acknowledged the large number of assumptions in the analysis and concluded that the choices of model inputs made by the authors were reasonable. The Subcommittee noted that the approach has been advanced in previous publications and is applied in other regions (Alaska, Washington and Oregon) to estimate juvenile freshwater rearing capacity. The Subcommittee could not conclude whether the method was superior to other existing methods for assessing stock status in the Nass area but concurred with the authors that it represents an effective alternative to existing methods. The authors noted that it is the only method for estimating juvenile rearing capacity of the Upper Nass (Meziadin) Area where indicator systems have not been established.

The Working Paper advanced two alternative models for developing a relationship between mean smolt abundance and stream length. Model 1 used historical estimates of mean smolt abundance and stream length for Alaskan and British Columbia streams. Model 2 used recent decadal smolt yield and stream length for three northern British Columbia coho indicator streams (Lachmach, Zolzap, and Toboggan). One reviewer wondered if spatial differences in the relationships would best be captured using latitudinal or bio-geographical categories rather than the arbitrary groupings representing Alaska, BC, Washington and Oregon used by the authors. The other reviewer questioned the use of stream order classification (i.e. 1= lower main stem; 6 = upper stream tributary) in the predictive relationship between smolt abundance and stream length. One participant identified an alternative analytical approach for assessing spatial effects in the smolt abundance – stream length relationship.

The Subcommittee agreed with the authors, based on the information in the Working Paper, that Model 1 is more representative compared to Model 2. One reviewer noted, however, that a more rigorous method for choosing between models should be considered in future development of the method. Area 3 was divided into 4 sub-areas in the Working Paper (Outer Area 3 Coastal, Coastal Nass, Lower Nass and Upper Nass). Estimates of S_{\max} were then predicted separately for each sub-area. The estimates of S_{\max} derived from Model 1 and Model 2 were similar except in the Upper Nass sub-area.

The Subcommittee recognized that many of the model parameters used to construct the relationship between mean smolt abundance and stream length were based on previous analyses of freshwater habitats outside the North Coast area. The Subcommittee agreed that the potential for bias in applying the relationship to other areas needs to be investigated. This is particularly important for the Upper Nass systems where habitat characteristics based on TRIM mapping techniques may be more affected by barriers to coho rearing such as the location and frequency of beaver dams. Furthermore, the Subcommittee agreed that methods should be developed to establish whether the estimates of S_{\max} are in fact fully seeding the juvenile freshwater habitat potentially using the indicator system approach.

The Subcommittee acknowledged and supported the extensive suggestions by the reviewers for consideration in future development of the model. Based on the reviews comments and Subcommittee discussion, specific revisions to the Working Paper should:

- 1) clarify Working Paper objectives and append the Request-For-Working-Paper (RFP) to the revised document.
- 2) relate objectives of the paper to current management practices.
- 3) modify introduction to emphasize need to develop of management objectives.
- 4) revise analysis comparing modelled smolt yields with observed yields to exclude data from the system (Zolzap) from which input parameters were derived.
- 5) Include additional analysis to better assess the validity of the area groupings in the relationship between mean smolt abundance and habitat characteristics.
- 6) acknowledge biasing influences on the smolt production data (e.g., non-natal rearing, and leaky counting fence) and if practical, use cwt data to illustrate possible biases in discrepancies between marked outmigrant smolts and returning adults.
- 7) address a reviewer's concern for potential error in the survival rate estimates used in the analysis.

Subcommittee Conclusions

- The Subcommittee accepted the Working Paper with revisions as outlined above.
- The Subcommittee accepted the authors' Model 1 methodology for estimating the spawning escapement (S_{\max}) that fully seeds the freshwater rearing habitat.

