

PACIFIC FISHERIES RESOURCE CONSERVATION COUNCIL

Conseil pour la conservation des ressources halieutiques du pacifique



Pacific Fisheries Resource Conservation Council Suite 290, 858 Beatty Street, Vancouver, BC V6B 1C1

ANNUAL REPORT 2008

Pacific Fisheries Resource Conservation Council

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Annual Report 2008 Pacific Fisheries Resource Conservation Council

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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 CANADA Telephone 604 775 5621 Fax 604 775 5622 www.fish.bc.ca info@fish.bc.ca Printed and bound in Canada ISBN 1-897110-50-2

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April 2009

The Honourable Barry Penner Minister of Environment Province of British Columbia Legislative Building Victoria The Honourable Gail Shea Minister of Fisheries and Oceans Government of Canada House of Commons Ottawa

Dear Ministers:

This is the tenth annual report provided to you by the Pacific Fisheries Resource Conservation Council. In it we summarize the work we carried out in 2008, and provide you with a retrospective on the issues we have addressed in the past decade concerning wild Pacific salmon stocks and their freshwater and ocean habitats.

In 2008, our Council published several reports intended to contribute to better public understanding of the salmon resource and more effective conservation practices by everyone involved in the fisheries. Those reports are summarized in this annual report, in addition to our accounts of community meetings, briefings and discussions with government officials, scientists, First Nations fishery specialists and individuals from across British Columbia.

This report also summarizes the discussion that took place at the PFRCC's tenth anniversary event in September that helped us to chart the course for future consideration of issues related to the sustainability of wild Pacific salmon. It identified trends and emerging issues that you and your Cabinet colleagues will have to address in the coming years, which we hope will be helpful to your governments in crafting and implementing solutions.

Our Council members wish to acknowledge the retirement in December of our Managing Director, Gordon Ennis, who served for more than six years and made an exceptionally valuable contribution to the Council's work, particularly related to salmon habitat. We welcome his interim replacement, Diane Lake, as well as Yvonne Shiratti who has joined us as Administrator.

We are completing several long-term projects over the coming months, and we anticipate the production of at least six new reports by mid-year. We plan to concentrate on initiating and completing three additional new reports during the upcoming fiscal year, with a focus on sustainability for the salmon resource and building conservation capacity.

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Paul LeBlond Chair

Mark Angelo

Mark Angelo Deputy Chair

290 - 858 Beatty Street Vancouver. British Columbia Canada V6B 1C1 Tel/Tel: (604) 775-5621 Fax/Tele: (604) 775-5622 E-mail: info@ fish.bc.ca Web Site/Site Web: www.fish.bc.ca 290 - 858 rue Beatty Vancouver. Colombie-Britannique Canada V6B 1C1



Avril 2009

The Honourable Barry Penner Minister of Environment Province of British Columbia Legislative Building Victoria L'honorable Gail Shea Ministre des pêches et des océans Gouvernement du Canada Chambre des communes Ottawa

Monsieur, Madame,

Ceci est le dixième rapport annuel du Conseil pour la conservation des ressources halieutiques du Pacifique. Dans ce rapport, nous résumons le travail que nous avons accompli en 2008, et récapitulons les questions que nous avons abordées au cours de la dernière décennie concernant les stocks de saumons sauvages du Pacifique et leurs habitats dulcicole et océanique.

En 2008, notre Conseil a publié plusieurs rapports visant à mieux faire comprendre au public les ressources en saumons et à promouvoir des pratiques de conservation plus efficaces auprès des diverses parties à l'industrie de la pêche. Le présent rapport annuel résume ces différents rapports et contient en outre les comptes rendus des réunions communautaires, séances d'information et discussions que nous avons eues avec les responsables gouvernementaux, les scientifiques, les spécialistes des pêches des Premières nations et les divers intéressés dans l'ensemble de la Colombie-Britannique.

Par ailleurs, ce rapport résume les discussions qui ont eu lieu lors de l'activité organisée pour souligner le dixième anniversaire du CCRHP en septembre, et qui nous ont aidés à orienter l'action future quant aux questions concernant la durabilité du saumon sauvage du Pacifique. Le rapport définit les tendances et les questions nouvelles sur lesquelles vous-même et vos collègues du Cabinet devriez vous pencher au cours des années qui viennent, ce qui, nous l'espérons, sera utile à vos gouvernements pour trouver et mettre en œuvre des solutions.

