

Response to Marine Stewardship Council

Indicators for Principle 1 - Stock Assessment and Stock Status

Pacific Wild Salmon Fishery

Nass 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 Nass 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 Nass 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 units for all Nass stocks were specified as part of the DFO 2004 regional stock assessment project review process.<sup>1</sup> These are not formally reviewed by PSARC but were accepted by the DFO Science staff as the best current units.

The Nass River watershed produces sockeye from 5 lakes in the upper Nass and at least 6 lower river tributaries not associated with lake systems.<sup>2, 3</sup> Meziadin Lake is by far the largest

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<sup>1</sup> DFO stock assessment framework, May 2004

<sup>2</sup> Rutherford, D.T., Wood, C.C., Jantz, A.L., and Southgate, D.R. 1994. Biological characteristics of Nass River sockeye salmon (*Oncorhynchus nerka*) and their utility for stock composition analysis of test fishery samples. Can. Tech. Rep. Fish. Aquat. Sci. No. 1988.

<sup>3</sup> Beacham, T.D., and Wood, C.C. 1999. Application of microsatellite DNA variation to estimation of stock composition and escapement of Nass River sockeye salmon (*Oncorhynchus nerka*). Can. J. Fish. Aquat. Sci. 56: 297-310.

producer accounting for over 80% of the total Nass sockeye production. The other main sockeye producers are Bowser, Damdochax and Fred Wright Lake systems.

The timing of the sockeye stock units has been evaluated from DNA stock composition of weekly samples from the lower river test fishery and fish wheels.<sup>4</sup> The Nass sockeye lake stocks all have similar timing while the river types tend to have an earlier migration into the river.

Chinook stocks are generally treated as an aggregated stock unit for the Nass watershed and a second stock unit representing coastal tributaries. Coho are aggregated into three units, Nass River interior, lower Nass River and coastal stocks.

### *Stock Assessment*

The sockeye stock units are well defined for the purposes of assessment.

The Pacific Salmon Treaty reconstruction model for northern British Columbia and S.E. Alaskan provides sockeye reconstructions for the watershed unit that are also used for Nisga'a Treaty purposes.<sup>5, 6</sup> PSARC forecasts for Nass sockeye are produced for the watershed aggregate stock.<sup>7</sup> Assessments of sockeye production are generally based on individual lake units.<sup>8</sup>

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<sup>4</sup> Beacham, T.D., and Wood, C.C. 1999. Application of microsatellite DNA variation to estimation of stock composition and escapement of Nass River sockeye salmon (*Oncorhynchus nerka*). Can. J. Fish. Aquat. Sci. 56: 297-310.

Rutherford, D.T., Wood, C.C., Jantz, A.L., and Southgate, D.R. 1994. Biological characteristics of Nass River sockeye salmon (*Oncorhynchus nerka*) and their utility for stock composition analysis of test fishery samples. Can. Tech. Rep. Fish. Aquat. Sci. No. 1988.

<sup>5</sup> 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.

<sup>6</sup> 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.

<sup>7</sup> Cox-Rogers, S. 2003. Pre-season 2003 stock size forecasts for Nass River and Skeena River sockeye salmon. PSARC Working paper S2003-01. Fisheries and Oceans Canada, Nanaimo, BC

<sup>8</sup> Johannes, M.R.S., and K.D. Hyatt. 1994. DFO-Nisga'a interim measures program status report on assessment of sockeye salmon carrying capacity of Meziadin Lake. Report SRe 11-94. Recruit. Assess. Sec., Pac. Bio. Sta. Nanaimo, B.C.

Cooper, K.L., M.R.S. Johannes, and K.D. Hyatt. 1994. Limnology of Salmonid nursery lakes of the Nass River system(1991-1993) under study by the interim measures fisheries program. Can. Data. Rep. Fish. Aquat. Sci. 29 p.

Cooper, K.L., M.R.S. Johannes, and K.D. Hyatt. 1994. Zooplankton community structure (1991-1993) of Salmonid nursery lakes of the Nass River system under study by the interim measures fisheries program. Can. Data. Rep. Fish. Aquat. Sci. 33 p.

