

Response to Marine Stewardship Council

Indicators for Principle 2 - Ecosystem Impacts

Pacific Wild Salmon Fishery

Barkley Sound Sockeye

Fisheries and Oceans Canada

Pacific Region

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Introduction

The BC Wild Salmon Fishery has applied for certification of its fisheries to the Marine Stewardship Council.

In June 2003, the Marine Stewardship Council published their MSC Evaluation Criteria for the BC Salmon Fisheries (which included Units of Certification, Performance Indicators and Scoring Guideposts) describing in detail how the certification process will be conducted¹. The Marine Stewardship Council has defined a total of 47 Indicators under three Principles.

This document prepared with the assistance of Fisheries and Oceans Canada is the BCSMC's technical submission on the indicators for Barkley Sound sockeye for all three principles. This principle examines the impact of the fishery upon the marine environment. It examines the effect fishing has on immediate marine environment including other non-target fish species, marine mammals and seabirds.

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 Barkley Sound sockeye fishery

Indicator 2.1.1

The management plan for the prosecution of the marine fisheries provides a high confidence that direct impacts on non-target species are identified.

The intent of this measure is to ensure that the management plans for the fisheries require collection of adequate data to address direct impacts of fishing on non-target species.

DFO Response

Current Situation

Reporting catch of non-target (and target) species for commercial fisheries, is obligatory, enforced by condition of licence. Catch is reported through mandatory logbooks, frequent phone-in requirements, and sales slip programs. By-catch of other species of fish, seabirds,

¹ Marine Stewardship Council. 2003. MSC Evaluation of BC Salmon Fisheries: Units of Certification, Performance Indicators and Scoring Guideposts.

mammals, etc must be recorded. (See sample logbook in 2003 IFMP²). During the fishery, random on-board observers verify log-book data and phone-in reports.

Catch and effort in the sport fishery are monitored through the Creel Survey. Effort is estimated from daily boat counts. Catch and release statistics for all species including bycatch encountered are estimated from dockside interviews. This estimate is applied to effort to determine the total catch and release of all species in the fishery by day.

For First Nation net fisheries, catch reporting is obligatory. Catch information is gathered through phone-in reports and/or from band biologists. Periodically, independent fishery observers employed by First Nations verify catch reports.

Fishery monitoring programs are described in the *2002/03 Pacific Region Integrated Fisheries Management Plan: Salmon - Southern BC*³.

DFO's plans for fishery monitoring and catch reporting are detailed in its discussion paper, *Pacific Region Fishery Monitoring and Reporting Framework*⁴.

The regional catch database, which produces a variety of catch reports can be accessed via the Internet⁵. Historic catch data are also available via the Internet⁶.

It is unlikely that the use or loss of the gear has a negative impact on the ecosystem, therefore quantities of lost gear are not monitored. Bottom trawling is not used in the Barkley Sound sockeye fishery. Troll and net gear fish some portion of the water column, depending on the estimated depth of sockeye schools. If lost, troll lines simply drop to the bottom and are no longer fishable. Seine and gillnet nets are attached to the vessel and are constantly being worked and therefore rarely lost.

Scoring Summary

The information presented establishes that the intent of Indicator 2.1.1 has been met.

The 60 Scoring Guidepost has been met.

Both 80 Scoring Guideposts have been achieved.

Two of three 100 Scoring Guideposts have been met; the remaining 100 Scoring Guidepost is not applicable to the salmon fishery.

² IFMP 2003, Appendix 3.

³ IFMP 2002, Section 2.10, page 19. (<http://www.pac.dfo-mpo.gc.ca/ops/fm/mplans/plans02/SSalmon02pl.PDF>)

⁴ http://www-comm.pac.dfo-mpo.gc.ca/pages/consultations/fisheriesmgmt/reportingframework/monitoringpaper_e.pdf

⁵ http://www-sci.pac.dfo-mpo.gc.ca/sa/Commercial/default_e.htm

⁶ http://www-sci.pac.dfo-mpo.gc.ca/sa/Commercial/HistoricStats_e.htm

Future Changes

DFO is undertaking a comprehensive, detailed review of fishery monitoring and catch reporting programs in consultation with harvesters from all sectors to identify any deficiencies and discuss potential improvements to better meet the needs of the resource, the public and stakeholders. (2002-03 IFMP: Salmon - Southern BC. Section 2.10; page 19; last paragraph). This review will incorporate requirements of the Marine Stewardship Council.

100 Scoring Guidepost

- A monitoring program exists that provides estimates of bycatch that meet statistical criteria acceptable to external reviewers.
- All historic monitoring data is readily available to stakeholder groups and external reviewers.
- Quantities of gear lost are recorded, and the impacts of lost gear on target and non-target species have been researched and accurate projections of impacts have been completed

80 Scoring Guidepost

- A monitoring program exists that provides estimates of bycatch.
- In known problem areas of high bycatch, there is an ongoing monitoring program.

