

Response to Marine Stewardship Council

Indicators for Principle 1 - Stock Assessment and Stock Status

Pacific Wild Salmon Fishery

Skeena River Sockeye

Fisheries and Oceans Canada

Pacific Region

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Introduction

The BC Salmon Marketing Council (BCSMC) has applied to the Marine Stewardship Council for certification of the BC wild salmon fishery. In June 2003, accredited certifier Scientific Certification Systems Inc published the evaluation team's Units of Certification, Performance Indicators and Scoring Guidelines that describe in detail how the fishery will be evaluated. SCS has defined 47 indicators under the three Principles.

This document, prepared with the assistance of Fisheries and Oceans Canada, is the BCSMC's technical submission on the indicators for Skeena sockeye for Principle 1. Principle 1 examines stock assessment procedures and examines whether the procedures in place are adequate to ensure that the fishery is sustainable.

The Scoring Guideposts as identified by MSC have been colour coded to indicate the level of agreement with the statements.

Green - The requirements of the guidepost have been met.

Red - The requirements of the guidepost have not been met.

Orange - The requirements of the guidepost have partially been met.

Black - The requirements of the guidepost are not applicable to the Skeena sockeye fishery

Indicator 1.1.1.1

The stock units are well defined for the purposes of conservation, fisheries management and stock assessment.

DFO Response

Current Situation

Stock Unit Definitions

Stock units are currently defined and used at four levels of resolution.

- Lake
- Spawning areas within a Lake system
- Run timing aggregates
- Watershed aggregate

Skeena River Sockeye Lakes

Skeena River sockeye lakes are distributed from the coast to the high interior regions and vary in size and productivity.¹ The Skeena system has one very large sockeye rearing lake (Babine-Nilkitkwa) and 28 smaller ones². Babine Lake was enhanced in the late 1960s and early 1970s with the development of the Pinkut Creek and Fulton River spawning channels³. Babine Lake accounts for two-thirds of the total Skeena sockeye lake surface area⁴ and an estimated 90% of the smolt production potential⁵.

Other Skeena nursery lakes considered secondary sockeye producers include: Alastair, Bear, Johanson, Kitsumkalum, Kitwanga, Lakelse, Morice, Morrison, Sustut and Swan. These 10 lakes account for 29% of the total Skeena sockeye lake surface area and 7% of the smolt production potential.

There are 18 smaller Skeena lakes that are utilised by juvenile sockeye: Aldrich, Asitka, Atna, Azuklotz, Club, Damshlgwit, Dennis, Johnston, Kluatantan, Kluayaz, McDonell, Motase, Sicintine, Stephens, Slamgeesh, Spawning, Maxan, and Bulkley. These smaller lakes account for 4% of the total Skeena sockeye Lake surface area and 3% of the smolt production potential. Several of the smaller lakes are part of larger lake systems within the same drainage watershed.

Skeena Sockeye Production Area	Number of Lakes	Skeena Sockeye Lake Surface Area	Skeena Sockeye Smolt Production
Babine Lake	1	67%	90%
Other Skeena Nursery Lakes	10	29%	7%
Smaller Skeena Lakes	18	4%	3%

¹ Cox-Rogers, S., J. Hume, and K.S. Shortreed. 2003. Stock status and lake-based production relationships for wild Skeena River sockeye salmon. PSARC Working Paper S2003-09. Fisheries and Oceans Canada, Nanaimo, BC ; Figure 1.

² Cox-Rogers, S., J. Hume, and K.S. Shortreed. 2003. Stock status and lake-based production relationships for wild Skeena River sockeye salmon. PSARC Working Paper S2003-09. Fisheries and Oceans Canada, Nanaimo, BC ; Table 1.

³ West , C.J., and J.C. Mason. 1987. Evaluation of sockeye salmon (*Oncorhynchus nerka*) production from the Babine Lake Development Project. Pp. 176-190 in H.D. Smith, L. Margolis, and C.C. Wood (ed.) Sockeye salmon (*Oncorhynchus nerka*) population biology and future management. Can. Spec. Publ. Fish. Aquat. Sci. 96.

⁴ Cox-Rogers, S., J. Hume, and K.S. Shortreed. 2003. Stock status and lake-based production relationships for wild Skeena River sockeye salmon. PSARC Working Paper S2003-09. Fisheries and Oceans Canada, Nanaimo, BC ; Table 1.

⁵ Cox-Rogers, S., J. Hume, and K.S. Shortreed. 2003. Stock status and lake-based production relationships for wild Skeena River sockeye salmon. PSARC Working Paper S2003-09. Fisheries and Oceans Canada, Nanaimo, BC ; Table 5.

Spawning Areas Within a Lake System

Tagging studies⁶ identified three distinct runs of sockeye into Babine Lake (early, mid, and late-timing). Wood et al⁷ concluded that these runs are sub-populations rather than distinct populations because they are connected by relatively high rates of gene flow.

Outside the Babine several of the smaller lakes are part of larger lake systems within the same drainage watershed. Co-joined lake systems include Aldrich-Dennis-McDonnell in the Zymoetz River drainage, Azuklotz-Bear in the Bear River drainage, Atna-Morice in the Morice River drainage, Club-Stephens-Swan in the Kispiox River drainage, the Damshilgwit-Slameesh in the Slameesh River drainage, and the Morrison-Babine-Nilkikwa in the Babine River drainage. The level of gene flow among the sockeye populations homing to each of these lakes is not known.

Escapements for Skeena River sockeye are enumerated at numerous spawning areas with 102 census locations sampled at least once historically⁸. In any given year, far fewer locations are sampled; in recent years 35-40 is the norm. McKinnell and Rutherford (1994)⁹ reviewed the methods for estimating non-Babine sockeye escapements. The Pacific Fisheries Resource Conservation Council provides a summary of Skeena sockeye escapement for wild and enhanced stocks¹⁰.

Run Timing

Ocean fisheries that harvest Skeena River sockeye operate on a mixed stock aggregate¹¹. There are no opportunities to isolate component stocks spatially in ocean fisheries. The 26 non-Babine stocks are aggregated into three groups based on their run timing (early:Alastair, Atna, Bulkley, Johnston, Lakelse, Maxan, Morice; Mid:Aldrich, Asitka, Club, Damshilgwit, Den-

⁶ Smith, H.D., and F.P. Jordan. 1973. Timing of Babine Lake sockeye stocks in the north-coast commercial fishery as shown by several taggings at the Babine counting fence and rates of travel through the Skeena and Babine Rivers. Fish. Resr. Bd. Can. Tech Rep. 418.