Johannes, M.R.S., and K.D. Hyatt. 1994. DFO-Nisga'a interim measures program status report on assessment of sockeye salmon carrying capacity of Meziadin Lake. Report SRe 11-94. Recruit. Assess. Sec., Pac. Bio. Sta. Nanaimo, B.C.

### *Conservation*

The sockeye stock units are well defined for the purposes of conservation. There is biological information to distinguish the stocks, but no evidence of population sub-structure to warrant further division below the lake units or tributary aggregates.<sup>9</sup>

### *Fisheries Management*

The stock units are well defined for the purposes of fisheries management. Nass River sockeye are caught in a complex array of mixed-stock fisheries in southern southeast Alaska, northern British Columbia (Statistical Areas 1 through 4), and in First Nations food, social, and ceremonial fisheries (FSC) and escapement surplus to spawning requirement (ESSR) fisheries within the Nass River itself.<sup>10</sup>

The Pacific Salmon Treaty annex arrangements use watershed aggregates as the sockeye stock units for fishery management.<sup>11</sup> The Nisga'a Treaty uses watershed aggregates for sockeye treaty accounting and lake stock units for assessment and conservation.<sup>12</sup>

### **Scoring Summary**

Both 60 Scoring Guideposts have been met.

Both 80 Scoring Guideposts have been met.

Both 100 Scoring Guideposts have been met.

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Johannes, M.R.S., K.D. Hyatt, and D.K. McCreight. 1994. DFO-Nisga'a interim measure program status report on assessment of sockeye salmon smolts from the Nass River system. Report SRe 19-94. Recruit. Assess. Sec., Pac. Bio. Sta. Nanaimo, B.C.

Johannes, M.R.S., K.D. Hyatt, D.P. Rankin, and D.K. McCreight. 1995. Hydroacoustic/trawl survey estimates of limnetic fish population abundance in Salmonid nursery lakes of the Nass River system. Can. Data. Rep. Fish. Aquat. Sci. 75 p.

<sup>9</sup> Beacham, T.D., and Wood, C.C. 1999. Application of microsatellite DNA variation to estimation of stock composition and escapement of Nass River sockeye salmon (*Oncorhynchus nerka*). Can. J. Fish. Aquat. Sci. 56: 297-310.

Rutherford, D.T., Wood, C.C., Jantz, A.L., and Southgate, D.R. 1994. Biological characteristics of Nass River sockeye salmon (*Oncorhynchus nerka*) and their utility for stock composition analysis of test fishery samples. Can. Tech. Rep. Fish. Aquat. Sci. No. 1988.

<sup>10</sup> 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.

<sup>11</sup> 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>

<sup>12</sup> FOG. 2001. Fisheries operational guidelines (Draft: 13 December 2001). Report prepared by the Nisga'a Fisheries Working Group for the Nisga'a Tripartite Comprehensive Claims Negotiations. Section 2.2. Pages 3 to 6.

## 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 and this 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 rationale 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.

Stock units for all Nass stocks were specified as part of the DFO 2004 regional stock assessment project prioritisation process.<sup>13</sup> Sockeye stock units have been reviewed through PSARC as part of the DNA stock composition reviews.<sup>14</sup> The PSARC process includes fishery scientists

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<sup>13</sup> DFO stock assessment framework, May 2004

<sup>14</sup> Beacham, T.D., and Wood, C.C. 1999. Application of microsatellite DNA variation to estimation of stock composition and escapement of Nass River sockeye salmon (*Oncorhynchus nerka*). Can. J. Fish. Aquat. Sci. 56: 297-310.

outside the management agency. For other species the stock units have not been reviewed by PSARC, but were accepted by the DFO 2004 Regional Science review process as the current best units.<sup>15</sup>

There is general agreement among regional fisheries scientists outside the management agency that the stock units are appropriate for target and non-target stock units of all species. The Pacific Salmon Treaty annex arrangements use watershed aggregates as the treaty stock units for sockeye.<sup>16</sup> The Nisga'a Treaty Joint Technical Committee (Nisga'a JTC) uses stock units that agree with the DFO stock assessment regional approach. There have been no expressions of concern regarding the stock units from inside DFO or from outside agencies.<sup>17</sup>

### Scoring Summary

The 60 Scoring Guidepost has been met.