Les membres du Conseil souhaitent souligner le départ à la retraite, en décembre, de notre directeur général, Gordon Ennis, qui a été en poste pendant plus de six ans et qui a contribué de façon exceptionnelle au travail du Conseil, en particulier en ce qui concerne l'habitat du saumon. Nous souhaitons la bienvenue à sa remplaçante par intérim, Diane Lake, ainsi qu'à Yvonne Shiratti, qui s'est jointe à nous en tant qu'administratrice.

Nous allons terminer plusieurs projets à long terme au cours des mois qui viennent, et nous prévoyons déposer au moins six nouveaux rapports d'ici le milieu de l'année. Nous avons l'intention de nous concentrer sur la production de trois autres nouveaux rapports au cours du prochain exercice, avec un accent particulier sur la durabilité des ressources en saumons et sur le développement des capacités en matière de conservation.

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Paul LeBlond Président

Mark Angelo

Mark Angelo Vice-président

290 - 858 Beatty Street Vancouver. British Columbia Canada V6B 1C1 Tel/Tel: (604) 775-5621 Fax/Tele: (604) 775-5622 E-mail: info@ fish.bc.ca Web Site/Site Web: www.fish.bc.ca 290 - 858 rue Beatty Vancouver. Colombie-Britannique Canada V6B 1C1

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EXECUTIVE SUMMARY

This annual report of the Pacific Fisheries Resource Conservation Council for 2008 presents a summary of its publications, activities and issue positions for the year. It represents the work undertaken within the Council's mandate to provide strategic advice to the fisheries ministers and the British Columbia public on ways to ensure sustainability for wild Pacific salmon and steelhead populations and their freshwater and ocean habitats.

The Council marked its tenth year anniversary in 2008 and encouraged participation in a workshop intended to identify emerging conservation issues and innovative solutions. It reflected the evolution of the Council's agenda over the decade, to its current emphasis on ecosystem-based management, climate change adaptation, and water allocation.

Reports issued during the year included a public information brochure on the salmon habitat impacts of the mountain pine beetle, supplemented by newspaper advertorials to raise awareness.

A background report was issued on the climate effects on salmon in the ocean, presenting summaries of the findings of contained in recent studies, along with a compilation and analysis in terms of the relevance to future fisheries management.

Another background report explained the status and prospects for the use of computer modeling that can account for the many variables that would have to be considered to enable ecosystem-based management to be effective.

The Council continued its series of informative and well-attended community meetings, involving the array of stakeholders, organizations and interested individuals who share a concern about the future of wild Pacific salmon.

In setting its agenda for the coming year, the Council will be completing several reports that were near completion at year-end, including regional updates on salmon stocks, habitat landscape issues and the application of traditional and local knowledge in salmon conservation.

SYNOPSIS

Le présent rapport annuel de 2008 du Conseil pour la conservation des ressources halieutiques du Pacifique présente un résumé des publications, des activités et des positionnements thématiques du Conseil pendant l'année. Il illustre les travaux accomplis dans le cadre de notre mandat pour fournir des conseils stratégiques aux ministres des Pêches et à la population de la Colombie-Britannique sur les différentes façons d'assurer la durabilité des populations de saumon sauvage et de saumons arc-en-ciel du Pacifique ainsi que de leurs habitats dulcicole et océanique.

À l'occasion de son dixième anniversaire, en 2008, le Conseil a encouragé les intéressés à participer à un atelier visant à cerner les questions nouvelles et les solutions novatrices en matière de conservation. Cet atelier reflétait l'évolution, au cours de la décennie, du programme du Conseil, qui aujourd'hui met l'accent sur la gestion écosystémique, l'adaptation au changement climatique et la répartition des ressources hydrauliques.

Parmi les rapports publiés au cours de l'année, il faut souligner une brochure d'information publique sur les répercussions du dendroctone du pin ponderosa sur l'habitat du saumon, publication qui a été complétée par des articles publicitaires placés dans des journaux.

Un rapport circonstanciel a été remis sur les effets de l'évolution du climat sur le saumon dans l'océan, rapport qui contenait des résumés et des constatations de diverses études récentes ainsi que des compilations et des analyses de données établies dans l'optique de la future gestion des pêches.

