



Pacific Fisheries Resource Conservation Council

Advisory: An Ecosystem- based Approach to Managing Salmon in Georgia Strait

*A Report on the Why and How of an
Ecosystem-based Management
Approach*

*Report to the Minister of Fisheries
and Oceans Canada*

*Report to the Minister of Agriculture,
Food and Fisheries*

Report to the Canadian Public

June 2007

**ADVISORY: AN ECOSYSTEM-BASED
APPROACH TO MANAGING SALMON IN
GEORGIA STRAIT**

Pacific Fisheries Resource Conservation Council

June 2007

Advisory: An Ecosystem-based Approach to Managing Salmon in Georgia Strait

Pacific Fisheries Resource Conservation Council

Copyright © June 2007 Pacific Fisheries Resource Conservation Council. All Rights Reserved.

For non-commercial use, you are welcome to copy and distribute this document in whole or in part by any means, including digitally, as long as this copyright/contact page is included with all copies. As well, the content may not be modified, and no reference to the Pacific Fisheries Resource Conservation Council may be deleted from the document.

Commercial users may use the material as above, as long as access to it by the general public is not restricted in any way, including but not limited to: purchase of print or digital document(s), singly or as part of a collection; the requirement of paid membership; or pay-per-view. For all such commercial use, contact the Pacific Fisheries Resource Conservation Council for permission and terms of use.

The limited permissions granted above are perpetual and will not be revoked by the Pacific Fisheries Resource Conservation Council.

Note that this document, and the information contained in it, are provided on an "as is" basis. They represent the opinion of the author(s) and include data and conclusions that are based on information available at the time of first publication, and are subject to corrections, updates, and differences or changes in interpretation. The Pacific Fisheries Resource Conservation Council is not responsible for use of this information or its fitness for a particular purpose.

For quotes and short excerpts from the material covered under "fair use", we recommend the following citation:
PFRCC 2007. Advisory: An Ecosystem-based Approach to Managing Salmon in Georgia Strait. Vancouver, BC: Pacific Fisheries Resource Conservation Council.

For further information about this document and about the Pacific Fisheries Resource Conservation Council (PFRCC), contact:

Pacific Fisheries Resource Conservation Council
290 - 858 Beatty Street
Vancouver, BC V6B 1C1
Telephone 604 775 5621
Fax 604 775 5622
www.fish.bc.ca
info@fish.bc.ca

Printed and bound in Canada

ISBN 1-897110-34-0



Pacific Fisheries Resource Conservation Council
Conseil pour la conservation des ressources halieutiques du pacifique

June 11, 2007

The Hon. Loyola Hearn
Minister of Fisheries and Oceans
Government of Canada
Parliament Buildings
Ottawa

The Hon. Barry Penner
Minister of Environment
Province of British Columbia
Legislative Building
Victoria

PFRCC Advisory: An Ecosystem-based Approach to Managing Salmon in Georgia Strait

Dear Ministers:

Ecosystem management has attracted wide support, but there has been limited success by fisheries managers in devising ways to do it effectively and in applying that notion in practical ways. To help foster progress in employing the ecosystem-based approach, the Pacific Fisheries Resource Conservation Council (PFRCC) held a technical workshop in Vancouver on March 15th, 2007. A short summary report on that workshop is appended to this letter.

The Strait of Georgia was chosen as the area to examine in the workshop for several reasons. As compared to other BC marine areas there are reasonably detailed data, background information and on-going monitoring of aquatic life and environmental conditions. The Strait is experiencing observable changes—getting warmer, experiencing variation in freshwater supply and nutrient availability, and shifting abundances of fish, shellfish, marine mammals and planktonic food. These changes and many others are affecting the communities that depend on fisheries and aquatic resources for their livelihoods. The Strait of Georgia is highly visible and significant to British Columbians. Approximately 75 percent of residents of the Province live within close proximity to the Strait, and changes in the region have been substantial and readily observed in recent years. For salmon, the species that have traditionally been highly valued, such as coho and chinook, are experiencing poor marine survival and are depressed in numbers compared to historical abundances. The inability to reverse these persistent low abundances raises the question of what is wrong with the traditional fisheries management regime that is strict but seemingly ineffective in many instances.