The two 80 Scoring guideposts have been met.

All of the 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.

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Rutherford, D.T., Wood, C.C., Jantz, A.L., and Southgate, D.R. 1994. Biological characteristics of Nass River sockeye salmon (*Oncorhynchus nerka*) and their utility for stock composition analysis of test fishery samples. Can. Tech. Rep. Fish. Aquat. Sci. No. 1988.

<sup>15</sup> DFO stock assessment framework, May 2004.

<sup>16</sup> Pacific Salmon Treaty, Amended June 30, 1999 Chapter 2 and associated Appendix. Pages 25 to 29.

<sup>17</sup> Stock assessment frameworks reference 2004 STAD review.

## 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.

#### DFO Response

#### Current Situation

Preseason forecasts of Nass sockeye aggregate abundance, prepared annually using PSARC approved methods, provide the basis for the development of pre-season management plans. Management plans are modified in-season based on estimates of Nass sockeye stock abundance derived from interpretations of effort and catch rates in Alaskan and Canadian fisheries compared to historical data.<sup>18, 19</sup>

A reconstruction model is used for post-season evaluation of the geographic range of harvest for Nass sockeye.<sup>20</sup> The data required for these reconstructions are catch (aggregated 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 studies.<sup>21</sup> The model then incorporates any direct stock composition estimates (derived from DNA or scale samples) 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, US and the Nisga'a 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).

There is excellent information available on the geographic range of harvest of Nass coho, including in-season evaluations from Alaskan and Canadian fisheries.<sup>22, 23, 24</sup>

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<sup>18</sup> Wood, C.C., D.T. Rutherford, and L. Jantz. 1999. Trends in abundance and pre-season 1999 stock size forecasts for major sockeye, pink, and chum salmon stocks in northern British Columbia. PSARC Working Paper S99-03: 50 p.

<sup>19</sup> DFO internal memo May 16, 2000 "Preliminary Updated Nass Run Size Estimator"

<sup>20</sup> 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.

<sup>21</sup> 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.

<sup>22</sup> Baxter, B.E. and C.Y. Stephens. 2004. Adult and juvenile coho salmon enumeration and coded-wire tag recovery analysis for Zolzap Creek, BC, 2003. Can. Manuscr. Rep. Fish. Aquat. Sci. 2684: vii + 44 p.

There is information available on the geographic range of harvest of Nass chinook from Nass chinook tagging and from the Skeena chinook indicator stock.<sup>25, 26</sup>

The Nisga'a harvest of all salmon species in ocean and in-river fisheries is monitored in-season and documented.<sup>27</sup>

### 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.

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<sup>23</sup> [TCNB \(02\)-3](#) - *Status of Coho Salmon Stocks and Fisheries in the Northern Boundary Area*. July, 2002.

[TCNB \(02\)-3 appendix 1](#) - *Status of Coho Salmon Stocks and Fisheries in the Northern Boundary Area*. July, 2002. *Appendix One*.

[TCNB \(02\)-3 appendix 2](#) - *Status of Coho Salmon Stocks and Fisheries in the Northern Boundary Area*. July, 2002. *Appendix Two*.

<sup>24</sup> S.P. Cox, J. Sawada, W. de la Mare. 2003. 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

Holtby, B. 2000. In-season indicators of run-strength and survival for northern British Columbian coho. PSARC Working Paper S00-11

<sup>25</sup> Sviatko, S. and B. E. Baxter. 2003. Adult Chinook salmon enumeration and coded-wire tag recovery analysis for Kincolith River, BC, 2002. Report NF 02-12 prepared by LGL Limited, Sidney, BC for the Nisga'a Lisims Government, New Aiyansh, BC.