60 Scoring Guidepost

- Data on bycatch of the majority of the stocks are available to determine that impacts on non-target species.

Indicator 2.1.2

The management system includes measures to reduce marine ecosystem impacts.

For salmon fisheries, the primary concerns related to marine ecosystem impacts are related to the bycatch of non-salmon species and the removal of large numbers of the target salmon species.

DFO Response

Current Situation

By-Catch of Non-Salmon Species

For the Barkley Sound sockeye fishery, the stocks causing most concern are Somass River wild chinook and steelhead runs.

There is mandatory release of all of unmarked chinook and steelhead caught in sockeye fisheries.

Chinook migration peaks in September, but fish may begin migrating in early August. Fisheries targeting Somass sockeye are therefore closed by the last week of July or the first week of August (or earlier if necessary to avoid chinook runs).

There are both summer and winter wild steelhead runs to the system. Steelhead runs are vulnerable to freshwater angler effort directed toward steelhead in the Somass watershed. The summer steelhead run is vulnerable to sockeye fisheries, particularly First Nation net fisheries occurring in terminal areas of Alberni Inlet and the lower river.

In commercial fisheries, selective fishing techniques such as the use of barbless hooks or recovery boxes, help reduce the mortality of released bycatch. The management plan allows for time and area closures as well as night fishing restrictions to reduce bycatch. Fishing is restricted in-season if monitoring information indicates further reductions in effort are required to reduce bycatch.

The impact of fisheries on marine piscivores that utilize the target species is likely minimal. Barkley Sound fisheries are conducted in relatively terminal areas not generally frequented by large marine mammals. Research indicates that utilization of sockeye is low for harbour seals⁷. Research is ongoing into the composition of Stellar Sea Lion⁸ and Killer Whale⁹ diets, but sockeye contributions are thought to be low. Current levels of commercial harvests are not thought to present any risks to these populations.

Removals of Target Salmon Species

The primary objective of all fisheries is conservation.¹⁰ This objective includes determining the Total Allowable Catch and acceptable harvesting methods.

Managing for conservation also means incorporating a precautionary approach. Fishery management is risk averse and sustainable. Regular monitoring of fisheries, stock assessment and the use of selective fishing methods ensure that healthy stock levels are maintained.¹¹ Examples of precautionary approach, risk averse management and sustainability follow:

- In accordance with the precautionary approach, run size forecasts are developed at the 50% and 75% probability levels.
- In 2003, exploitation rates are to be capped at 65% regardless of abundance. This reflects a risk averse stance taken to ensure sustainability.

Examples and discussion of fishery monitoring and catch reporting, stock assessment and selective fishing follow:

⁷ Olesiuk, Peter F., Annual prey consumption by harbour seals (*Phoca vitulina*) in the Strait of Georgia, British Columbia.

⁸ Olesiuk, Peter F., Pers Comm

⁹ Ford, John, Pers Comm

¹⁰ IFMP 2002, Section 3.1, page 21, first paragraph, first sentence. See entire section.

¹¹ IFMP 2002, Section 3.1, page 21, first paragraph.

- Monitoring of harvests of target stocks is addressed in Indicator 1.1.2.1.
- Monitoring of spawning escapements for target stock units is addressed in Indicator 1.1.2.2.
- Catch monitoring, stock assessment and their use in deriving productivity estimates and management guidelines for target stocks is described in indicator 1.1.2.4.
- Selective fishing is discussed in Indicator 3.7.1.

All Barkley Sound sockeye stocks groups remain within acceptable limits.

Comprehensive decision guidelines were introduced as a feature of salmon management plans in 2002. They provide a summary of the rationale behind management decisions and describe DFO's intended responses to in-season information and conditions as they become available.¹²

Exploitation Rate Ceilings are established pre-season.¹³

Decision guidelines provide for low impact fisheries to fish before fisheries having a higher impact. This is particularly so at low run sizes or at the start of the run when the run sizes are uncertain or when stocks of concern have peaked but continue to migrate through an area.¹⁴

Greater detail is available in Section 4.3 of the IFMP 2002.¹⁵ See especially Tables 2 and 3.¹⁶

Where conflicts exist between the harvest of fish and ecosystem concerns (defined as "the bycatch of non-salmon species and the removal of large numbers of the target salmon species") based on their removal, the balance achieved has been the subject of an open review by stakeholders. The process used to achieve this is to include management options in draft IFMPs that are available for review by stakeholders and the public.

Scoring Summary

DFO takes a variety of measures to ensure that removals of target stocks and species are sustainable and that removals of non-salmon species are kept to a minimum.

The two 60 Scoring Guideposts have been met.

All three 80 Scoring Guideposts are in effect.

One of the five 100 Scoring Guideposts has been met, one has not been met and the other three have been partially met.

¹² IFMP 2002, Section 4, page 26, first paragraph.