During the workshop it became clear that the federal government committed to adopting an ecosystem approach and there are several prime reasons for undertaking this in Georgia Strait:

- As indicated above the fisheries resource within the Strait is undergoing change and some of the most highly valued species are at low abundances. The majority of British Columbians live in or near Georgia Strait and, accordingly, improvements in fisheries management would be most felt in this area.
- A better understanding of the mechanisms (such as environment, food, predation) responsible for a successful ocean life would improve management accuracy and offer hope for improvement of the status of key species, which currently are at low levels despite a strict but traditional management regime.
- There are many species other than salmon in the Strait of Georgia, some also of commercial importance; a healthy balance of life in coastal waters near BC's major population centers is important for the health of our environment and our society.



Pacific Fisheries Resource Conservation Council

Conseil pour la conservation des ressources halieutiques du pacifique

While some would recommend that everything and all linkages should be studied our advice is to develop an approach strongly focused on key species (e.g., coho salmon) and how the rest of the ecosystem drives their variability. This will allow for early gains in understanding and management adaptation to be made with the application of such an approach.

Presently there are impediments to adopting an ecosystem approach. Some of these impediments are financial, some scientific and some important ones are of an institutional nature. Progress must be made on at least three fronts:

1. Information linking environmental forcing to ecosystem response must be systematically gathered and analyzed.
2. Clarification of interactions between the major components of the living ecosystem, including human interactions, is required to understand fluctuations in key species populations.
3. An institutional framework providing overall guidance and continuity must be put in place to ensure the ecosystem-based approach is developed and implemented. Council recommends that not only should scientists be working as a team in an ecosystem approach but that there should be strong linkages with resource managers, within the Fisheries and Aquaculture Management Branch and the Oceans, Habitat and Enhancement Branch.

The Council urges you in the strongest terms to positively consider and to act on Council recommendations for the application of an ecosystem approach within Georgia Strait. We believe there are several compelling reasons to choose Georgia Strait as the BC focus on ecosystem research and management and in addition we note that it could be the best location for a Canadian Centre of Excellence on ecosystem based management.

Sincerely,

Dr. Paul LeBlond
Chair

Mark Angelo
Vice Chair

cc. PFRCC Members

Larry Murray, DG, Fisheries and Oceans Canada

P. Sprout, RDG, Pacific Region, Fisheries and Oceans Canada

A. Webb, DG, Policy, Pacific Region, Fisheries and Oceans Canada

C. Trumpy, DM, Ministry of the Environment

ADVISORY: AN ECOSYSTEM-BASED APPROACH TO MANAGING SALMON IN GEORGIA STRAIT

A REPORT ON A MARCH 15, 2007 WORKSHOP ON:
THE WHY AND HOW OF AN ECOSYSTEM-BASED
MANAGEMENT APPROACH

Pacific Fisheries Resource Conservation Council

June 2007

TABLE OF CONTENTS

1 BACKGROUND	1
2 SYNOPSIS OF THE WORKSHOP	2
3 DISCUSSION ASPECT OF MEETING.....	4
3.1 What do participants think of an ecosystem-based approach to fisheries management?	4
3.2 Why do we need it?.....	4
3.3 Are we close to achieving it?	5
3.4 What are the steps forward?.....	5
3.5 What can be done now?	6
3.6 What recommendations could be made?.....	6
APPENDIX 1	7
Georgia Basin Ecosystem-Based Management Workshop Attendance.....	7

1 BACKGROUND

The notion of managing Pacific salmon populations from an ecosystem-based perspective has attracted wide support, but there has been limited success by fisheries managers in devising ways to do it effectively and in applying that notion in practical ways.

To help foster progress in employing the ecosystem-based approach, the Pacific Fisheries Resource Conservation Council (PFRCC) held a technical workshop in Vancouver on March 15th, 2007 involving fisheries specialists. They discussed the topic as it could be applied in the Strait of Georgia where a wide assortment of factors influence the productivity and prospects of wild salmon. This report is a short synopsis meant to capture the ideas and comments that were expressed by participants and heard by the PFRCC.