⁷ Wood, C.C., D.T. Rutherford, D. Bailey, and M. Jakubowski. 1998. Assessment of sockeye salmon production in Babine Lake, British Columbia with forecast for 1998. Can. Tech. Rep. Fish. Aquat. Sci. 2241: 50 p.

⁸ DFO escapement database Prince Rupert, spilstedb@dfo-mpo.gc.ca

⁹ McKinnell, S., and D. Rutherford. 1994. Some sockeye salmon are reported to spawn outside the Babine Lake watershed in the Skeena drainage. PSARC Working Paper S94-11: 52 p.

¹⁰ Riddell, Brian. 2004. Pacific salmon resources in central and northern British Columbia. Vancouver,BC:Pacific Fisheries Resource Conservation Council. Pages 29 to 35.

¹¹ Sprout, P.E., and R.K. Kaduwaki. 1987. Managing the Skeena River sockeye salmon (*Oncorhynchus nerka*) fishery - the process and the problems. pp. 385-395 in H.D. Smith, L. Margolis, and C.C. Wood (ed.) Sockeye salmon (*Oncorhynchus nerka*) population biology and future management. Can. Spec. Publ. Fish. Aquat. Sci. 96. Pages 386 to 389.

nis, Johanson, Kluatantan, Kluayaz, McDonell, Motase, Sicintine, Slamgeesh, Spawning, Stephens, Sustut, Swan; late: Azuklotz, Bear, Kitsumkalum, Kitwanga)¹².

Inland fisheries target enhanced sockeye stocks in areas adjacent to the spawning channels at Pinkut and Fulton Rivers where there is complete isolation from other sockeye populations. There are also harvest opportunities to target enhanced stocks in terminal fisheries in the Babine River (outlet of Babine Lake) where significant timing differences separate the majority of the wild stocks (the early tributaries and the late Babine River) from the mid-timed enhanced stocks. Fishing opportunities in the mainstem Skeena below the Babine River confluence provide intermediate opportunities for temporal or spatial isolation.

Watershed Aggregate

The most aggregated stock unit includes all Skeena watershed sockeye stocks. This unit applies to the Pacific Salmon Treaty agreements with the US. Treaty arrangements apply only to the aggregate and do not recognise disaggregated stock units¹³.

Purposes for Stock Unit Definitions

Stock Assessment

For purposes of assessment, stock units are well defined. The Pacific Salmon Treaty reconstruction model for northern British Columbia and SE Alaska sockeye provides reconstructions for the watershed unit^{14, 15}. Formal forecasts for Skeena sockeye are produced for the watershed aggregate stock¹⁶.

Production assessments are generally conducted based upon the Lake stocks spend their juvenile life stage and have been reviewed in 2003 through PSARC¹⁷. Wild and enhanced sockeye

¹² Cox-Rogers, S., J. Hume, and K.S. Shortreed. 2003. Stock status and lake-based production relationships for wild Skeena River sockeye salmon. PSARC Working Paper S2003-09. Fisheries and Oceans Canada, Nanaimo, BC ; Table 2.

¹³ Pacific Salmon Treaty, Amended June 30, 1999 Chapter 2 and associated Appendix. Pages 25 to 29

Copy available <http://www.psc.org/Treaty/Treaty.pdf>

¹⁴ Gazey, W.J. and K.K. English. 2000. Assessment of sockeye and pink salmon stocks in the northern boundary area using run reconstruction techniques, 1982-95. Can. Tech. Report Fish. Aquat. Sci. No. 2320. 132 p.

¹⁵ English, K.K., and W.J. Gazey, D. Peacock and G. Oliver. 2003. Assessment of the Canadian and Alaskan sockeye stocks harvested in the northern boundary fisheries using run reconstruction techniques, 1982-2001. Can Tech. Report Fish. Aquat. Sci. XX:XX p.

¹⁶ Cox-Rogers, S. 2003. Pre-season 2003 stock size forecasts for Skeena River and Nass River sockeye salmon. PSARC Working paper S2003-01. Fisheries and Oceans Canada, Nanaimo, BC

¹⁷ Cox-Rogers, S., J. Hume, and K.S. Shortreed. 2003. Stock status and lake-based production relationships for wild Skeena River sockeye salmon. PSARC Working Paper S2003-09. Fisheries and Oceans Canada, Nanaimo, BC ;

juveniles are present in Babine Lake; production dynamics of both components have been extensively assessed^{18, 19}.

Conservation

Stock units are well defined for purposes of conservation. There is biological information to distinguish stocks but no evidence of population sub-structure to warrant further division below Lake units.

Fisheries Management

For purposes of fisheries management, stock units are well defined. Skeena River sockeye are caught in a complex array of mixed-stock fisheries in southern southeast Alaska, northern British Columbia (Statistical Areas 1 through 5), and in First Nations' food, social, and ceremonial (FSC) fisheries and escapement surplus to spawning requirement (ESSR) fisheries within the Skeena River. Sprout and Kadowaki (1987)²⁰ provide a historical review of the marine commercial fishery and its management.

Stock units are watershed aggregates for Pacific Salmon Treaty management and lake or run-timing units for domestic fisheries management. A daily in-season management model for ocean fisheries (Cox-Rogers 1994)²¹ is used to develop fishing plans, to manage the Area 3/4/5 fishery in-season and for post-season assessments. This model provides multi-species, stock-specific harvest impact evaluations for Canadian ocean fisheries²². The ocean model is being expanded to include stock and fishery evaluations for Skeena in-river fisheries²³.

Within Babine Lake, tributary-specific timing information is used to manage terminal fisheries on tributary spawning stocks within the Lake.

Scoring Summary

Both 60 Scoring Guideposts have been met.

¹⁸ Levy, D.A., and K.J. Hall. 1985. A review of the limnology and sockeye salmon ecology of Babine Lake. Westwater Research Centre, UBC, Canada, Tech Rep. No. 27. 78p.

¹⁹ Wood, C.C., D.T. Rutherford, D. Bailey, and M. Jakubowski. 1998. Assessment of sockeye salmon production in Babine Lake, British Columbia with forecast for 1998. Can. Tech. Rep. Fish. Aquat. Sci. 2241: 50 p.