Un autre rapport circonstanciel expliquait la situation actuelle et les perspectives d'utilisation des modèles informatiques susceptibles de rendre compte des nombreuses variables dont il faut tenir compte pour que la gestion écosystémique soit efficace.

Le Conseil a poursuivi sa série de réunions communautaires d'information, qui ont attiré un grand nombre d'intervenants, de représentants d'organisations et de particuliers qui partagent une préoccupation commune pour l'avenir du saumon sauvage du Pacifique.

Au cours de l'année qui vient, le Conseil mettra la dernière touche à plusieurs rapports dont la rédaction était presque achevée à la fin de l'exercice, y compris les mises à jour régionales sur les questions concernant les stocks de saumons et les habitats, et l'application des connaissances traditionnelles et locales à la conservation du saumon.

1. SALMON CONSERVATION OVERVIEW

The Pacific Fisheries Resource Conservation Council has worked for the past ten years towards the goal of protecting wild Pacific salmon and steelhead, by being an independent and credible source of relevant information and strategic advice.

The Council was mandated to enable ministers and the general public to understand how Pacific salmon could be better protected and sustained in the face of the challenges of human impacts and environmental conditions, such as climate change.

1.1 TRACKING SALMON HEALTH AND PERIL

In its first annual report, issued for the 1998-99 period, the Council explained its perspective:

Fisheries conservation issues are often perceived to be a confusing portrayal of trends, science, business and political considerations. It is not an easy task for anyone to draw informed conclusions about matters involving so many controversial elements and emotionally charged attitudes. It should be no surprise that the Council's findings ...defy any absolute statement about their health or peril.

That difficulty continues now, a decade later. Then, as now, there were conflicting signals of progress and deterioration, hope and frustration.

The PFRCC has continued to public reports on the status of wild Pacific salmon stocks (three new reports are now nearly complete). During the past decade, Fisheries and Oceans Canada has also expanded its provision of public information about wild salmon stocks through its websites, publications and public consultations. At the same time, organizations such as the Wild Salmon Center in Portland have become reliable sources of information about salmon stocks from an international perspective, comparing trends in salmon productivity and abundance across several Pacific jurisdictions. There is now less of a need for the PFRCC to be a separate source of public information on salmon stock status.

At the same time, serious knowledge gaps continue to exist about wild salmon, and the research programs of governments and academic institutions continue to be more crucial than ever. The PFRCC provides thematic guidance and strongly encourages the pursuit of innovative and collaborative research and its application to the urgent problems of declining and disappearing salmon populations.

1.2 TRANSLATING RESEARCH FINDINGS INTO DECISION TOOLS

The PFRCC has been concerned for some time about how the knowledge emerging from fisheries science could be applied more quickly and effectively in the management of Pacific salmon stocks. Unlike many other natural resource sectors, investment in research primarily related to salmon conservation has lacked the financial incentives that increasingly drive research programs. In the fisheries, there are relatively few individuals involved in knowledge translation—the entrepreneurial process of converting research discoveries and findings into new procedures and products.

Broadly speaking, the scientific research directed towards salmon conservation has been far less successful in attracting funding and support than the research that would have more direct or obvious economic returns. The significant increase in investment in aquaculture research as a proportion of the overall fisheries research budgets is a vivid example of the bias towards economic values compared to environmental or conservation values in the fisheries.

This situation appears to be one of the most significant reasons why innovation, such as ecosystem-based management, has been so slow to be adopted in salmon fisheries management. There has been little incentive for managers to change their approach even where there have been obvious shortcomings and apparent opportunities for improvement.

After initially concentrating its resources in analysis of the state of wild salmon stocks, the PFRCC has shifted towards dealing with matters of long-term and strategic significance for the sustainability of wild salmon. The adaptation of salmon and the required changes to their management regimes in the face of climate change has been one of the most important topics for the Council members.

The PFRCC does not conduct a research program; its projects and reports are reviews of existing information and compilations of what is known but has not otherwise been assembled or analyzed. It has been undertaking an extensive program of contracted projects intended to fill the crucial gaps in fisheries knowledge not currently addressed by academic institutions and government agencies. At the same time, the PFRCC is directing some of its resources into the largely-overlooked task of translating new research findings into effective management tools, with special attention to the ecosystem-based approaches that offer great potential for effective applications.