Subcommittee Recommendations

- 1) The Subcommittee recommended acceptance of the S_{\max} spawning escapements produced in the authors' Model 1 for each of four areas within Statistical Area 3 (Outer Coastal Area: 15,000; Coastal Nass Area: 30,000; Lower Nass Area: 26,000; Upper Nass Area: 168,000) as preliminary estimates of S_{\max} for stream-type coho in Area 3.
- 2) The Subcommittee recommended that ground-truthing of the juvenile coho rearing habitat area (i.e., refinement of data for analysis of TRIM maps) is required to test for potential bias in the base-line relationships used to define the relationship between stream length and mean smolt abundance. This is particularly important in the upper Nass Area where there is the greatest uncertainty in estimates of rearing habitat (e.g., errors in mapping, location of barriers, frequency of beaver dams).
- 3) The Subcommittee recommended that estimates of the spawning escapement that result in fully seeded habitats need to be validated potentially using the indicator system approach.

APPENDIX 1: Working Paper Summaries

S2003-15: Habitat-Based Production Goals for Coho Salmon In Fisheries & Oceans Canada Statistical Area 3

R.C. Bocking, David Peacock

Smolt production capability and the number of spawners that are required in order to fully seed the available habitat were estimated for 102 coho streams in Statistical Area 3 using a habitat-based model. Stream length accessible to coho salmon was determined from terrain resource inventory maps (TRIM) using GIS. Stream order, gradient and known barriers were used to define the accessible length of stream. The average number of smolts per kilometre was derived using two models. The first used a log-linear predictive regression of smolt yield and stream length for Alaskan and British Columbia streams. The second used recent decadal smolt yield and stream length for three northern British Columbia coho indicator streams (Lachmach, Zolzap, and Toboggan). Estimates of smolt production capability and required spawner numbers were stratified into four geographic regions of Statistical Area 3; Outer Coastal Area, Outer Nass Area, Lower Nass Area, and Nass River Area. The predicted smolt yield from both models for Zolzap Creek was comparable to maximum smolt yield from Ricker and Hockey Stick smolt-recruitment relations. However, the estimated required number of spawners to seed the available habitat in Zolzap Creek, and for all streams in general was highly variable and depended on the assumed values of egg-to-smolt survival and the number of smolts produced per spawner.

APPENDIX 2: PSARC Salmon Subcommittee Meeting Agenda, May 11, 2004

PSARC Salmon Subcommittee Meeting
May 11, 2004
Seminar Room, PBS, Nanaimo

Tuesday May 11, 2004

9:00 – 9:15	Introduction and procedures
9:15 – 12:00	Habitat-Based Production Goals for Coho Salmon In Fisheries & Oceans Canada Statistical Area 3
12:00 – 1:00	Lunch
1:00 – 2:30	Further discussion as required.

APPENDIX 3: List of Attendees

Subcommittee Chair:
PSARC Chair:

Greg Thomas
Al Cass

NAME	Tuesday (11)	AFFILIATION
EXTERNAL PARTICIPANTS		
Argue, Sandy	✓	BC Ministry
Atkinson, Mary-Sue	✓	Pacific Fisheries Resource Cons.
Blackbourn, Dave	✓	Consultant
Harling, Wayne	✓	SFAB
DFO MEMBERS		
* Subcommittee Members		
Baillie, Richard	✓	
Baillie, Steve	✓	
Brown, Gayle*	✓	
Brown, Tom	✓	
Cass, Al*	✓	
Cook, Roberta*	✓	
Grout, Jeff*	✓	
Ionson, Bert	✓	
Irvine, James*	✓	
McNicol, Rick*	✓	
Parken, Chuck*	✓	
Riddell, Brian	✓	
Sawada, Joel	✓	
Simpson, Kent*	✓	
Thomas, Greg*	✓	
Tompkins, Arlene*	✓	
Trudel, Mark	✓	
Wood, Chris*	✓	

Reviewers for the PSARC papers presented at this meeting are listed below, in alphabetical order. Their assistance is invaluable in making the PSARC process work.

Bradford, Mike	Fisheries and Oceans
Parken, Chuck	Fisheries and Oceans