²⁰ Sprout, P.E., and R.K. Kadowaki. 1987. Managing the Skeena River sockeye salmon (*Oncorhynchus nerka*) fishery - the process and the problems. pp. 385-395 in H.D. Smith, L. Margolis, and C.C. Wood (ed.) Sockeye salmon (*Oncorhynchus nerka*) population biology and future management. Can. Spec. Publ. Fish. Aquat. Sci. 96. Pages 389 to 394.

²¹ Cox-Rogers, S. 1994. Description of a daily simulation model for the Area 4 commercial salmon fishery. Can. Man. Rep. Fish. Aquat. Sci. 2256. 46p.

²² Cox-Rogers, S. 2003 Skeena Sockeye, Coho, and Steelhead Post-Season Review. DFO unpublished memo.

²³ Gazey, W.J. 2001. Documentation for the Skeena River Allocation Model (W.J.Gazey Research, Victoria, B.C.)18p.

Both 80 Scoring Guideposts have been met.

Both 100 Scoring Guideposts have been met.

Future Changes

A Wild Salmon Policy is under development. This Policy will describe the future framework for identifying conservation units for all species of salmon that will be used for both assessment and management purposes. A draft policy paper was publicly released in 2000 that outlined many elements of this new approach. It is presently being reviewed and revised while operational guidelines are developed

100 Scoring Guidepost

- There is an unambiguous description of each stock unit, including: its geographic location, run timing, details on all the component stocks, and rational for its definition.
- The rationale for each stock unit is clear with regard to conservation, fisheries management and stock assessment requirements.

80 Scoring Guidepost

- The stock units are well defined and include details on the major component stocks.
- The rationale for each stock unit for the target species is clear with regard to conservation, fisheries management and stock assessment requirements.

60 Scoring Guidepost

- The majority of stock units are defined.
- The rationale for the majority of stock units for the target species is clear with regard to conservation, fisheries management and stock assessments.

Indicator 1.1.1.2

There is general scientific agreement that the stock units are appropriate.

DFO Response

Current Situation

Stock units are described in Indicator 1.1.1.1.

The stock units for Skeena sockeye have been reviewed and accepted through the PSARC process²⁴ that includes scientists from outside the management agency.

²⁴ Cox-Rogers, S., J. Hume, and K.S. Shortreed. 2003. Stock status and lake-based production relationships for wild Skeena River sockeye salmon. PSARC Working Paper S2003-09. Fisheries and Oceans Canada, Nanaimo, BC ;

The stock units for the main non-target species steelhead and coho have been reviewed and accepted through the PSARC process^{25, 26} that includes scientists from outside the management agency. The steelhead PSARC paper was prepared by scientists outside the management agency.

Scoring Summary

The 60 Scoring Guidepost has been met.

The 80 Scoring guideposts have been met.

The three 100 Scoring Guideposts have been met.

100 Scoring Guidepost

- The stock units for target species have been reviewed and found to be scientifically defensible and appropriate by the Pacific Scientific Advice Review Committee or the appropriate Pacific Salmon Commission technical committee.
- There is general agreement among regional fisheries scientists outside the management agency that the stock units are appropriate.
- There is general scientific agreement regarding the stock units for non-target species.

80 Scoring Guidepost

- There is general agreement among regional fisheries scientist within the management agency that the stock units are appropriate for target species.
- There is no significant scientific disagreement regarding the stock units used by the management agency to formulate management decision for the fishery.

60 Scoring Guidepost

- There is general agreement among regional fisheries scientist within the management agency that the majority of stock units are appropriate for target species.

Indicator 1.1.1.3

The geographic range for harvest of each stock unit in the fishery is known.

²⁵B. Holtby, B. Finnegan, D. Chen and D. Peacock. 1999. Biological Assessment of Skeena River coho salmon. PSARC Working Paper S1999-09. Fisheries and Oceans Canada, Nanaimo, BC ;

²⁶Ward, B.R., A.F. Tautz, S. Cox-Rogers and R.S. Hooton. 1993. Migration Timing and Harvest Rates of the Steelhead Trout Populations in the Skeena River System. PSARC Working Paper S1993-06. Fisheries and Oceans Canada, Nanaimo, BC

DFO Response

Current Situation

A reconstruction model is used for post-season evaluation of the geographic range of harvest for Skeena sockeye²⁷. The data required for these reconstructions are (aggregated catch) by time and area, daily escapement by population (stock), the residence time of each population in each harvest area, and the routing of the populations. Migration routes and residence time for each stock were initially defined using information from the 1982-83 north coast tagging studies²⁸. The model then incorporates any direct stock composition estimates (derived from DNA or scale samples)²⁹ to provide weekly catch estimates by sockeye stock for each ocean fishery in Canada and Alaska. The results from these run reconstructions have been accepted by Canadian and the US as the most reliable annual estimates of stocks and fishery specific catch and exploitation rates for each of the major sockeye stock groups harvested in northern boundary fisheries (Nass, Skeena, two Alaskan sockeye stock aggregates and the Stikine River).

In addition, for sockeye fisheries in the areas adjacent to the Skeena River, the Skeena Model (an in-season weekly management model that incorporates sub-area specific catches and effort to evaluate harvest impacts for all species) provides in-season information on the harvest range for Skeena sockeye.³⁰

There is excellent information available on the geographic range of harvest for coho, including in-season evaluations from Alaskan and Canadian fisheries.³¹

The geographic distribution of steelhead harvests is well understood.³²

Both coho and steelhead are non-target species that are not retained and must be released.

²⁷ English, K.K., and W.J. Gazey, D. Peacock and G. Oliver. 2003. Assessment of the Canadian and Alaskan sockeye stocks harvested in the northern boundary fisheries using run reconstruction techniques, 1982-2001. Can Tech. Report Fish. Aquat. Sci. XX:XX p.

²⁸ Pella, J., M. Hoffman, M. Hoffman, S. Hoffman, M. Masuda, S. Nelson and L. Tally. 1993. Adult sockeye and pink salmon tagging experiments for separating stocks in Northern British Columbia and Southeast Alaska, 1982-1985. NOAA Technical Memorandum NMFS-AFSC-18.

²⁹ Beacham, T.D., C.C. Wood, R.E. Withler, K.D. Le, and K.M. Miller. 2000. Application of microsatellite DNA variation to estimation of stock composition and escapement of Skeena River sockeye salmon (*Oncorhynchus nerka*). N. Pac. Anad. Fish. Comm. Res. Bull. 2: 263-276.

³⁰ Cox-Rogers, S. 1994. Description of a daily simulation model for the Area 4 commercial salmon fishery. Can. Man. Rep. Fish. Aquat. Sci. 2256. 46p.