It is this knowledge translation task and its application to fisheries management that is a focus of the Council's work, with an emphasis on cross-disciplinary analysis that draws from disparate information sources.

2. REVIEW OF REPORTS, ACTIVITIES AND INITIATIVES

During the 2008 calendar year, the PFRCC maintained its energetic program of reports, public meetings and communications with government officials and the general public.

2.1 SPRING 2008 COMMUNITY MEETINGS (FORT LANGLEY AND SECHELT)

The Council continued its series of public meetings in 2008 to give British Columbians the opportunity to share information on wild salmon stock and habitat issues in their communities and regions. The March meetings in Fort Langley and Sechelt were well-attended by an array of individuals with interests in salmon stewardship, hatcheries, sport fishing, and community organizations. A detailed summary of the discussion in the meetings is contained in the appendices of this report.

The Fort Langley participants were primarily concerned about freshwater habitat protection and the apparent lack of attention to wild salmon in the agricultural and urban development occurring along salmon-bearing rivers and streams in the region. Several participants reported the loss of small local salmon streams to development, with a figure of some 250 lost for Surrey alone, as well as deteriorating water quality conditions in the larger creeks and rivers.

Sechelt residents raised issues of inadequate fisheries management and protection of freshwater that has led to declines in salmon returns and reliance on enhancement in the Sunshine Coast and Powell River areas. Sakinaw Creek, with returns down from 50,000 to single digits, was noted as the most extreme example. Ecosystem effects, particularly increased predator and prey populations, were reported in terms of their influence on salmon productivity in the region.

The Council members noted that consistent themes relayed to them by participants and speakers in the community meetings were about inadequate conservation enforcement by government fisheries agencies and a perceived lack of leadership and political will at all levels of government to protect wild salmon stocks in the face of human development pressures.

The Council heard a few examples of local success stories. However, many participants felt that much more could be done to reverse salmon declines and support local salmon populations through initiatives such as education and awareness campaigns.

2.2 MOUNTAIN PINE BEETLE INFORMATION CAMPAIGN

Also in March 2008, the Council published a booklet entitled "Mountain Pine Beetle: Salmon Are Suffering Too". It explained the connection between the beetle infestation and the devastating consequences for many salmon runs in the resulting changes to watersheds, riparian habitat, stream flows, channel stability and water conditions.

Temperature shifts brought on by climate change have created conditions for mountain pine beetles to devour British Columbia's forests. The forests attacked by these beetles have more extreme water cycles—more flash flooding and longer summer droughts. In healthy forests, pine branches intercept snow and rain and shade the forest floor, slowing spring melt, while their roots absorb huge quantities of water. Forests of beetle-killed trees have higher snow packs, faster snow melt, higher spring floods, more flash flooding and erosion. These conditions will require changes to watershed management to deal with the extreme water cycles, already difficult due to increasing competition for water access for agricultural, residential and industrial uses. At the same time, the salvage logging of affected wood can worsen the conditions for salmon by further increasing flood and run-off risks.

Council members felt that it was important for the public to understand the impacts of the pine beetle infestation on the salmon ecosystem. Along with the booklet, the PFRCC sponsored "advertorials" in weekly and daily newspapers to expand the scope of public awareness by British Columbians. The booklet and newspaper versions emphasized the importance of ecosystem-based management to ensure effective responses in forest harvesting and water control.

One of the immediate measures that could help would be to revise the province's Water Act to provide authority to manage water resources more effectively and to specify water access for salmon in conjunction with other purposes in streams and rivers to leave water for fish.

2.3 CLIMATE EFFECTS ON SALMON IN THE OCEAN BACKGROUND PAPER

Less is generally known about the period of the salmon lifecycle spent in ocean conditions than in freshwater. Tracking and observation in ocean conditions has been more difficult, and the effects of water temperature, nourishment, predation and other at-sea factors cannot be readily monitored.

Some fisheries scientists have suggested that the ocean phase has a greater influence on the level of salmon returns and productivity than any factors in the freshwater stages of their lifecycle. Some go so far as to suggest that development impacts, habitat conditions, predation and other freshwater-related conditions are largely irrelevant, and that the ocean life phase is the dominating determinant of wild salmon regeneration or decline.