The Strait of Georgia was chosen as the area to examine in the workshop for several reasons. First, there is reasonably detailed data, background information and on-going monitoring of aquatic life and environmental conditions in the region compared to other waters. Second, 35 percent of the total salmon caught in BC spend their early marine period in the Strait. Third, the Strait is experiencing observable change—getting warmer, experiencing variation in freshwater supply and nutrient availability, and shifting abundances of fish, shellfish, marine mammals and planktonic food. These changes and many others are affecting the communities that depend on fisheries and aquatic resources for their livelihoods.

The Strait of Georgia is highly visible and significant to British Columbians. Approximately 75 percent of residents of the Province live within close proximity to the Strait, and changes in the region have been substantial and readily observed in recent years. For salmon, the species that have traditionally been highly valued, such as coho and chinook, are experiencing poor marine survival and are depressed in numbers compared to historical abundances. The inability to reverse these persistent low abundances raises the question of what is wrong with the traditional fisheries management regime that is strict but seemingly ineffective in many instances.

Those attending the PFRCC's technical workshop were asked to share information on just what an ecosystem-based approach might entail and how to make progress in applying it in the Strait. The eighteen workshop participants included researchers from government, First Nations and universities, as well as fisheries managers, policymakers and representatives of Pacific salmon organizations. The attendees are listed in Appendix 1.

2 SYNOPSIS OF THE WORKSHOP

To focus the workshop, three short presentations dealt with the Georgia Strait ecosystem from scientific information, modeling and First Nations perspectives. They addressed ecosystem management issues and referenced the ecosystem management models and experience from elsewhere.

The participants heard about how the abundance of key species has changed over time. For instance:

- Lingcod and rockfish and Pacific cod have all decreased substantially in abundance.
- Herring have recovered from previous collapses.
- Pacific Hake have increased in abundance since the mid-1960's and are now the dominant species in the Strait, perhaps because of reduced predation from lingcod and rockfish.
- Seals and sea lions are at an all time high perhaps owing to hake abundances (their primary food) and lack of human culling. They are thought to play a critical role in impacting recovery of chinook and coho salmon whose population numbers are reduced. Views differ on how to deal with the seal predation with thoughts ranging from a seal cull to reduction of hake, their prime prey.
- Marine survival of coho has been poor with most mortality occurring soon after they enter the ocean. However, coho survival last year was better than in the recent past, particularly for wild coho stocks.
- Chum and pink salmon stocks are up.

These are not independent conditions and trends; they are connected in many ways. Views differ on how the highly valued fisheries resources in Georgia Strait might be improved by advancing scientific understanding about these linkages and fish species adaptability. Traditional ecological knowledge (TEK) from cultural groups is based on years of experience and passed across generations, and is closely linked to observations and experience in local area ecosystems. Continued efforts to integrate TEK with institutional knowledge are difficult but important, and will help build capacity to understand the linkages among species and with their environment.

Fish species and their abundance is affected not only by fishing, but by interactions among the various species in the ecosystem. Likewise, the conditions of freshwater flow and ocean temperature influence primary and secondary production. Fish abundance in the Strait and elsewhere is impacted by the changing conditions in nearshore environments (kelp abundance, for instance).

Discussion in the technical workshop also revealed current practices of scientists and fisheries managers to work to some extent in an integrated fashion as would be necessary for an ecosystem-based management approach. A present limitation is that scientists and managers often work in relative isolation. As specialists, they tend to focus on single sectors or species, and a cultural change to encourage cross-disciplinary and team activity is needed. As an example, while good information exchange and discussion takes place at conferences, people go back to their organizations where integrated initiatives are not encouraged nor enabled.

Ecosystem management models have been tested and proven to be practical. Public health provides a parallel where, after years of increasing specialization, organizations are becoming more inclusive and multi-disciplinary. Relevant organizational models exist in the form of the BC Washington Environmental Cooperation Council, the Georgia Strait Alliance, and the Fraser Basin Council. In the United States, the Pacific States Marine Fisheries Commission and the Puget Strait Council have

elements and practices relevant to ecosystem-based management. Further a field, the Lower Columbia Estuary Partnership, the Great Lakes Commission and the Chesapeake Bay Foundation have elements that might be useful for the Strait of Georgia's ecosystem-based management.