³¹ S.P. Cox, J. Sawada, W. de la Mare. In-season forecasting of North Coast coho salmon marine survival: A decision-analytic method and retrospective analysis. PSARC Working Paper S2003-11. Fisheries and Oceans Canada, Nanaimo, BC

Scoring Summary

All 60, 80 and 100 Scoring Guideposts have been achieved.

100 Scoring Guidepost

- The geographic range for harvests of each stock unit in the fishery is estimated and documented each year.
- The information on the geographic range of harvests is monitored during the fishing season and used when making in-season management decisions.

80 Scoring Guidepost

- The geographic range for harvests of target stocks is defined.
- The information on the geographic range of the harvests of target stocks is monitored during the fishing season and is sufficient to prevent the over harvesting of these stocks.
- The information available on the geographic range for harvest of non-target stocks is sufficient to prevent the over-harvesting of these stocks.

60 Scoring Guidepost

- The information available on the geographic range for harvests of target or non-target stocks is sufficient to prevent the over-harvesting for the majority of the stocks within each stock unit.

Indicator 1.1.1.4

Where indicator stocks are used as the primary source of information for making management decisions on a larger group of stocks in a region, the status of the indicator stocks reflects the status of other stocks within the management unit.

DFO Response

Current Situation

The target fisheries on Skeena sockeye do not rely on indicator stocks.

The only non-target stock occurring in significant numbers in the Skeena sockeye fishery that relies on indicator stocks is coho. The indicator stocks have been reviewed through PSARC³³ and the approach includes a specific objective to annually evaluate extensive coho escapements to evaluate the utility of the indicators.

³³ B. Holtby, B. Finnegan, D. Chen and D. Peacock. 1999. Biological Assessment of Skeena River coho salmon. PSARC Working Paper S1999-09. Fisheries and Oceans Canada, Nanaimo, BC ;

Scoring Summary

This indicator applies only peripherally to the Skeena sockeye fishery. For coho the 60, 80 and 100 Scoring Guidelines are all met.

100 Scoring Guidepost

- The status of the indicator stocks is well correlated with the stocks that are most at risk from a conservation point of view, not just correlated with the most productive stocks in the region.
- The indicator stocks used have been reviewed and found to be scientifically defensible and appropriate by the Pacific Scientific Advice Review Committee or the appropriate Pacific Salmon Commission technical committee.
- There is general agreement among regional fisheries scientists outside the management agency that the indicator stocks are appropriate.
- The relationships between indicator stocks and stocks of interest are assessed every three to five years.

80 Scoring Guidepost

- There is general agreement among regional fisheries scientists within the management agency that the status of indicator stocks reflects the status of other stocks within the management unit.
- There is no significant scientific disagreement regarding the indicator stocks used by the management agency to formulate management decisions for the fishery.

60 Scoring Guidepost

- There is a scientific basis for the indicator stocks used in the management of the fishery.

Indicator 1.1.1.5

Where stock units are composed of significant numbers of fish from enhancement activities, the management system provides for identification of the enhanced fish and their harvest without adversely impacting the diversity, ecological function or viability of un-enhanced stocks.

DFO Response

Current Situation

The Skeena sockeye returns include a high proportion of Babine sockeye.³⁴ The majority of the Babine stock is enhanced³⁵ (Pinkut and Fulton spawning channels)³⁶.

Ocean fisheries that harvest Skeena River sockeye operate on a mixed stock aggregate³⁷. There are no opportunities to isolate component stocks spatially in ocean fisheries.

Inland fisheries target enhanced sockeye stocks in areas adjacent to spawning channels at Pinkut and Fulton Rivers where there is complete isolation from other sockeye populations.

There are also harvest opportunities to target enhanced stocks in terminal fisheries in the Babine River (outlet of Babine Lake) where significant timing differences separate the majority of the wild stocks (the early tributaries and the late Babine River) from the mid-timed enhanced stocks. Fishing opportunities in the mainstem Skeena below the Babine River confluence provide intermediate opportunities for temporal or spatial isolation.

The management and assessment frameworks for Skeena sockeye are focused on the challenge of managing the fishery to meet conservation objectives while providing harvest opportunities^{38 39}. The assessment program identifies spatial and temporal patterns in enhanced sockeye migrations relative to wild stocks as part of the basic assessment-management

³⁴ McKinnell, S., and D. Rutherford. 1994. Some sockeye salmon are reported to spawn outside the Babine Lake watershed in the Skeena drainage. Fisheries and Oceans Canada, Pacific Stock Assessment Review Committee Working Paper S94-11:52 p.

³⁵ Wood, C.C., D.T. Rutherford, D. Bailey, and M. Jakubowski. 1998. Assessment of sockeye salmon production in Babine Lake, British Columbia with forecast for 1998. Can. Tech. Rep. Fish. Aquat. Sci. 2241: 50 p.

³⁶ West, C.J., and J.C. Mason. 1987. Evaluation of sockeye salmon (*Oncorhynchus nerka*) production from the Babine Lake Development Project. pp. 176-190 in H.D. Smith, L. Margolis, and C.C. Wood (ed.) Sockeye salmon (*Oncorhynchus nerka*) population biology and future management. Canadian Special Publication of Fisheries and Aquatic Sciences 96

³⁷ Sprout, P.E., and R.K. Kaduwaki. 1987. Managing the Skeena River sockeye salmon (*Oncorhynchus nerka*) fishery – the process and the problems. pp. 385-395 in H.D. Smith, L. Margolis, and C.C. Wood (ed.) Sockeye salmon (*Oncorhynchus nerka*) population biology and future management. Can. Spec. Publ. Fish. Aquat. Sci. 96.

³⁸ Wood, C.C. 2001. Managing biodiversity in Pacific Salmon: the evolution of the Skeena River sockeye salmon fishery in British Columbia *chapter in:* B. Harvey and D. Duthie (ed.). Blue Millennium: Managing Global Fisheries for Biodiversity. Pages 12 to 17.

available at <http://www.unep.org/bpsp/HTML%20files/TS-Fisheries2.html>

³⁹ 2004 North Coast IFMP pages 32 - 38

model⁴⁰. There is no real-time mark recovery program as there are currently no practical techniques for marking large channel production (up to 200 million fry).

Skeena harvest guidelines incorporate goals and objectives for un-enhanced stocks. The Skeena management process has changed dramatically in response to conflicts between objectives for enhanced and un-enhanced stock⁴¹ particularly coho and steelhead.