To get a better understanding of the ocean conditions in relation to Pacific salmon, the PFRCC asked Dr. Dave Preikshot to undertake a literature review of the available research findings on the subject. He was also asked to investigate the sources of research and the directions in which scientific inquiry on this topic were headed. His March 2008 background paper entitled *"Climate Effects on Pacific Salmon in the Ocean: Creating a Canadian Focus"* was the result of the review sponsored by the Council.

The background paper noted that research studies have dealt with several physical processes that combine to affect ocean-going salmon, such as winds, pressure systems, currents, sea surface temperature and sea surface salinity. Conditions such as upwelling and regime shifts (El Nino, La Nina) bring significant environmental changes for salmon, although the actual impacts differ in terms of the scale and extent of these environmental or climate changes over seasons and longer cycles.

The author pointed out that research has tended to focus on short-term ocean condition changes that may affect salmon, rather than the long-term variations that may have more profound impacts and be more significant for stock management and conservation purposes. He suggests that the various discipline-specific studies provide a valuable basis for a comprehensive integration of this knowledge into an ecosystem framework. This effort to reorient the scientific inquiry in this field into multi-disciplinary teams would be a valuable use of research resources.

Dr. Preikshot suggested to the Council a consolidation of research into a new institute that would draw together leading scientific minds and resources to address ocean-related climate change and marine fish issues. This suggestion may deserve further consideration in light of existing institutional conditions and the value of synergies from combining research resources.

2.4 ANNUAL REPORT 2007

The past year's annual report dealt with several issues and reported on the outcome of projects including ecosystem-based management in the Georgia Basin, climate change impacts on freshwater habitat, and the complex ecosystem of the Heart of the Fraser River between Hope and Mission.

The annual report, issued in June 2008, addressed several current challenges to wild salmon, including the slow implementation of the Wild Salmon Policy and the effects of salmon hatcheries and enhancement on wild stocks.

In it, the Council noted the importance of proposed legislative changes that would establish a new federal Fisheries Act—an initiative that was once again put on hold, but is to be reconsidered in the new session of Parliament.

A crucial theme in that year was the importance of building and restoring the predictive capacity in fisheries management agencies to anticipate problems with greater reliability of information and to respond in more timely ways. The traditional methods of predicting salmon migrations, run sizes, timing and other key factors have too often failed to capture dramatic changes until it was too late to intervene successfully. The adoption of forms of ecosystem-based management techniques would be a valuable tool to supplement traditional predictive methods.

The background paper on the Heart of the Fraser presented a large-scale perspective on fish habitat in one of the province's most productive salmon areas. It proposed action, specifically the expansion of land set-asides for environmental protection and the creation of a multi-sectoral task force to manage this section of the river.

While the Council did not develop a stand-alone advisory report on salmon hatcheries and enhancement, it suggested that guidelines and innovations in research and management oversight should be adopted in future management decisions. This included maintaining high levels of precaution where evidence might indicate any detrimental effects from competition between wild and hatchery stocks. It stressed that continuing hatchery operations should be closely monitored and the impact of hatchery releases assessed within the context of ecosystem interactions. One of the Council's recommendations was that the Salmonid Enhancement Program should incorporate experimentation related to wild/hatchery fish interaction to improve understanding of marine survival issues.

2.5 MODELS TO IMPROVE SALMON CONSERVATION KNOWLEDGE

In October, the Council issued a background paper on new methodologies to build capacity in ecosystem-based management. The report entitled *Computer Modelling of Marine Ecosystems: Applications to Pacific Salmon Management and Research* was commissioned by the PFRCC and produced by Dr. Dave Preikshot. Its purpose was to provide perspectives on the current computer-based tools that could complement the present fisheries management systems and practices.

Ecosystem modeling refers to a computer application that simulates, through time, biological changes such as biomass, mortality, catch, feeding, and competition among species. The models emulate such changes by considering factors including environment, predation, competition and fishing effort. Because these models capture both ecosystem and species changes over time, they offer a potential guide to future changes.

This background paper examined ecosystem modelling and its relevance to fisheries management and research, and concluded that it could make a valuable contribution to knowledge alongside current salmon research directions and management techniques.

Cited in the report were the current users of this approach, and the findings from applications of ecosystem modeling in various areas of the world, including both the advantages and limitations of the models in each instance. The author concluded that ecosystem modeling in its current stage of development is a more important tool for strategic and long-term decision-making than for short-term tactical management decisions. The current applications for Pacific salmon are particularly being honed to focus on species interaction and biomass impacts. Collaboration across academic disciplines is a necessary ingredient of successful modeling of marine ecosystems.