¹³ IFMP 2002, Section 4.1.2, page 28, first paragraph.

¹⁴ IFMP 2002, Section 4.1.8, page 30, last paragraph.

¹⁵ IFMP 2002, Section 4.3, pages 45-44.

¹⁶ IFMP 2002, Table 2, page 39 and Table 3, page 40.

Future Changes

Fisheries and Oceans Canada will be developing a risk assessment framework for assessing Barkley Sound sockeye.¹⁷

100 Scoring Guidepost

- A risk assessment of bycatch concerns has been conducted as part of developing the management plan.
- The effect of the fishery on the marine ecosystem has been explicitly addressed in the management plan.
- Research has been conducted on marine piscivores that utilize the target species to ensure that commercial harvests do not present significant risks to the populations of these piscivores.
- Where conflicts exist between the harvest of fish and ecosystem concerns based on their removal, the balance achieved has been the subject of an open review by stakeholders.
- This information is presented in documents that are made available to stakeholders.

80 Scoring Guidepost

- The effect of the fishery on the marine ecosystem has been addressed by the management system.
- Where problems are identified, fisheries managers make adjustments to reduce impacts on non-target species.
- Where conflicts exist between the harvest of fish and ecosystem concerns based on their removal, the balance achieved has been made known to stakeholders through publicly available information sources.

60 Scoring Guidepost

- The management system does include measures to reduce marine ecosystem impacts to achieve management objectives.
- The management system has a history of responding to bycatch problems and has procedures that are followed to limit bycatch.

¹⁷ Review of the 2002 Barkley Sound Sockeye Fishery, Recommendation 4, pages 51-52.

Indicator 2.1.3

Research efforts are ongoing to identify new problems and define the magnitude of existing problems, and fisheries managers have a process to incorporate this understanding into their management decisions.

The intent of this measure is to ensure that a research program has been established to evaluate historic and new data to identify future problems. It is also necessary to have an established management process that will ensure research conclusions can quickly be transparently incorporated into future management activities associated with prosecuting the fishery.

DFO Response

Current Situation

Research Program

DFO has a long history of supporting fisheries research. Scientists at the Pacific Biological Station have conducted basic and seminal research on ichthyology¹⁸, ecology¹⁹, stock assessment²⁰, population biology²¹, and fishery management methods²². More recent research has focused on understanding ecosystem relationships²³, habitat impacts²⁴, and larger scale perturbations such as climate change²⁵.

¹⁸ Foerster, R.E. 1968. The sockeye salmon. Fish. Res. Board Can. Bull. 162. 422p; Groot, C., L. Margolis, and W.C. Clarke. [ed.] 1995. Physiological Ecology of Pacific Salmon. UBC Press, Vancouver. 510p.; Groot, C. and L. Margolis [ed.]. 1991. Pacific Salmon Life Histories. UBC Press, Vancouver. 654 p.

¹⁹ Stockner, J.G. and K.R.S. Shortreed. 1978. Limnological survey of 19 sockeye salmon (*Oncorhynchus nerka*) nursery lakes in British Columbia and the Yukon Territory. Fish. Mar. Serv. Tech. Rep. 824. 47p.; Healey, M.C. 1980. The ecology of juvenile salmon in Georgia Strait, British Columbia, p. 203-229. *In* W.J. McNeil and D.C. Himsworth [ed.]. Salmonid ecosystems of the North Pacific. Oregon State University Press, Corvallis, OR.

²⁰ Ricker, W.E. 1979. Growth rates and models. Fish Physiology, Vol. 8. Academic Press, New York, pp. 678-743.; Schnute, J. 1987. A general fishery model for a size-structured fish population. Can. J. Fish. Aquat. Sci. 44: 924-940.

²¹ Smith, G.H., L. Margolis, and C.C Wood. [ed.] 1987. Sockeye salmon (*Oncorhynchus nerka*) population biology and future management. Can. Spec. Publ. Fish. Aquat. Sci. 96.

²² Ricker, W.E. 1954. Stock and Recruitment. J. Fish. Res. Bd. Can. 11: 559-623.; Ricker, W.E. 1958a. Handbook of Computations for Biological Statistics of Fish Populations. Fisheries Research Board of Canada, Bulletin No. 119.; Schnute, J. 1985. A general theory for the analysis of catch and effort data. Can. J. Fish. Aquat. Sci. 42:414-429.

²³ Hyatt, K.D., 2001. Ecosystem considerations for the development of biological reference points and future implementation of Fisheries and Oceans Canada's wild salmon policy. ICES CM (International Council for the Exploration of the Sea. Theme Session on Developing Salmon Conservation Limits - Recent Progress and Review; 2001/M:09.; Shortreed, K.S.; Morton, K.F.; Malange, K.; Hume, J.M.B. 2001. Factors limiting juvenile sockeye production and enhancement potential for selected B.C. nursery lakes. Canadian Science Advisory Secretariat research document; 2001/098

There is a commitment to incorporate this information into the management and conservation of salmon stocks through the development of the department's 'Wild Salmon Policy'. The underlying principles of this policy consider the current state of scientific knowledge of salmonid ecology, evolution, population biology and genetics, and coastal ecosystems and trophic interactions.