Koski, W.R., Link, M.R. & English, K.K. 1996. Distribution, fate and numbers of chinook salmon returning to the Nass River Watershed in 1992. Can. Tech. Rep. Fish. Aquat. Sci. No. 2129:xi +141p.

Koski, W.R., Alexander, R.F. & English, K.K. 1996. Distribution, fate and numbers of chinook salmon returning to the Nass River Watershed in 1993. Can. Manuscr. Rep. Fish. Aquat. Sci. No. 2371:xi +143p.

<sup>26</sup> McNicol, R.E. 2000. An assessment of Kitsumkalum River summer chinook, a north coast indicator stock. PSARC Working Paper S00-17

<sup>27</sup> Baxter, B.E. and C.G. Azak. 2003. Nisga'a Catch Monitoring Program: 2002 Nisga'a Fishery. Nisga'a Fisheries Report NF02-05.

Baxter, B.E. and C.Y. Stephens. 2004. Nisga'a Catch Monitoring Program: 2003 Nisga'a Fishery. Nisga'a Fisheries Report NF03-05.

### 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 Nass sockeye do not rely on indicator stocks.

The only non-target stock prevalent in the Nass sockeye fishery that relies on indicator stocks is coho. The indicator stocks have been reviewed through the Pacific Salmon Treaty Northern Boundary Technical Committee and PSARC and the approach includes a specific objective to evaluate extensive coho escapements to evaluate the utility of the indicators.<sup>28, 29</sup>

#### Scoring Summary

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

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<sup>28</sup> PST NBTC coho report

<sup>29</sup> Baxter, B.E. 2003. Adult and juvenile coho salmon enumeration and coded-wire tag recovery analysis for Zolzap Creek, BC, 2002. Can. Manuscr. Rep. Fish. Aquat. Sci. 2646: vii + 44 p.

### 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 unenhanced stocks.

## DFO Response

### Current Situation

There are no enhanced sockeye stocks in the Nass area. There is very modest coho and chinook enhancement in the Kincolith River but the production is very small and there are no related fisheries.<sup>30</sup>

### Scoring Summary

The scoring guideposts are not applicable.

#### 100 Scoring Guidepost

- Fisheries targeting enhanced stocks are geographically removed from unenhanced 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 unenhanced 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 unenhanced fish stocks.

#### 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.

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<sup>30</sup> Sviatko, S. and B.E. Baxter. 2003. Adult Chinook salmon enumeration and coded-wire tag recovery analysis for Kincolith River, BC, 2002. Report NF 02-12 prepared by LGL Limited, Sidney, BC for the Lisims Government, New Aiyansh, BC

### **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 hail-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. Commercial and recreational catch estimates for all salmon species for SE Alaskan fisheries are provided annually through the Pacific Salmon Treaty Process and for the Nisga'a treaty.<sup>31, 32</sup>

Excellent First Nation catch information is available for Nass First Nation fisheries.<sup>33</sup>

Recreational catch information is of poorer quality, available only from periodic creel survey programs, although catches are generally small relative to commercial. Sockeye recreational harvests are estimated to be <100 fish.<sup>34</sup>

Fisheries and Oceans Canada has done studies on mortality rates for the majority of released species for all sectors.<sup>35</sup> Where empirical studies are not available, professional judgment is used in the estimation of mortality rates. Mortality rates by species and gear are used in the Nisga'a Treaty post-season reports to evaluate release mortalities.<sup>36</sup> Detailed reviews of the data and procedures used to provide the catch estimates for Nass salmon are available in the Nisga'a Treaty annual salmon fisheries management reports.<sup>37</sup>

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<sup>31</sup> [TCNB \(02\)-2](#) - *U.S./Canada Northern Boundary Area 2001 Salmon Fisheries Management Report and 2002 Preliminary Expectations*. January, 2002.