The focus of Skeena fisheries management is management of wild sockeye stocks. Significant changes introduced in the fishery in recent years will continue to be refined (e.g. reduced harvest rates in the marine areas and downstream from the Babine River).⁴²

Scoring Summary

The 60 and 80 Scoring Guideposts are met.

The first 100 Scoring Guidepost has been partially met (terminal inland fisheries), the second 100 guidepost has been met, and the third 100 guidepost has not been met.

100 Scoring Guidepost

- **Fisheries targeting enhanced stocks are geographically removed from un-enhanced stocks and separate terminal harvest areas are established for these fisheries.**
- **Times and areas have been identified where the majority of enhanced fish migrate through the general fishery.**
- **There is real time mark recovery program during the prosecution of the fishery that allows determination of harvest rates of the enhanced component of the run and this data is used in regulation of the fishery.**

80 Scoring Guidepost

- **In fisheries where both enhanced and un-enhanced stocks are harvested at the same time, the harvest guidelines are based on the goals and objectives established for the un-enhanced stocks.**
- **There are adequate data and analyses to determine that the presence of enhanced fish in the management units do not adversely impact the un-enhanced fish stocks.**

⁴⁰ Cox-Rogers, S. 1994. Description of a daily simulation model for the Area 4 commercial salmon fishery. Can. Man. Rep. Fish. Aquat. Sci. 2256. 46p.

⁴¹ Wood, C.C. 2001. Managing biodiversity in Pacific Salmon: the evolution of the Skeena River sockeye salmon fishery in British Columbia *chapter in:* B. Harvey and D. Duthie (ed.). Blue Millennium: Managing Global Fisheries for Biodiversity. Pages 12 to 17. Available at <http://www.unep.org/bpsc/HTML%20files/TS-Fisheries2.html>

⁴² 2004 North Coast IFMP pages 32 - 38

60 Scoring Guidepost

- There is general scientific agreement within the management agency regarding the impacts of enhanced fish on the resultant harvest rates or escapements of un-enhanced fish stocks.
- Managers have some scientific basis for assuring that harvest rates for enhanced stocks are not adversely affecting the majority of un-enhanced stocks within each stock unit.

Indicator 1.1.2.1

Estimates exist of the removals for each stock unit.

DFO Response

Current Situation

Commercial catch and by-catch estimates for all fisheries in Canadian waters are gathered through haul-ins, boat counts and landing slips. Catch reporting systems are closely scrutinized because of the catch accounting requirements of the Nisga'a Treaty and the Pacific Salmon Treaty . Removals from Skeena run-timing units (weekly) are estimated in-season (and refined post-season) by applying weekly harvest rates using the Skeena Model⁴³

First Nation catch information is available for most Skeena First Nation fisheries.

Recreational catch information is of poorer quality, available only from periodic creel survey programs, although catches are generally small relative to commercial.

Fisheries and Oceans Canada has done studies on mortality rates for the majority of released species for all sectors. Mortality rates are available from Fisheries and Oceans Canada. Where empirical studies are not available, professional judgment is used in the estimation of mortality rates. Mortality rates by species and gear are incorporated in the Skeena model as part of the procedure for estimating harvest rates⁴⁴.

Commercial and recreational catch estimates for all salmon species are provided annually for SE Alaskan fisheries through the Pacific Salmon Treaty Process⁴⁵.

Removals from Skeena run-timing units (weekly) are estimated in-season (and refined post-season) by applying weekly harvest rates using the Skeena Model⁴⁶

⁴³ Cox-Rogers, S. 1994. Description of a daily simulation model for the Area 4 commercial salmon fishery. Can. Man. Rep. Fish. Aquat. Sci. 2256. 46p.

⁴⁴ Cox-Rogers, s. 2003. 2003 Skeena Sockeye, Coho and Steelhead Post-season Review. DFO Memorandum October 28, 2003. Page 11.

⁴⁵ [TCNB \(02\)-2](#)  - U.S./Canada Northern Boundary Area 2001 Salmon Fisheries Management Report and 2002 Preliminary Expectations. January, 2002.

First Nation catch information is available for most Skeena First Nation fisheries.

Scoring Summary

The information presented establishes that estimates exist of the removals for each stock unit.

All of the Scoring Guideposts for the 60, 80 and 100 levels have been met.

100 Scoring Guidepost

- Catch estimates are available for all fisheries in Canadian waters that harvest the target and non-target stocks harvested in the fishery being evaluated.
- Mortality rates are available for the fish released or discarded during the fishery.
- Catch estimates are available for fisheries outside Canadian waters that harvest the stocks that are the target of the fishery being evaluated.

80 Scoring Guidepost

- Catch estimates are available for all target stocks harvested in the fishery.
- Catch estimates are available for non-target stocks where the catch of the non-target stock may represent a significant component of the harvest of that stock.
- Mechanisms exist to ensure accurate catch reporting and these mechanisms are evaluated at least once every 5 years.

60 Scoring Guidepost

- Catch estimates for the majority of target stocks are available.
- Catch estimates are available for non-target stocks where the catch of the non-target stocks may represent a significant component of that stock.
- Mechanisms exist to ensure accurate catch reporting and these mechanisms are evaluated at least once every 10 years.

Indicator 1.1.2.2

Estimates exist of the spawning escapement for each stock unit.

⁴⁶ Cox-Rogers, S. 1994. Description of a daily simulation model for the Area 4 commercial salmon fishery. Can. Man. Rep. Fish. Aquat. Sci. 2256. 46p.

DFO Response

Current Situation

Escapements for Skeena River sockeye are enumerated at many spawning areas (102 census locations have been sampled at least once historically)⁴⁷. In any given year, far fewer locations are sampled; in recent years 35-40 enumeration sites is the norm.

McKinnell and Rutherford (1994)⁴⁸ reviewed methods for estimating non-Babine sockeye.

The Pacific Fisheries Resource Conservation Council provides a summary of Skeena sockeye escapement for wild and enhanced stocks.⁴⁹

Sockeye juvenile surveys, used as a proxy for adult escapement estimates, are only available periodically⁵⁰.

The Skeena test fishery provides in-season indices of escapement by species.⁵¹

Representative spawning ground escapements for a sub-set of the spawning areas are provided annually for all species.

Scoring Summary

Both of the 60 Scoring Guideposts have been met.

All of the 80 Scoring Guideposts has been met.

Both of the 100 Scoring Guideposts have been partially met.