The Pacific Scientific Advice Review Committee (PSARC) is the Pacific Regional body responsible for review and evaluation of all scientific information on the status of living aquatic resources, their ecosystems, and on biological aspects of stock management.

PSARC reports are available at:

www.pac.dfo-mpo.gc.ca/sci/english/psarc

Post-release mortality rates are monitored and assessed to ensure that they are appropriately reflected in the fishing plans.

http://www-comm.pac.dfo-mpo.gc.ca/pages/selective/pdfs/prmsreport_e.pdf

DFO continues to investigate modifications in gear to increase selectivity and reduce impacts on fish and fish habitat.²⁶

A full summary of the selective fishery program including its research program can be found in the Selective (Salmon) Fishing Final Report.

http://www-comm.pac.dfo-mpo.gc.ca/publications/SFFinalReport_e.pdf

These documents reflect a sequential and evolving response to bycatch concerns as new issues were identified.

Established Management Process

Scientific research is incorporated into fisheries management plans through a two-stage process. First, all forecast, stock status and habitat status papers are peer-reviewed by the Pacific Scientific Advice Review Committee (PSARC). PSARC flags important issues and advises the Resource Management Executive Committee (RMEC) on forecast stock abundance and conservation concerns.

RMEC oversees the integration of PSARC advice into the fisheries planning process. Abundance forecasts and conservation concerns are discussed prior to the fishing season during the consultation process. Integrated Fisheries Management Plans (IFMPs) are constrained by the reduction or elimination of bycatch of stocks of concern, including non-target salmon stocks or

²⁴ Levings, C.D., L.B. Holtby, and M.A. Henderson. [ed.]. 1989. Proceedings of the National Workshop on Effects of Habitat Alteration on Salmonid Stocks. Can. Spec. Publ. Fish. Aquat. Sci. 105. MacDonald, S.

²⁵ Beamish, R.J., D. Noakes, G. McFarlane, W. Pinnix, R. Sweeting, J. King and M. Folkes. 1998. Trends in coho marine survival in relation to the regime concept. Canadian Stock Assessment Secretariat research document; 98/171, 26p.

²⁶ IFMP 2003, Sections 7.8.1 and 7.8.2.

species other than salmon, such as inshore rockfish. The post-season fishery review reports on achievement of pre-season objectives in the IFMP.

PSARC issues Stock Status Reports (SSRs) and Habitat Status Reports (HSRs). These reports are public documents that summarise, in lay terms, scientific information and fisheries information on major commercially harvested species and their aquatic habitats. They are available to the public on the Internet²⁷. The more detailed scientific papers containing data and analysis are available to the public from the Canadian Stock Assessment Secretariat (CSAS)²⁸.

DFO has a proven history of closing fisheries when bycatch mortality problems arise. In 1997 and further in 1998 commercial fisheries targeting coho were shut down to conserve Interior Fraser and Skeena coho populations which were severely depressed. Since coho were caught as bycatch in other salmon fisheries, retention of coho in all commercial fisheries was prohibited. Major effort was undertaken to monitor bycatch of non-target coho in fisheries and further restrictions of time and area of openings were made as necessary to reduce bycatch.

As a result of serious concerns for coho conservation, DFO established the Selective Fishery Program. That program supported research into selective fishing methods through gear modification. The Selective Fishing Program Final Report is available on the Internet²⁹. Catch and release studies were conducted to determine gear-specific mortality rates in non-retention fisheries³⁰. Quantitative analysis of historical exploitation rates, effort, catchability, and fish distribution data are underway to better describe, predict and minimize fisheries impacts on non-target species.

In the Barkley Sound sockeye fishery, research initiatives are ongoing to better understand population biology, local ecology and fishery impacts. Examples of this research include: development of genetic stock identification techniques, research into the relative influence of climatic change versus habitat impacts, and development of new forecasting methods and improved stock assessment methods. An experimental selective fishing program has been conducted for the last 3 years. As well, there have been industry initiatives to control effort through the development of small-bite fisheries, quota pooling and improved reporting.

Post-season review processes and references are described in Indicator 3.3.1. These include a review of compliance with IFMP by-catch objectives that are incorporated into subsequent IFMPs.

Availability of research results and review of research plans are described in Indicator 3.2.2.