<sup>32</sup> JTC. 2004. Nass area salmon fisheries management report, 2002: Update version 27 April 2004. Report prepared by the Nisga'a Joint Technical Committee for the Nisga'a Joint Fisheries Management Committee. Footnote 1 on Page 33.

<sup>33</sup> Baxter, B.E. and C.G. Azak. 2003. Nisga'a Catch Monitoring Program: 2002 Nisga'a Fishery. Nisga'a Fisheries Report NF02-05.

<sup>34</sup> Baxter, B.E. 2003. Nass River Sport Fishery Catch Monitoring Program, 2002. Nisga'a Fisheries Report NF02-06.

<sup>35</sup> Personal communication DFO Stock Assessment Prince Rupert, Steve Cox-Rogers.

<sup>36</sup> JTC. 2004. Nass area salmon fisheries management report, 2002: Update version 27 April 2004. Report prepared by the Nisga'a Joint Technical Committee for the Nisga'a Joint Fisheries Management Committee. Page 33 Appendix A3, Footnote 1

<sup>37</sup> JTC. 2004. Nass area salmon fisheries management report, 2002: Update version 27 April 2004. Report prepared by the Nisga'a Joint Technical Committee for the Nisga'a Joint Fisheries Management Committee. Summary pages 3 to 5, Nisga'a harvests page 19, Canadian commercial page 20, recreational page 21, Alaskan page 22.

## 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.

### DFO Response

#### Current Situation

Nass sockeye in-season escapement estimates are provided from in-river test fishing. Prior to 1992, the Nass test fishery was conducted with gillnets but in 1992 fish-wheels were introduced through the Nisga'a fisheries program, and by 1994 the gillnet test fishery was replaced with fish-wheels and a mark-recapture program to provide more reliable estimates of sockeye

salmon escapement.<sup>38, 39</sup> Recent developments in stock separation techniques indicate the potential for stock specific in-season abundance estimates.<sup>40</sup>

Annual escapement estimates for each species aggregate of Nass salmon are documented in the annual Nisga'a Treaty Management reports.<sup>41</sup>

The Nass fish-wheels provide in-season indices of escapement by species.<sup>42</sup>

In some cases sockeye juvenile surveys are used as a proxy for adult escapement estimates but are only conducted periodically.<sup>43</sup>

The escapement of Meziadin Lake sockeye salmon is reliably determined at a fish-way at Victoria Falls near the outlet of the lake.<sup>44</sup>

Escapement data for other Nass sockeye Lake systems are not collected every year.

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<sup>38</sup> Southgate, D.R., Spilsted, B., and Jantz, L. 1990. A review of the Nass River test fishery biological program for 1989. Can. Data Rep. Fish. Aquat. Sci. No. 805.

<sup>39</sup> Link, M.R. and K.K. English. 1996. The 1993 Fishwheel Project on the Nass River and an Evaluation of Fishwheels as an In-season Management and Stock Assessment Tool for the Nass River. Can. Tech. Rep. Fish. Aquat. Sci. 2130: xi + 103 p.

Link M.R. 1995. The value of an improvement in the precision and accuracy of information used to manage a sockeye salmon (*Oncorhynchus nerka*) fishery: the Nass River gillnet and fishwheel test fishery programs. Rep. No. 164. Master's thesis, School of Resource and Environmental Management, Simon Fraser University, Burnaby, BC

<sup>40</sup> Rutherford, D.T., Wood, C.C., Jantz, A.L., and Southgate, D.R. 1994. Biological characteristics of Nass River sockeye salmon (*Oncorhynchus nerka*) and their utility for stock composition analysis of test fishery samples. Can. Tech. Rep. Fish. Aquat. Sci. No. 1988.

Beacham, T.D., and Wood, C.C. 1999. Application of microsatellite DNA variation to estimation of stock composition and escapement of Nass River sockeye salmon (*Oncorhynchus nerka*). Can. J. Fish. Aquat. Sci. 56: 297-310.