This background paper was the basis for a report entitled *Public Summary—Computer Modelling of Marine Ecosystems* issued at the same time. That brief document distilled the technical information of the background paper into a form that was more directly relevant to the general public.

2.6 NISGA'A COMMUNITY MEETINGS

In August, a small delegation of Council members met with Nisga'a Fisheries staff and toured facilities in the Nass River area, including a fish wheel and the Seaskinnisk River weir. The discussions with Chief Harry Nyce and others provided new perspectives on the extensive work involving selective harvesting and in-season stock assessment.

The Council was told about the transition of salmon management into local hands, and development of technical and scientific capacity to maintain an effective conservation and harvest program. Council members noted that the positive experience of the Nisga'a fisheries program could provide a valuable role model for other areas of the province. The discussions covered several topics including salmon certification, industrial development projects, conservation funding shortfalls, and use of traditional ecological knowledge to enable forecasting of salmon returns.

2.7 LETTER TO MINISTERS ON COMMUNITY MEETING PERCEPTIONS

In a September 12th letter, the Council wrote to the fisheries ministers to provide a synopsis of the greatest concerns expressed by participants in the twenty-six public meetings held over the previous three years. In reviewing the meeting summaries, it became apparent that there were particular consistencies in the views that were expressed to the Council.

The public meetings spanned northern, urban, interior and coastal communities throughout the province and included an array of residents in each case. They involved salmon stewardship personnel, hatchery volunteers, commercial fish harvesters, sport fishers, First Nations, government officials, community group representatives and the public.

The letter contained the following comment about the views conveyed to the Council:

We found that the threats and challenges to the future of wild Pacific salmon and steelhead continue to cause considerable anxiety for British Columbians. In some cases, it was acknowledged by the meeting participants that the natural variation in salmon productivity and factors beyond human influence and control were the sources of problems. In many instances, however, it was recognized and documented that salmon stocks were being more seriously undermined by conditions of our own making.

A widely held and emphatically expressed view of many British Columbians is that neither the Government of Canada nor the Province of British Columbia is making a sufficient effort to fulfill its legislative and moral obligations to protect and preserve pacific salmon and steelhead stocks.

A prevailing theme of the public meeting participants was that government fisheries regulatory agencies are unwilling or unable to enforce the laws and policies that are essential to protect wild salmon. Notable are the delays or apparent reluctance in some cases to investigate or act on reports by members of the public of situations where salmon streams or riparian areas are being compromised or put at risk.

At the same time, the Council heard of some positive trends and initiatives, such as opportunities for local stewardship involvement in development planning. Some communities have become more aware of past inadvertent habitat damage from development that had impacted salmon, and have invested in stream restoration.

The Council suggested that ministers should make a clear public statement about the commitment of their governments to wild salmon conservation, and consider carrying out a review of how they could work together to fulfill their salmon conservation responsibilities.

2.8 PFRCC ANNIVERSARY WORKSHOP

The Council's tenth anniversary on September 18th, 2008 was marked by a day-long workshop that reviewed the preceding decade and looked ahead to the emerging and prospective issues of wild Pacific salmon. A detailed account of the key points raised in the proceeding is contained in the appendices of this annual report.

The event involved 22 participants, including past and present Council members and leaders from the salmon conservation community. Included was the Honourable David Anderson who, as fisheries Minister in 1998, decided to establish the Ministerial Council to advise him on strategic conservation matters. As the luncheon guest speaker, he pointed out that salmon conservation was about more than differing positions of conservation and economics—the future of wild Pacific salmon is a moral responsibility that supercedes self-interest or commercial values.

The wide-ranging discussion in the workshop dealt with the challenges to the viability of salmon in circumstances of reduced public exposure to salmon, encroachment from expanding population, and relative insignificance of fish-related activity in the economy and society. However symbolic salmon may have been in the past, it has dwindled in the eyes of the general public as an icon of British Columbia and of nature.

It was pointed out that the Council had served a valuable role in informing British Columbians about the state of wild salmon and in helping to resolve conflicts across science, economic interest, stakeholder and public interest viewpoints. PFRCC has shifted its focus over the past ten years, as it addressed issues that were not anticipated at the time of the Council's creation. That initial focus was on developing reliable knowledge about salmon stocks, their productivity and abundance, as well as identifying habitat vulnerability in terms of impacts on salmon spawning and migration.