The IFMP does not explicitly require new monitoring programs to be implemented when new problems are encountered. New monitoring programs are, however, very much part of the process of developing management plans. The objective of a management plan is to identify

²⁷ PSARC website: www.pac.dfo-mpo.gc.ca/sci/english/psarc

²⁸ CSAS website: http://www.dfo-mpo.gc.ca/csas/Csas/English/Index_e.htm

²⁹ Selective Fishing Report: http://www-comm.pac.dfo-mpo.gc.ca/publications/SFFinalReport_e.pdf

³⁰ Mortality Rates: http://www-comm.pac.dfo-mpo.gc.ca/pages/selective/pdfs/prmsreport_e.pdf

the approach to be taken in prosecuting a fishery. Monitoring programs are part of that approach and are specified in Conditions of Licence³¹ (but not explicitly in the IFMP).

Scoring Summary

DFO has an entire branch—Science Branch—dedicated to research including assessment and evaluation of historic and new data to identify future problems. The annual post-season review is the primary vehicle by which such research is incorporated into the management of the fishery.

All three of the 60 Scoring Guideposts have been met.

All four 80 Scoring Guideposts are in effect.

All 100 Scoring Guideposts are in place.

100 Scoring Guidepost

- There is detailed knowledge of the relationship between the fishery and the marine ecosystem impacts or ongoing research is attempting to identify if such problems exist.
- The management agency has a proven history of incorporating new research findings into management plans.
- The management agency has a proven history of closing fisheries when bycatch problems arise.
- The management agency has supported the development of more selective fishing practices.

80 Scoring Guidepost

- There is ongoing research of previously identified problems areas to determine if bycatch reduction measures are effective.
- When new problems are identified, the management plans require a new monitoring program be instituted to determine the effectiveness of bycatch reduction measures.
- The management plan allows for between season assessment and institution of new controls on the fishery or stakeholder consultation following the identification of bycatch problems or ecosystem related impacts.

³¹ Conditions Of 2003/2004 Salmon Area B Licence, part 1, sections 6, 7 8 and 9 (there are no page numbers in Conditions of Licence).

- The management agency has a proven history of closing fisheries when bycatch problems or successfully arbitrating stakeholder concerns when balance between fish harvests and ecosystem concerns have arisen.

60 Scoring Guidepost

- The management agency collects or plans to collect data on bycatch problems or ecosystem concerns.
- There are procedures established to incorporate any knowledge obtained about bycatch problems into management actions.
- The management agency responds to data provided on bycatch problems by entities outside of their agency.

Indicator 2.1.4

The management system supports research efforts to understand the adequacy of existing escapement goals for meeting freshwater ecosystem needs.

The intent of this indicator is to encourage the collection of information and data that can be used to address freshwater ecosystem concerns. It is our intent that future reviews of Pacific Salmon certification demonstrate that the information developed from these research programs on ecosystem requirements, such as nutrient requirements and piscivore food requirements, are incorporated into the management system.

DFO Response

Current Situation

The provisional TRP escapement for Barkley Sound sockeye is based on an estimate of optimum escapement, given the productivity of the stock determined from stock-recruit parameters. When run size permits, the management plan allows for escapement of up to almost double the target of 350,000. This adaptive management strategy is designed to test the effects and determine potential benefits of large escapement to the ecosystem. Long term research conducted on the productivity of the nursery lakes is used to evaluate escapement targets.

The LRP of 200,000 escapement far exceeds historical levels of escapement observed in these systems. The escapement targets (and recent escapements) for Great Central and Sproat lakes meet or exceed historic levels of abundance observed in these systems. The escapement target has been met or exceeded 6 times out of the last 10 years. It is likely, therefore, that sufficient nutrients from escapement are transferred to the freshwater ecosystem to meet the needs of producers and also piscivore species that prey on juvenile sockeye. When the return is forecast to be low, allowable harvest rates are decreased and the goal of meeting the minimal escapement target (provisional LRP) supersedes fishery interests.

Analysis in support of freshwater ecosystems includes analysis of:

- lake trophic status,

- limiting factors,
- productivity and productive capacity,
- nutrient monitoring and numbers,
- distribution,
- behaviour and diet in sockeye nursery lakes. Results of productivity studies are utilized to develop productivity models that are incorporated into the establishment of escapement goals.

A number of studies have been published.³² Additional information can be found by searching for "Hume" and/or "Shortreed" at the following web site.

http://www-sci.pac.dfo-mpo.gc.ca/mehsd/publ/pubs2001-2005_e.htm

Fisheries and Oceans Canada has conducted studies on the impacts of salmon carcasses on stream productivity and nutrient budgets. These consider the impact of salmon-derived nutrients on the terrestrial eco-system, including icon species such as bears, and the role that icon species play in the transfer of nutrients to the terrestrial ecosystem³³. Further studies are in progress that track salmon nutrients into higher trophic levels³⁴.

Articles have been written in other jurisdictions (eg, Alaska). Proceedings of a symposium on this subject, held in Eugene Oregon in 2001, are available.³⁵

Scoring Summary

We believe the material presented in this section establishes that the management system does indeed support research efforts to understand the adequacy of existing escapement goals for meeting freshwater ecosystem needs.