<sup>41</sup> JTC. 2004. Nass area salmon fisheries management report, 2002: Update version 27 April 2004. Report prepared by the Nisga'a Joint Technical Committee for the Nisga'a Joint Fisheries Management Committee. Summary pages 5 to 8, Table 6 page 23, Appendix Table A4 to A6, Pages 34 to 36.

<sup>42</sup> Alexander, R.F., and R.C. Bocking. 2003. The 2001 fishwheel project on the Nass River, B.C. Can. Man. Rep. Fish. Aquat. Sci. 2659: xi + 118 p.

<sup>43</sup> Johannes, M.R.S., K.D. Hyatt, D.P. Rankin, and D.K. McCreight. 1995. Hydroacoustic/trawl survey estimates of limnetic fish population abundance in Salmonid nursery lakes of the Nass River system. Can. Data. Rep. Fish. Aquat. Sci. 75 p.

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

<sup>44</sup> Southgate, D.R. 1991. Review of the Meziadin River fishway and the upper Nass biological programs, 1990. Can. Data. Rep. Fish. Aquat. Sci. 823: 74 pp.

## Scoring Summary

Both of the 60 Scoring Guideposts have been met.

All of the 80 Scoring Guideposts has been met.

One of the 100 Scoring Guideposts has been met, and one 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.

### 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 for catch from Canadian ocean fisheries based on a sampling plan designed to provide age by week and by catch sub-area.<sup>45</sup> Age and length information is

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<sup>45</sup> Personal communication Steve Cox-Rogers, Prince Rupert DFO stock assessment

collected for all species from the Nass fish wheels. The data is maintained by Nisga'a fisheries and by DFO Prince Rupert.

Periodic monitoring programs are in place collecting information on age and size of other species in the ocean fisheries catch. Sampling programs are not in place for recreational or First Nations fisheries.

### Scoring Summary

The 100 scoring guidepost has been partially met.

The 80 scoring guideposts are met.

The 60 scoring guidepost is 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 Meziadin sockeye and for some other Nass sockeye Lake systems.<sup>46, 47</sup> The relative productivity of non-target species is known from coho assessments vetted through PSARC and recent steelhead studies by the Nisga'a and BC.<sup>48, 49</sup>

The value of Nass assessment programs in meeting Nass sockeye conservation and production objectives has been evaluated.<sup>50</sup>

### Scoring Summary

Both 60 Scoring Guideposts have been met.

All three 80 Scoring Guideposts have been met.

One of the two 100 Scoring Guideposts have been met.

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<sup>46</sup> Bocking, R.C., M.R. Link, B. Baxter, B. Nass and L.Jantz. 2003. Meziadin Lake Biological Escapement Goal and Considerations for Increasing Yield of Sockeye Salmon. PSARC Working Paper 2001-08

Johannes, M.R.S., and K.D. Hyatt. 1994. DFO-Nisga'a interim measures program status report on assessment of sockeye salmon carrying capacity of Meziadin Lake. Report SRe 11-94. Recriut. Assess. Sec., Pac. Bio. Sta. Nanaimo, B.C.

<sup>47</sup> Shortreed, K.S., K.F. Morton, K. Malange and J.M.B. Hume. 2001. Factors limiting juvenile sockeye production and enhancement potential for selected BC nursery Lakes. Can. Sc. Advisory Secretariat Res. Doc. 2001/098

Rankin, D.P., and K.D. Hyatt. 2002. Juvenile sockeye salmon and limnetic zooplankton data summary from 1991-1993 surveys of Fred Wright and Meziadin Lakes. Report to file:JSIDS - SSRe 04-2001. Stock Assessment Division, Fisheries and Oceans Canada, Pacific Biological Station, Nanaimo, B.C. V9T 6N7

<sup>48</sup> Holtby, B., B. Finnegan, B. Spilsted. 2000. Forecast for northern British Columbia coho salmon in 2000 PSARC Working Paper S00-4.

<sup>49</sup> BC Nisga'a steelhead ref in Press.