100 Scoring Guidepost

- Estimates are available for the annual escapement for each stock unit harvested in the fishery.
- In-season escapement data are collected for all stock units and used to regulate the fishery.

⁴⁷ DFO escapement database Prince Rupert, spilstedb@dfo-mpo.gc.ca

⁴⁸ McKinnell, S., and D. Rutherford. 1994. Some sockeye salmon are reported to spawn outside the Babine Lake watershed in the Skeena drainage. PSARC Working Paper S94-11: 52 p.

⁴⁹ Riddell, Brian. 2004. Pacific salmon resources in central and northern British Columbia. Vancouver, BC:Pacific Fisheries Resource Conservation Council. Pages 29 to 35.

⁵⁰ Cox-Rogers, S., J.M.B. Hume and K.S. Shortreed. 2003. Stock status and lake-based production relationships of wild Skeena River sockeye stocks. PSARC working paper S2003-09, DFO, Nanaimo. 62p

⁵¹ Cox-Rogers, S. and L. Jantz. 1993. Recent trends in the catchability of sockeye salmon in the Skeena River gillnet test fishery and impacts on escapement estimation. Can. Man. Rep. Fish. Aquat. Sci. No. 2219. 19p.

80 Scoring Guidepost

- Estimates are available for the annual escapement of each target stock harvested in the fishery.
- Fishery independent indicators of abundance are available for the non-target species harvested in the fishery.
- In-season escapement data are collected for the target stocks and used to regulate the fishery.

60 Scoring Guidepost

- Escapement estimates for target stocks are available, where escapement estimates are necessary to protect the target stock from overexploitation.
- Fishery independent indicators of abundance are available for non-target stocks where the fishery harvests may represent a significant component of the harvest of that stock.

Indicator 1.1.2.3

The age and size of catch and escapement have been considered, especially for the target stocks.

DFO Response

Current Situation

Age data for sockeye is collected from catch in Canadian ocean fisheries using a prescribed sampling plan. Age and size information is collected for all species from the Skeena test fishery. The data is maintained by DFO Prince Rupert.

Periodic monitoring programs are in place to collect information on age and size of other species in ocean fisheries catch.

Sampling programs are not in place for recreational or First Nations fisheries.

Scoring Summary

The 60 scoring guidepost is met.

The 80 scoring guideposts are met.

The 100 scoring guidepost has been partially met.

100 Scoring Guidepost

- Annual monitoring programs collect data on the age and size of the catch and escapement for target and non-target stocks where there is a clear scientific basis for collecting these data.

80 Scoring Guidepost

- Periodic monitoring programs collect data on the age and size of the catch and escapement for target stocks, and for non-target stocks where the fishery harvests may represent a significant component of the harvest of those non-target stocks.
- There is a scientific basis for the frequency of the sampling program to collect age and size data where there is a clear scientific basis for collecting these data.

60 Scoring Guidepost

- The information on age and size of catch and escapement is adequate, where there is general scientific agreement that these data are important to assess the status of the stocks or adjust fisheries management decisions. For example: information on the age distribution of pink salmon harvests would not be considered important for stock assessment or fisheries management decisions where as age information would be important for the assessment and management related to most chinook and sockeye fisheries. Monitoring programs should be in place to detect changes in the size of the fish harvested for each salmon species.

Indicator 1.1.2.4

The information collected from catch monitoring and stock assessment programs is used to compute productivity estimates for the target stocks and management guidelines for both target and non-target stocks.

DFO Response

Current Situation

Scientifically defensible productivity estimates have been produced for the Babine sockeye target stock and estimates have been proposed for most other Skeena sockeye stocks⁵².

Productivity of non-target species relative to sockeye is known for coho⁵³, chum⁵⁴ and steelhead⁵⁵ assessments vetted through PSARC.

⁵² Cox-Rogers, S., J.M.B. Hume and K.S. Shortreed. 2003. Stock status and lake-based production relationships of wild Skeena River sockeye stocks. PSARC working paper S2003-09, DFO, Nanaimo. 62p (In press).

Differences in productivity among species and stocks within a species are central to fishery management planning. The IFMP makes specific reference to the potential impact of harvesting enhanced sockeye compared to the less production wild sockeye, coho and steelhead stocks⁵⁶. The coho management guidelines provide a 15% exploitation rate ceiling for Canadian fisheries based on assessments of total sustainable exploitation rates⁵⁷

A risk assessment evaluation is in progress but not yet published⁵⁸

Scoring Summary

Both 60 Scoring Guideposts have been met.

All three 80 Scoring Guideposts have been met.

One of the two 100 Scoring Guideposts has been met.

100 Scoring Guidepost

- Scientifically defensible productivity estimates (eg, stock/recruitment relationships) have been derived for all target stocks and the relative productivity of non-target stocks is known.
- Risk assessment has been conducted to determine the impact of alternative harvest strategies on non-target stocks. The risk assessment should include an assessment of the uncertainties with estimates of stock productivity for both the target and non-target stocks.

80 Scoring Guidepost

- There is adequate information to identify the harvest limitations and production strategies required to maintain the high productivity of the target stocks.

⁵³ B. Holtby, B. Finnegan, D. Chen and D. Peacock. 1999. Biological Assessment of Skeena River coho salmon. PSARC Working Paper S1999-09. Fisheries and Oceans Canada, Nanaimo, BC ;

⁵⁴ spilsted chum reference

⁵⁵ Tautz, A.F., B.R. Ward, and R.A. Ptolemy. 1992. Steelhead trout productivity and stream carrying capacity for rivers of the Skeena drainage. PSARC Working Paper S1992-6. Fisheries and Oceans Canada, Nanaimo, BC

⁵⁶ 2003 IFMP Page 32, section4.8.1, paragraph 2.

⁵⁷ B. Holtby, B. Finnegan, D. Chen and D. Peacock. 1999. Biological Assessment of Skeena River coho salmon. PSARC Working Paper S1999-09. Fisheries and Oceans Canada, Nanaimo, BC ;

⁵⁸ Cox-Rogers, S. 2003. (In Prep) Risk Assessment simulations for wild Skeena River sockeye salmon (DFO, Prince Rupert, B.C.)

- There is adequate information to estimate the relative productivity of the non-target stocks where the fishery harvests may represent a significant component of those non-target stocks.
- The harvest limitations for target stocks take into consideration the impacts on non-target stocks and the uncertainty of the productivity for these stocks.