The workshop participants addressed several questions about the future of salmon and steelhead, including those contained in the four-page *Discussion Paper* that has been reproduced in the appendices of this report. Those questions dealt with trends and issues within the categories of human threats, ecosystem assumptions and management issues.

The views expressed in the workshop about future challenges revolved around five themes:

- An ecosystem approach to wild salmon management will have to replace the single-species regimes that currently prevail and have proven to be inadequate.
- Preventive measures and voluntary initiatives, such as the Salmon Strongholds Partnership, will become ever more necessary investments for key watersheds and basins to supplement the crisis management approach that has prevailed in the past quarter-century.
- Adaptation strategies that respond to climate change effects will have to be applied to salmon management planning, and require investment in research.
- Conservation advocacy must be transformed to become more relevant and persuasive. The public and government leaders are not sensitive to the consequences of the unrelenting loss of salmon habitat due to population growth and competition for access to water.
- A shift towards the concept sustainability could a more practical perspective that could serve as a basis for wild salmon policy and initiatives.

2.9 FALL 2008 COMMUNITY MEETINGS (MASSET AND SKIDEGATE)

The Council's meetings in Haida Gwaii from November 4th to 6th involved an array of local residents who were asked to share their ideas and experience to inform the Council members about the state of salmon stocks and habitat. A detailed account of the discussions and the issues raised by participants is contained in the appendices of this report.

The community meetings in Masset and Skidegate were supplemented by a session with Haida Fisheries personnel. Topics in the Masset meeting gravitated towards fishing practices, particularly the contrast of conservation-related requirements for commercial harvest compared to sport fishing. The impacts of logging on salmon, even years after areas have been left to regenerate, were also the subject of concern to residents.

The Skidegate community meeting included several references to problems associated with fishing lodges, as well as shortcomings in resource management that did not provide sufficient funding for enhancement and restoration. The contrast of fishing activity in Haida Gwaii with the performance of the wild salmon sector in Alaska was also noted by participants, as was the growing presence and influence of sport fishing in the region.

The Haida Fisheries meeting dealt with the ways in which the local fishery is monitored and planned, increasingly on an ecosystem-based management footing. The transition in the move towards co-management of fisheries resources has been underway for several years.

3. EMERGING ISSUES AND AGENDA

In 2009, the Council expects to complete on-going projects, some of which have been overdue for completion. Other projects will be determined early in 2009, for production prior to the year-end. In some instances, particularly for technical and stock status projects, the reports may be made available through the PFRCC's website rather than in printed forms.

The PFRCC currently has several projects underway that overlap the current calendar year and will generate twelve reports that will be issued in 2009. Those projects include:

- Water Management Perspectives: Due by April 2009, this consultants' report will provide a basis for the Council to document how various jurisdictions provide a regulatory framework for effective water management, and how lessons could be applied for the water resources required for Pacific salmon.
- Responsible Fishing: The report, being produced by the LGL consulting firm and anticipated for March 2009, is meant to present a portrayal of recent innovations in the fisheries and suggest directions for the adoption of conservation-focused practices.
- South Coast Stocks: This report being drafted for the Council by fisheries scientist Mark Labelle will be an update of one originally prepared in 2002. It is expected to be ready by March 2009.
- Yukon and Northern Transboundary Stock Status: This relatively brief report is expected to be completed by March 2009.
- Arctic Salmon Stock Status: A mid-year completion target has been set for this report that will present the relatively scarce information currently available about the region's salmon stocks.
- Steelhead Stock Status: A report on steelhead stocks commissioned by the Council was delayed for extended periods due to the lack of available data and the need to ensure thorough peer reviews, but is expected to be released in March 2009.
- Landscape-Level Habitat Impacts: This report has been prepared by Marvin Rosenau and Mark Angelo, and it deals with salmon and steelhead habitat issues from the large-scale perspectives of landscapes. It is due to be released by March 2009.
- Traditional and Local Ecological Knowledge: The application of fisheries knowledge for conservation
 purposes from communities and experienced individuals is the focus of a report due in 2009. It reviews the
 ways in which First Nations and other sources of information and community knowledge have been used,
 and what it might offer in combination with other sources. This information would include social
 interactions, not only environmental analysis.
- Canadian Applications of the Salmon Stronghold Partnership: A consulting firm was engaged to assess the
 potential to apply the voluntary watershed and basin conservation approach being taken in other Pacific
 coast jurisdictions. The work will be carried out in conjunction with the Wild Salmon Center in Portland to
 provide information for the Council about whether or not the Strongholds approach might be applicable in
 Canada and how it might be adapted to Canadian objectives and conditions. The report is due in March
 2009.
- Nisga'a and Haida Gwaii Community Meetings: The detailed summaries of the discussion that took place with Nisga'a leaders and later in the Masset, Skidegate and Haida Fisheries meetings are expected to be completed and distributed by April 2009.