The single 60 Scoring Guidepost is true.

³² Hume, J.M.B., K.S. Shortreed, and K.F. Morton. 1996. Juvenile sockeye rearing capacity of three lakes in the Barkley Sound system. *Can. J. Fish. Aquat. Sci.* 53:719-733.

Shortreed, K.S., J.M.B. Hume, and J.G. Stockner. 2000. Using photosynthetic rates to estimate the juvenile sockeye rearing capacity of British Columbia lakes. pp. 505-521 in E.E. Knudsen, C.R. Steward, D.D. MacDonald, J.E. Williams, and D.W. Reiser (ed.) *Sustainable Fisheries Management: Pacific Salmon*. CRC Press, Boca Raton, Fla.

Shortreed, K.S., K.F. Morton, K. Malange and J.M.B. Hume. 2001. Factors limiting juvenile sockeye production and enhancement potential for selected B.C. nursery Lakes. *Can. Sc. Advisory Secretariat Res. Doc.* 2001/098

³³ N.T. Johnston, E.A. MacIsaac, P.J. Tschaplinski, and K.J. Hall (in prep). Effects of the abundance of spawning sockeye salmon (*Oncorhynchus nerka*) on nutrients and epilithic algal biomass in forested streams in north-central British Columbia. Electronic copy available but not to be distributed.

³⁴ MacIsaac, Erland. Fisheries and Oceans Canada. Pers comm.

³⁵ Ken Shortreed, Fisheries and Oceans Canada, pers comm.

Both 80 Scoring Guideposts are in effect.

Both 100 scoring guideposts are true.

100 Scoring Guidepost

- There is research to determine tradeoffs of fish harvests with ecosystem concerns such as providing for sustainable populations of dependent components of the aquatic ecosystem.
- Results and conclusions from research are made available to stakeholders.

80 Scoring Guidepost

- Ongoing research is supported to determine the impacts of carcasses on freshwater ecosystem processes and to identify tradeoffs between harvests and freshwater ecosystem concerns.
- The management system provides for the communication of research results to managers so that the results can be used in the development of escapement goals for meeting freshwater ecosystem needs.

60 Scoring Guidepost

- The management system supports research efforts to understand the adequacy of existing escapement goals for meeting freshwater ecosystem needs.

Indicator 2.2.1

The management of the fishery includes provisions for integrating and synthesizing new scientific information on biological diversity at the genetic, species or population level of all species harvested in the fishery and impacts on endangered, threatened, protected or icon species.

The intent of this measure is to ensure that the management system incorporates available knowledge and considers the impacts of the fishery on biodiversity issues. This indicator includes the impacts of enhanced fishery harvests on these issues.

DFO Response

Current Situation

The management plan for Barkley Sound sockeye maintains a relatively low harvest rate on the target stock. The catch is spread throughout the duration of the run and the catch target in any given week is designed to reflect the forecast abundance for that week. It is assumed that by apportioning catch targets to return timing, the age, sex, stock and genetic structure of the run will be preserved.

The Department interprets threatened and endangered species to include those identified by COSEWIC (Committee on the Status of Endangered Wildlife in Canada) or listed in Schedule 1 of the Species at Risk Act (SARA)³⁶.

www.speciesatrisk.gc.ca

When a species is listed by COSEWIC, DFO has a legal obligation to establish provisions to eliminate or reduce bycatch of that species. There are currently no listed or icon species that are regularly caught in the Barkley Sound sockeye fishery.

The remainder of this section is structured according to the main elements indicated in Marine Stewardship Council's "Intent" Statement following the Indicator statement.

Adequate Protection of Significant Components of the Target Species to Provide for a Reasonable Expectation of Sustainability of these Components and their Contribution to the Genetic Diversity of the Target Population

A Wild Salmon Policy is under development. This Wild Salmon 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 publicly released in 2000 that outlined many elements of this new approach is presently being reviewed and revised while operational guidelines are developed. The operational guidelines will be the subject of consultation in the fall of 2004.³⁷

Sources of Uncertainty and Information Available on target stocks/species are described in the response to Indicator 3.1.4

The response to Indicator 3.1.5 describes the department's responses to changing information.

Direct Mortality of Non-Target Species in the Prosecuted Fisheries

The Selective Fisheries Program (1998-2001) began the widespread exploration of selective gear and methods.

http://www-comm.pac.dfo-mpo.gc.ca/pages/selective/default_e.htm

The continued development of selective fishing techniques has taken on more importance as a result of heightened conservation concerns on identified stocks as well as a stronger focus on protection of small stocks. Seines have to fish selectively, sorting catch and releasing coho and chinook salmon as well as steelhead.