60 Scoring Guidepost

- The available information and analyses are adequate to identify the harvest limitations and production strategies required to maintain the productivity of the majority of target stocks.
- The relative productivity of the non-target stocks is considered in the management strategy, where the fishery harvests may represent a significant component of those non-target stocks.

Indicator 1.1.3.1

Limit Reference Points or operational equivalents have been set and are appropriate to protect the stocks harvested in the fishery.

The Limit Reference Point (LRP) or operational equivalent set by the management agency has been defined as “*the state of a fishery and/or a resource, which is not considered desirable. Fishery harvests should be stopped before reaching it. If an LRP is inadvertently reached, management action should severely curtail or stop fishery development, as appropriate, and corrective action should be taken. Stock rehabilitation programs should consider an LRP as a very minimum rebuilding target to be reached before the rebuilding measures are relaxed or the fishery is re-opened.*”

DFO Response

Current Situation

Limit Reference Points (LRPs) have been established through PSARC for Morice Lake and for the aggregate of the other non-Babine sockeye lakes⁵⁹. An interim LRP of 400,000 for the aggregate Skeena sockeye escapement has been established⁶⁰. LRPs for most Skeena sockeye Lake systems have been proposed and are generally accepted as representing conservative values^{61,62}.

⁵⁹ Shortreed, K.S., J.M.B. Hume, and C.C. Wood. 1997. Recommended escapements to secondary sockeye nursery lakes in the Skeena River system. PSARC Working Paper S97-9:48 p.

⁶⁰ North Coast IFMP Pages 54 and 55.

⁶¹ Wood, C. 1999. Provisional Limit Reference Points for Skeena River sockeye in 1999. memorandum to R. Kaduwaki, Stock Assessment Division, Science Branch, Fisheries and Oceans Canada, Nanaimo, 14 April 1999, 14 p.

Although there is no formal coho LRP the Canadian fishery impacts on Skeena coho were reduced to near zero in 1998 following a period of decline and very low coho abundance in 1997. The Canadian coho fisheries are still managed very conservatively to a total Canadian exploitation rate ceiling of 15%.

Scoring Summary

The sole 60 Scoring Guidepost has been met.

Both of the 80 Scoring Guideposts have been met.

The 100 Scoring Guideposts have been partially met.

Future Changes

It is anticipated that the intensive assessment evaluations centered around the current SARA evaluations will be helpful in defining an approach to establishing LRP's.

100 Scoring Guidepost

- The Limit Reference Point for target species have been reviewed and found to be scientifically defensible and appropriate by the Pacific Scientific Advice Review Committee or the appropriate Pacific Salmon Commission technical committee.
- There is general agreement among regional fisheries scientists outside the management agency that the LRPs are appropriate.
- There is general scientific agreement regarding the LRPs for non-target species.

80 Scoring Guidepost

- There is some scientific basis for the LRPs for target stocks and these LRPs are defined to protect the stocks harvested by the fisheries.
- There is no significant scientific disagreement regarding the LRPs used by the management agency to formulate management decisions for the fishery.

60 Scoring Guidepost

- There is general agreement among regional fisheries scientists within the management agency that the LRPs or equivalents are appropriate to achieve the management goals for target stocks.

⁶² Personal communication Dave Peacock DFO.

Indicator 1.1.3.2

Target Reference Points or operational equivalents have been set.

The Target Reference Point (TRP) or operational equivalent set by the management agency has been defined above as “*the state of a fishery and/or a resource, which is considered desirable. Management action, whether during a fishery development or stock rebuilding process, should aim at maintaining the fishery system at its level.*”

DFO Response

Current Situation

Target reference points (TRPs) for Skeena stocks have not been formally set. The operational TRP for the Skeena sockeye aggregate is 900,000 (intended to approximate the MSY escapement level). The TRP for the Skeena aggregate is accepted by the Northern Boundary Technical Committee and adopted in the 1999 Pacific Salmon Treaty⁶³

Coho rebuilding targets in the Skeena have not been formally stated but stock status is indicated in terms of percent of estimated MSY or smolt capacities.

Reference points have been established for Skeena steelhead⁶⁴

The target reference point equivalent does not take into account of the productivity of the non-target wild sockeye or the wild components of the Babine wild stock

Future Changes

Under the Wild Salmon Policy, consistent “reference points” of abundance as performance benchmarks will be expressed in measurable terms for all identified conservation units based on estimates of productive capacity. This will include lower reference points of abundance (set at precautionary levels) that identify zones of increasing conservation concern and higher reference points of abundance that identify zones of few conservation concerns. In addition, one or more potential target reference points (TRPs) may be identified for some conservation units to assist in fisheries planning. The goal is to have stock abundance for each conservation unit at or over its established target reference point. A total abundance below the target reference point but above the lower reference point will imply that the conservation unit is secure but requires rebuilding. A total abundance below the lower reference point implies a conservation concern, and urgently requires rebuilding.

Scoring Summary

All 60 Scoring Guideposts have been met.

One of the 80 Scoring Guideposts has been met.

⁶³ Pacific Salmon Treaty reference 1999 nb sockeye annex

⁶⁴ Tautz, A.F., B.R. Ward, and R.A. Ptolemy. 1992. Steelhead trout productivity and stream carrying capacity for rivers of the Skeena drainage. PSARC Working Paper S1992-6. Fisheries and Oceans Canada, Nanaimo, BC.

One of 100 Scoring Guideposts has been met and two have not been met.

100 Scoring Guidepost

- The Target Reference Point (TRP) for target species have been reviewed and found to be scientifically defensible and appropriate by the Pacific Scientific Advice Review Committee or the appropriate Pacific Salmon Commission technical committee.
- There is general agreement among regional fisheries scientist outside the management agency that the TRPs are appropriate.
- The TRPs for the target stocks take into account variability in the productivity of each component of the target stock and productivity of non-target stocks.

80 Scoring Guidepost

- There is no significant scientific disagreement regarding the TRPs used by the management agency to formulate management decision for the fishery.
- The TRPs for the target stocks take into account variability in the productivity of each component of the target stock and the productivity of non-target stocks.

60 Scoring Guidepost

- There is general agreement among fisheries scientists within the management agency that the TRPs are appropriate for the target stocks.
- Target reference points have been defined for the majority of target stocks harvested in the fishery and these target reference points are not scientifically disputed.
- The management agency has taken into account the relative productivity of non-target stocks when setting the TRPs for the majority of target stocks.