<sup>50</sup> Link M.R. 1995. The value of an improvement in the precision and accuracy of information used to manage a sockeye salmon (*Oncorhynchus nerka*) fishery: the Nass River gillnet and fishwheel test fishery programs. Rep. No. 164. Master's thesis, School of Resource and Environmental Management, Simon Fraser University, Burnaby, BC

Robb, Christina, A and Peterman, Randall, M. Application of Bayesian decision analysis to management of a sockeye salmon fishery. 1998 NRC Canada. School of Resource and Environmental Management, Simon Fraser University, Burnaby, BC. Can. J. Fish. Aquat. Sci. 55: 86-98 (1998).

### 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.
- 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 set for Nass stock aggregates as part of the Nisga'a Treaty.<sup>51</sup> The Nisga'a Treaty Joint Technical Committee provided recommendations for limit reference points that have been accepted by the Nisga'a Joint Fisheries Management Committee. The minimum escapement levels (LRP) are the levels below which no fisheries may target that species. The values are sockeye 100,000, pink 150,000, chinook 10,000, coho 40,000 and chum 30,000. Steelhead LRP is identified as a percent of the maximum recruitment.<sup>52</sup>

The LRPs have not been formally reviewed by PSARC, but have been approved by the Nisga'a and provincial representatives as part of the Nisga'a process. There have been no expressions of concern from scientists within or outside of the agency.

### Scoring Summary

The sole 60 Scoring Guidepost has been met.

The 80 Scoring Guideposts have been met.

The 100 Scoring Guideposts have been met.

### Future Changes

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

### 100 Scoring Guidepost

- *The Limit Reference Point for target species have been reviewed and found to be scientifically defensive 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.*

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<sup>51</sup> FOG. 2001. Fisheries operational guidelines (Draft: 13 December 2001). Report prepared by the Nisga'a Fisheries Working Group for the Nisga'a Tripartite Comprehensive Claims Negotiations. Section 2.2. Pages 3 to 6.

<sup>52</sup> FOG. 2001. Fisheries operational guidelines (Draft: 13 December 2001). Report prepared by the Nisga'a Fisheries Working Group for the Nisga'a Tripartite Comprehensive Claims Negotiations. Section 2.2. Page 7.

### 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.

### **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 (TRP) have been set for Nass stock aggregates as part of the Nisga'a Treaty.<sup>53</sup> The Nisga'a Treaty Technical Committee provided recommendations for target reference points that have been accepted by the Nisga'a Joint Fisheries Management Committee. The target escapement levels are the levels above which commercial fisheries may target that species. The values are sockeye 200,000, pink 225,000, chinook 15,000, and coho 60,000 and chum 45,000. The sockeye values of 160,000 for Meziadin and 200,000 for the watershed aggregate are PSARC approved.<sup>54</sup>

Steelhead LRPs are identified as a percent of the maximum recruitment following the regional approach.<sup>55, 56</sup>

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<sup>53</sup> FOG. 2001. Fisheries operational guidelines (Draft: 13 December 2001). Report prepared by the Nisga'a Fisheries Working Group for the Nisga'a Tripartite Comprehensive Claims Negotiations. Section 2.2. Pages 3 to 6.

<sup>54</sup> Bocking, R.C., M.R. Link, B. Baxter, B. Nass and L. Jantz. 2003. Meziadin Lake Biological Escapement Goal and Considerations for Increasing Yield of Sockeye Salmon. PSARC Working Paper 2001-08

<sup>55</sup> FOG. 2001. Fisheries operational guidelines (Draft: 13 December 2001). Report prepared by the Nisga'a Fisheries Working Group for the Nisga'a Tripartite Comprehensive Claims Negotiations. Section 2.2. Page 7.

The TRP's have not been formally reviewed by PSARC, but have been approved by the Nisga'a and Provincial technical representatives as part of the Nisga'a process. There have been no expressions of concern from scientists within or outside of the agency.

### 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 (TRP) 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 of the 60 Scoring Guideposts have been met.

All of the 80 Scoring Guideposts have been met.

All 100 Scoring Guideposts 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.