No single organization is a fully applicable model by itself for the Strait nor for what is being envisioned in the region. If modified, the Living Rivers trust for the Fraser and Georgia Basins could provide an existing structure to build on. Environment Canada's Georgia Basin Action Plan, while it does not currently have a fisheries focus, is another possibility. Establishing a Centre of Excellence, under DFO's research program, is another possibility.

3 DISCUSSION ASPECT OF MEETING

In their discussions, the workshop dealt with a series of specific questions and offered valuable insights:

3.1 What do participants think of an ecosystem-based approach to fisheries management?

It is widely recognized as desirable but poorly defined. Canada is committed by international agreements to such an approach; policy and legislation prescribe it, but what should it be?

A range of options offer themselves.

An exhaustive scientific enquiry could aim at an understanding of every last component of the ecosystem and its response to environmental changes, but this is not considered a practical option for progress at this stage, although it is ultimately necessary to understand what is most important and to be retained in simpler approaches.

The workshop was premised on an approach strongly focused on key species (e.g., coho salmon) and how the rest of the ecosystem drives their variability, hoping that some progress on individual components of the system would lead to practices and attitudes fostering a deeper understanding.

Beyond the practical goals aimed at progress on specific ecosystem issues, it is recognized that a deeper understanding would help set realistic standards for ecosystem integrity. How ecosystem knowledge is to be applied to fisheries management remains a challenge.

3.2 Why do we need it?

The Strait of Georgia is going through what appears to be a vast change, and there is no comprehensive explanation of what this array of new conditions means for the future of Pacific salmon in the region.

Primary productivity in the Strait of Georgia, as evidenced by phytoplankton growth, responds to environmental forcing (winds, temperature, runoff...), affecting year-to-year changes in timing and availability of salmon food. Long-term trends (climate change, El Ninos, decadal variability) have been shifting baselines and influencing productivity and living conditions of salmon. Components of the living system interact directly (seals eat salmon) and indirectly (hake are the primary food of seals and given current high abundances of hake there may be more seals resulting in more predation on salmon). All these conditions and changes are acknowledged in principle as being important, but the actual ecosystem interactions at the species and area levels are poorly known. Many examples of possible interspecies interactions and responses to environmental changes were cited by workshop participants who also admitted that there were few substantiated theories at the ecosystem perspective.

Recent fluctuations in Strait of Georgia coho and chinook stocks remain unexplained. It is not known what controls “ocean survival”—that small fraction of the fish population that reaches maturity in seawater. Factors affecting prey (salmon food) or predators (salmon eaters) may be responsible for the low and variable rate of ocean survival. One suggestion was that ocean survival might be increased by an order of magnitude by applying an ecosystem-based management approach. Better ecosystem knowledge would undoubtedly lead to more accurate estimates of spawning stock abundance and management confidence, but the means by which survival would be increased was not immediately evident. It was also said that a better understanding of biological interactions would also shed light on the relations between wild and hatchery populations.

In summary, there are three reasons to adopt an ecosystem-based approach:

- the federal government committed to do so;
- a better understanding of the mechanisms (such as environment, food, predation) responsible for a successful ocean life would improve management accuracy; and,
- there are many species other than salmon in the Strait of Georgia, some also of commercial importance; a healthy balance of life in coastal waters near BC's major population centres is important for the health of our environment and our society.

3.3 Are we close to achieving it?

There is clearly not enough information, understanding and consensus on what is required to implement an ecosystem-based approach at this time. The workshop discussion focused on steps needed towards building that capability. Some argued that people would never agree on just what had to be done and that the ecosystem was too complicated to be modeled or simplified for practical application.

Most participants were more hopeful and expected that work currently underway could lead to the beginnings of applications of ecosystem knowledge to fisheries management. Opinions varied from "much of the information is already there" to "there is a need for much more study". Modelers in particular expressed some confidence that successes achieved so far in modeling aspects of the ecosystem (e.g., the response of primary productivity to environmental forcing; the interactions of the dominant species at higher trophic levels) could be extended to more practical applications. Climate change impacts remain a challenging issue.