The region's selective fishing policy

http://www-comm.pac.dfo-mpo.gc.ca/publications/selectivep_e.pdf

³⁶ Species at risk website: www.speciesatrisk.gc.ca

³⁷ IFMP 2003, section 2.2, fifth paragraph, page 12.

outlines the expectations and responsibilities of harvesters to continue to implement and develop new selective techniques and practices. An emphasis has also been placed on the need for continued learning, training and education.

Annually, there is provision for TAC to be put aside for selective fishing experiments. Through that provision, Fisheries and Oceans Canada is experimenting with selective fishing gears and methods. As these methods are perfected, DFO has moved to incorporate them into fisheries. This is especially the case where new and potentially promising selective fishing initiatives may be proposed that are not ready to be implemented without testing.

Fisheries and Oceans Canada will continue to work with harvesters to incorporate new selective gear and fishing practices into the annual fishing plans.

Selective fishing gear and methods are currently widely used and required in all fisheries. Selective fishing is addressed in Indicator 3.1.8. All gears—gillnet, seine and troll—are required to use revival tanks of prescribed design.³⁸

- **Gillnets.** Main selective fishing technique is avoidance. Gillnet fisheries, for example, are not authorized in Juan de Fuca due to the potential for impact on Thompson coho.
- **Trolls.** Use barbless hooks to facilitate release of non-target species.
- **Seines.** Brailing and sorting of catch are mandatory.

Adequate Protection of Icon Species from Direct or Indirect Impacts of Fisheries

Fisheries and Oceans Canada has conducted studies on the impacts of salmon carcasses on stream productivity and nutrient budgets. These consider the impact of salmon-derived nutrients on the terrestrial eco-system, including icon species such as bears, and the role that icon species play in the transfer of nutrients to the terrestrial ecosystem³⁹. Further studies are in progress that track salmon nutrients into higher trophic levels⁴⁰.

Production or Harvest of Enhanced Stocks does not Affect the Sustainability of Natural Spawning Stocks by Adversely Impacting the Genetic Structure of the Wild Fish.

Somass sockeye are not enhanced. There is a hatchery on Henderson Lake, but due to conservation concerns no Henderson sockeye, hatchery or wild, are targeted in fisheries.

Scoring Summary

The material presented under this Indicator responds to target stocks, non-target species, icon species and interactions between enhanced and wild salmon stocks. In each case, we be-

³⁸ Conditions Of 2003/2004 Salmon Area B Licence, part 1, section 3, sub-section 8 (there are no page numbers in Conditions of Licence).

³⁹ N.T. Johnston, E.A. MacIsaac, P.J. Tschaplinski, and K.J. Hall (in prep). Effects of the abundance of spawning sockeye salmon (*Oncorhynchus nerka*) on nutrients and epilithic algal biomass in forested streams in north-central British Columbia. Electronic copy available but not to be distributed.

⁴⁰ MacIsaac, Erland. Fisheries and Oceans Canada. Pers comm.

lieve we have described the department's policies and programs, and provided examples of recent initiatives.

All three of the 60 Scoring Guideposts have been met.

All three of the 80 Scoring Guideposts are in effect.

Two of the four 100 Scoring Guideposts are in place. The remaining two scoring guideposts have partially been met.

100 Scoring Guidepost

- A risk assessment has been conducted, based on current knowledge of direct and incidental mortalities from the fishery, to ensure the fishery does not pose a significant threat to the biodiversity of the target or non-target species.
- Stock composition including enhanced component is known within Fishery Management Units with the likelihood of harvest of endangered, threatened, protected, or icon species has been estimated.
- Time and area of migrations of weak year classes, sub-stock or population components are known.
- The management system contains provisions to reduce harvests based on biodiversity concerns of affected endangered, threatened, protected or icon species, or weak year classes of stocks, including the enhanced component, of the targeted species.

80 Scoring Guidepost

- The fishery has been monitored and the stock composition is assessed with a special effort to determine presence of rare, endangered, protected, or icon species.
- The management agency has a history of incorporating new research into management as new research data on impacts of fisheries on biodiversity become available.
- The fisheries management system includes provisions for selective fishing when biodiversity concerns are identified for target or non-target species.

60 Scoring Guidepost

- Efforts are being made to assess the impacts of the fishery on the biodiversity of the endangered, threatened, and protected or icon species.
- The impact of the fishery on endangered, threatened, and protected or icon species is identified and is considered in the management of fisheries.
- There are provisions in the management system to reduce the impacts of the fishery on the biodiversity of the endangered, threatened, and protected or icon species.

Indicator 2.3.1

Management strategies include provisions for restrictions to the fishery to enable recovery of non-target stocks to levels of established LRPs (Limit Reference Points)

DFO Response

Current Situation

Fishery Management plans for Barkley Sound sockeye provide for restrictions to the fishery to enable recovery of non-target stocks. The non-target stocks most vulnerable to the fishery include Henderson Lake sockeye and wild steelhead and chinook runs from the Somass river. The main provisions to ensure recovery of these stocks are monitoring of bycatch and fishery restrictions (eg, mandatory release, time and area closures when the stocks are prevalent, or gear restrictions such as limited soak times). The fishery is actively managed to avoid Henderson sockeye.