Indicator 1.2.1

There is a well-defined and effective strategy, and a specific recovery plan in place, to promote recovery of the target stock within reasonable time frames.

DFO Response

Current Situation

The management plan for the target stock for the Skeena fishery has a clear, pre-established response to low abundance⁶⁵. This has been tested over the last two cycles as the Babine sockeye stock was severely depressed, and fisheries were severely curtailed to quickly rebuild the stock. The current planning allows for First Nations' harvests to resume once the interim LRP is reached and the commercial fishery resumes once the TRP has been met.

Scoring Summary

All of the 60 Scoring Guideposts have been met.

All of the 80 Scoring Guideposts has been met.

All three 100 Scoring Guideposts have been met.

100 Scoring Guidepost

- There are comprehensive and pre-agreed responses to low stock size that utilize a range of management measures to ensure rapid recovery.
- Stocks are allowed to recover to the TRP before commercial fisheries are permitted that target these stocks.
- The management agency does not use artificial propagation as a substitute for maintaining or recovering wild stocks.

80 Scoring Guidepost

- In the event of severe depletion, recovery plans are developed and implemented to facilitate the recovery of the depleted stocks within 3 reproductive cycles.
- Stocks are allowed to recover to more than 150% of the LRP for abundance before any fisheries are permitted that target these stocks.

60 Scoring Guidepost

- In the event of severe depletion, recovery plans are developed and implemented to facilitate the recovery of the depleted stocks within 5 reproductive cycles.
- Stocks are allowed to recover to more than 125% of the LRP for abundance before any fisheries are permitted that target these stocks. Yes I agree

⁶⁵ North Coast IFMP Section 4.8

Indicator 1.2.2

Target stocks are not depleted and recent stock sizes are assessed to be above appropriate limit reference points for the target stocks.

In contrast to Indicator 1.2.1, which evaluates the strategy for stock recovery, this indicator evaluates the current status of the target species or stocks, and the basis for being reasonably certain about their status. The Scoring Guideposts are arranged hierarchically, so that evaluation of the current status depends on the assessment, which in turn depends on data and knowledge about the stocks and the fishery.

DFO Response

Current Situation

The Babine Lake sockeye stock, targeted by the Skeena fishery, has never been below the provisional LRP.

A long series of assessments of the productive potential and status of the Babine Lake sockeye stock have produced consistent results that are widely accepted.⁶⁶

Scoring Summary

Both 60 Scoring Guideposts have been met.

Both 80 Scoring Guideposts have been met.

Both 100 Scoring Guideposts have been met.

100 Scoring Guidepost

- There is general agreement among regional fisheries scientist outside the management agency that the methods of estimating escapements and exploitation rates for the target stocks are scientifically defensible.
- Management actions have reduced fishing as the target stocks approach the LRP and fisheries have only resulted in escapements that approach or are below the LRP escapement goal in one year in a period of the most recent 10 consecutive years, for any of the target stocks.

⁶⁶ Wood, C.C., D.T. Rutherford, D. Bailey, and M. Jakubowski. 1998. Assessment of sockeye salmon production in Babine Lake, British Columbia with forecast for 1998. Canadian Technical Report of Fisheries and Aquatic Sciences 2241:50 p.

80 Scoring Guidepost

- There is general agreement among regional fisheries scientist inside the management agency that the methods of estimating escapements and exploitation rates for the target stocks are scientifically defensible.
- Management actions have reduced fishing as the target stocks approach the LRP and fisheries have only resulted in escapements that approach or are below the LRP escapement goal in one year in a period of the most recent 5 consecutive years, for any of the target stocks.

60 Scoring Guidepost

- There is general agreement among regional fisheries scientist inside the management agency that the methods of estimating escapements and exploitation rates for the majority of target stocks are scientifically defensible.
- Management actions have reduced fishing as the target stocks approach the LRP and fisheries have only resulted in escapements that approach or are below the LRP escapement goal in no more than two years in a period of the most recent 5 consecutive years, for the majority of the target stocks.

Indicator 1.3.1

Information on biological characteristics such as the age, size, sex and genetic structure of the target stocks is considered prior to making management decisions and management actions are consistent with maintaining healthy age, size, sex and genetic structure of the target stocks.

DFO Response

Current Situation

While knowledge of the effect of fishing on biological characteristics is not comprehensive, management actions are generally consistent with maintaining the biological characteristics of the Babine sockeye target stock.⁶⁷ One problem is the ocean fisheries do not harvest any of the age 3 (jack) sockeye returns because of their very small size. The jack sockeye harvest conducted at the Babine weir by local First Nations is managed with the intent to harvest this age component at a rate equivalent to harvest rates on older sibling groups harvested in commercial and First Nation food fisheries to try and provide some balance in the age specific harvest rates.

⁶⁷ North Coast IFMPO Pages 37 and 38.

Terminal harvest opportunities in the Babine system are managed to avoid undue impacts on any particular timing component. There is a long term data set of biological characteristics of the Babine sockeye collected for over 50 years from the Babine weir project⁶⁸.

Scoring Summary

All three 60 Scoring Guideposts have been met.

Two of the three 80 Scoring Guideposts have been met.

Two of three 100 Scoring Guideposts have been met.

100 Scoring Guidepost

- There is comprehensive knowledge of the effect of fishing on biological characteristics such as the age, size, sex and genetic structure of the target stocks and the impact of changes in these factors on the reproductive capacity of the target stocks.
- Management actions are consistent with maintaining healthy target stocks relative to biological characteristics such as age, size, sex and genetic structure of all target stocks.
- Enhanced fish are identified and managed as separate target stocks.

80 Scoring Guidepost

- The knowledge of the effect of fishing on biological characteristics such as the age, size, sex and component stocks is adequate to detect threats to the reproductive capacity of the target stocks.
- Management actions are consistent with maintaining healthy target stocks relative to biological characteristics such as age, size, sex and genetic structure of all target stocks.
- The management system includes provisions to minimize any adverse impacts to the genetic structure of un-enhanced stocks that may be due to the enhancement of other stocks.

60 Scoring Guidepost

- The knowledge of the effect of fishing on biological characteristics such as age, size, sex and component stocks is adequate to detect threats to the reproductive capacity of the majority of target stocks.

⁶⁸ Babine weir reference

- Management actions are consistent with maintaining healthy target stocks relative to biological characteristics such as age, size, sex or genetic structure for the majority of target stocks.
- The management system includes provisions to minimize the major adverse impacts for the majority of un-enhanced stocks that may be due to the enhancement of other stocks.