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<sup>56</sup> Johnston N.T., E.A. Parkinson, A.F. Tautz and B.R. Ward. 2000. Biological reference points for the conservation and management of steelhead, *Oncorhynchus mykiss* PSARC Working Paper S00-08

## 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 Nass fishery has a clear pre-established response to low abundance.<sup>57</sup> The Nisga'a Treaty allows for First Nations' FSC harvests to be partially reinstated once the interim LRP is reached and the Nisga'a sale fishery and the commercial fishery resumes once the TRP has been met.<sup>58</sup> Nass sockeye stocks have remained very abundant in recent years so there have been no situations where rebuilding has been required.

##### Scoring Summary

Both of the 60 Scoring Guideposts have been met.

One of the 80 Scoring Guideposts has been met.

The 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.

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<sup>57</sup> North Coast IFMP pages

<sup>58</sup> Nisga'a Final Agreement April 27, 1999. Pages 104, 105, 123 and 124.

### 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.

## **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

Status of salmon stocks in the Nass watershed remains very good. Stock status for all Nass stocks were specified as part of the DFO 2004 regional stock assessment project prioritisation process.<sup>59</sup> The Nass area sockeye, chinook and coho stocks all received the highest status '*Abundant - stock well above target*'.

#### Scoring Summary

Both 60 Scoring Guideposts have been met.

Both 80 Scoring Guideposts have been met.

Both 100 Scoring Guideposts have been met.

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<sup>59</sup> DFO stock assessment framework, May 2004.

### 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.

### 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 target stock. The Nisga'a Fisheries Operational Guidelines has a chapter on *Biological*

*Considerations Related to Management and Harvesting* that addresses managing the distribution of harvest pressure, by-catch and reducing harvest on less productive stocks.<sup>60</sup>

There is a long term data set of biological characteristics of the Nass sockeye collected for over 50 years from Nass test fishing, Nisga'a fish wheels and the Meziadin fish way.<sup>61,62</sup>

Terminal harvest opportunities in the Nass system are limited to terminal fisheries at Meziadin to avoid undue impacts on less productive sockeye stocks.<sup>63</sup>

Recent studies have improved our understanding of the genetic structure of individual sockeye stocks in the Nass watershed.<sup>64</sup>

### Scoring Summary

Two 60 Scoring Guideposts have been met and one is not applicable.

Two 80 Scoring Guideposts have been met and one is not applicable.

One 100 Scoring Guideposts has been met, one has not been met and one is not applicable.

### 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.

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<sup>60</sup> FOC. 2001. Fisheries operational guidelines (Draft: 13 December 2001). Report prepared by the Nisga'a Fisheries Working Group for the Nisga'a Tripartite Comprehensive Claims Negotiations. Section 2.2. Chapter 5.0 Pages 24 to 26.

<sup>61</sup> Southgate, D.R., Spilsted, B., and Jantz, L. 1990. A review of the Nass River test fishery biological program for 1989. Can. Data Rep. Fish. Aquat. Sci. No. 805.

Biological database held by DFO Stock Assessment Prince Rupert, Barb Spencer, Spencerb@pac.dfo-mpo.gc.ca

<sup>62</sup> Haugan, D., L. Jantz, and B. Spilsted. 1989. Historical review of the Meziadin River fishway and biological programs from 1964 to 1986. Can. Data Rep. Fish. Aquat. Sci. 765: 112p.

Biological database held by DFO Stock Assessment Prince Rupert, Barb Spencer, Spencerb@pac.dfo-mpo.gc.ca

<sup>63</sup> North Coast IFMP Pages 30 and 31.

<sup>64</sup> Beacham, T.D., J. R. Candy, B. McIntosh, C. MacConnachie, A. Tabata, K. Miller, and R. Winther. 2004. DNA-level variation of sockeye salmon (*Onchorhynchus nerka*) in Southeast Alaska and the Nass and Skeena rivers, British Columbia, with applications to stock identification. In press.

- 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 unenhanced 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.
- 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 unenhanced stocks that may be due to the enhancement of other stocks.