The status of the Henderson Lake sockeye population is currently under review by PSARC. The purpose of this review is to identify limiting factors in lake productivity, evaluate the effect of stock enhancement and lake enrichment activities, identify the effects of habitat degradation, and establish a LRP and a TRP for escapement. The interim TRP of 50,000 is probably too high given current lake productivity and habitat capacity (this conclusion is not symptomatic of the 'moving baseline' syndrome; it is based on analysis of long-term data). The average escapement to Henderson since 1979 has been approximately 30,000 fish.⁴¹

The status of wild chinook populations that are potentially caught in the Barkley sockeye fishery are reviewed annually by PSARC. Naturally spawning chinook from the Somass system is the concern. This population has an established minimum escapement target of 50 million eggs wild and 9 million hatchery, allowing for 20% pre-spawn mortality. This level corresponds to an LRP and is based on an evaluation of pre 1985 escapement levels. No marine fisheries are permitted until the target is met. However, modest terminal fisheries for First Nation food, social and ceremonial purposes may be permitted.⁴² These plans include provision for modest post-release mortality in target fisheries at levels reviewed by PSARC.

In establishing recovery plans for a depleted stock, all factors limiting abundance are considered including non-fishing related impacts such as habitat degradation, water withdrawal and predation. When available, these data are evaluated to determine their effect on population abundance. DFO habitat biologists monitor water levels in the Somass system during summer low flow periods.

⁴¹ Hyatt, K.? 1986. Advice on Barkley Sound Sockeye. PSARC Advisory Document 86-5. P. 80. This reference needs updating with the PSARC paper in progress, which is currently not available: Stock data and status of Henderson Lake sockeye is currently in progress: K. Hyatt, D.P. Rankin, P.J. Tschaplinski, I. Miki, 2003 in prep. PSARC Working Document S2003-08: Assembly of standardized estimates of juvenile and adult sockeye salmon (*Onchorynchus nerka*) abundance associated with the 1976-2001 brood years in Henderson Lake and Clemens Creek, British Columbia.

⁴² Wilf Luedke, personal communication.

Scoring Summary

It should be clear from the information presented that DFO takes a variety of measures to ensure that removals of target stocks and species are sustainable and that removals of non-salmon species are kept to a minimum.

All three 60 Scoring Guideposts have been met.

All six 80 Scoring Guideposts are in effect.

Three of five 100 Scoring Guideposts are in place and one has been determined to be partially met. One has been determined to not be applicable.

Future Changes

Future plans call for a much more integrated approach to watershed management to address habitat impacts on fish populations. The department has developed a guidebook jointly with BC on watershed-based fish sustainability planning (ref is Watershed-Based fish Sustainability Planning, Conserving B.C. Fish Populations and their Habitat, 2001, BC MoFisheries, BC MELP, DFO). A pilot process utilizing this approach will be initiated in early 2004 for Henderson Lake. This process will integrate habitat and fisheries management through basic research and analysis and also consultation with all stakeholders (including First Nation and forestry companies).

100 Scoring Guidepost

- The management plans and escapement goals have been shown to have a high (>80%) probability of achieving a long-term recovery of depleted non-target stocks using risk analysis.
- Historic data have been thoroughly examined to ensure fisheries restoration objectives are based on the likely habitat capacity, rather than on trends that cover only the most recent decades, thus avoiding the "moving baseline" syndrome.
- Monitoring and assessment programs are established to determine with a high degree of confidence and in a timely manner that recovery is occurring.
- Proposed management strategies have been reviewed and found to be scientifically defensible and appropriate by the Pacific Stock Assessment Review Committee or the appropriate Pacific Salmon Commission technical committee.
- The management system supports the collection of data on non-fishing related human activity in the development of recovery plans for non-target stocks.

80 Scoring Guidepost

- The management system includes assessment of plans for the recovery of non-target stocks to levels above established LRPs.

- Objectives for recovery have at least some consideration of historic documents on stock abundance.
- The management system has a reasonable (>60%) probability of achieving long-term recovery of depleted non-target stocks.
- Monitoring and assessment programs are established to determine with a high degree of confidence and in a timely manner that recovery is occurring.
- Escapement goals will be revised periodically to accommodate new data indicating success or failure of existing recovery plans.
- The management system considers the impact of non-fishing-related human activity in the development of recovery plans for non-target stocks.

60 Scoring Guidepost

- The management system attempts to prevent extirpation of non-target stocks and does have rebuilding strategies for the majority of the stocks.
- The management system has at least a 50% probability of achieving long-term recovery of depleted non-target stocks.
- The management system has a strategy for periodically revisiting escapement goals to respond to new data on recovery success or failure for the majority of the stocks.