3.4 What are the steps forward?

Progress must be made on at least three fronts:

1. Information linking environmental forcing to ecosystem response must be systematically gathered and analyzed.
2. Clarification of interactions between the major components of the living ecosystem, including human interactions, is required to understand fluctuations in key species populations.
3. An institutional framework providing overall guidance and continuity must be put in place to ensure the ecosystem-based approach is developed and implemented.

Observational research programs are expensive and time-consuming; they are also necessary. Beyond the research stage, monitoring of physical, chemical and key biological properties remains essential to provide an input to ecosystem models. Participants reported on sampling and interpretive activities focused on the Georgia Strait ecosystem; they emphasized that the area is of course linked to the rest of the ocean. Continuing, well-directed work, spanning enough years to make sense of interannual variability, is necessary. In specific areas, traditional ecological knowledge may bring valuable insights.

Representation of the ecosystem components through a set of rules and relations—modeling, for short—is the means by which hypotheses can be tested and forecasts attempted. Modelers must be encouraged to test their results against traditional knowledge and ongoing observations, refining their characterizations of the ecosystem and improving the applicability of their models.

The lack of an institutional focus for an ecosystem-based approach was seen as a major obstacle to its development. The absence of leadership, political will, and coordination (“no one talks to each other”) were cited.

3.5 What can be done now?

There is considerable impatience about the chronic lack of progress towards any basic application of an ecosystem-based approach. “We need to deal with the hand we have been dealt!”, suggested a participant.

One suggestion is to ask specific questions of existing models: for example, what would have happened without seals in the Strait of Georgia. Another is to improve the accessibility of environmental science, as is attempted through the annual Pacific Region State of the Ocean Report. Yet another development would partition the models into near-shore (inter- and near sub-tidal areas) and deeper water areas, allowing closer focus on specific characteristics of each section.

There is a widely perceived need to link socio-economic goals to ecosystem objectives: “people have to agree on priorities”. Developing a “succinct set of ecosystem and First Nation objectives” for the Strait of Georgia could be the result of such priority setting. An analysis of initiatives taken elsewhere suggests that to gain public support the focus must be broadened to be inclusive beyond fisheries. There should be links with water quality, public health, economics, and other issues but at the same time we must avoid over-ambitious all-encompassing all-talk, do nothing programs. A positive, motivating vision of ecosystem objectives is required to drive the efforts.

Links and information sharing should be developed with existing programs and agencies in the region (e.g., Georgia Basin Ecosystem Initiative, BC-Washington Environmental Cooperation Council) having similar interests and goals.

3.6 What recommendations could be made?

The following were suggested as a course of action:

1. PFRCC should prepare a summary paper on the current issues based on the workshop’s discussions.
2. Discussions should be initiated with DFO leadership on establishing an ecosystem-based management center of excellence focused on Georgia Strait.
3. A steering group of workshop participants and others with an interest in the Strait should be formed to maintain momentum and advance progress on the workshop’s issues.

APPENDIX 1

Georgia Basin Ecosystem-Based Management Workshop Attendance

March 15th 2007

Last Name	First name	Association
Allen	Susan	UBC
Atkinson	Mary-Sue	PFRCC
Beamish	Richard	DFO
Beeson	Ken	PFRCC
Ennis	Gordon	PFRCC
Gale	Rupert	The Ritchie Foundation
Gilchrist	Brett	DFO
Kariya	Paul	Pacific Salmon Foundation
LeBlond	Paul	PFRCC
Lill	Allan	BC Conservation Foundation
Luedke	Wilfred	DFO
Marliave	Jeff	PFRCC
Masson	Diane	DFO
Preikshot	Dave	UBC
Rasmussen	Glen	DFO
Ryan	Teresa	BC Pacific Salmon Forum
Schweigert	Jake	DFO
Weinstein	Martin	Consultant – First Nations

Staff

Peterson	Dave
Singh	Priscilla
Steele	Dawn



290 - 858 Beatty Street
Vancouver, British Columbia
Canada V6B 1C1
Telephone: (604) 775 - 5621
Facsimile: (604) 775 - 5622
E-mail: info@fish.bc.ca
www.fish.bc.ca