3. EMERGING ISSUES AND AGENDA

 Aquatic Invasive Species: A consultant's report is due in 2009, providing information and viewpoints on arriving fish species that have environmental impacts and in some cases direct impacts on salmon stocks and habitat.

During 2009, the PFRCC is planning to initiate a review of the appropriate criteria for the five-year evaluation of the Wild Salmon Policy's implementation. The Council will propose the ways in which the Wild Salmon Policy should be directing resources to achieve greatest impact.

The other projects to be initiated in 2009 will be selected with reference to the discussion in the September 18, 2008 anniversary workshop in which the trends and anticipated challenges for salmon conservation were identified and described.

4. APPENDICES

- 4.1 Council Members and Staff
- 4.2 Discussion Paper
- 4.3 Future Threats to Wild Pacific Salmon-Tenth Anniversary Workshop Summary
- 4.4 PFRCC Publications

4.1 COUNCIL MEMBERS AND STAFF

Dr. Paul LeBlond serves as the Chairman of the Council and is Professor Emeritus of Oceanography and Physics at the University of British Columbia. Located on Galiano Island, he has a particular interest in climate change. He chairs and serves on several prestigious science panels and advisory boards.

Mark Angelo serves as the Deputy Chair of the Council. He is Program Head and Instructor in the Fish, Wildlife and Recreational Department of the BC Institute of Technology. Known across North America for his work as a river conservationist, habitat expert and educator, he was awarded Canada's first National River Conservation Award.

Mary-Sue Atkinson is a community volunteer and advocate for fisheries conservation. She has served as a streamkeeper, and she has led public awareness campaigns and school programs to expand public awareness about watershed protection and survival of wild salmon.

The Honourable John A. Fraser served as Chairman of the Council from inception until April 2005, and now continues to serve as a Council member. He is a former Minister for the Environment and Minister of Fisheries, and served as the first elected Speaker of the House of Commons. He headed the Fraser River Sockeye Public Review Board investigating the salmon fishery and was also Canada's Ambassador for the Environment.

Dr. Jeff Marliave is a senior scientist at the Vancouver Aquarium. He is extensively published and continues to be involved in hands-on research as a diver. He has been instrumental in providing leadership for the Council to deal with several high-profile issues including salmon aquaculture and protection of pink salmon stocks.

Marilyn Murphy is the Executive Director of the Sport Fishing Institute of BC. She has spent her career involved in sportfishing as a guide and lodge manager, contributing to the sustainable use of salmon resources. She is also currently the Chair of the BC Southern Sportfishing Advisory Board. She became a PFRCC member in December 2003.

Marcel Shepert is involved in the aboriginal fishery, having been executive director of the Fraser Watershed Fisheries Secretariat and also a fisheries program manager and coordinator for the Carrier Sekani Tribal Council. Located in Prince George, he has been a leader and representative of First Nations' interests in resource management, negotiations and conflict resolution

Vacant: Member representing commercial fishing perspectives

Vacant: member Representing public education and fisheries awareness perspectives

Dr. Richard Beamish: Ex-officio member representing Fisheries & Oceans Canada.

Vacant: Ex-officio member representing aboriginal fisheries perspectives

Gordon Ennis: Managing Director (to December 2008)

Diane Lake: Acting Managing Director (since December 2008)

Yvonne Shiratti: Administrator

4.2 DISCUSSION PAPER

PACIFIC FISHERIES RESOURCE CONSERVATION COUNCIL CONSEIL POUR LA CONSERVATION DES RESSOURCES HALUETIQUES DU PACIFIQUE July 2008

Natural and human-induced conditions of all kinds jeopardize the health and future prospects of wild Pacific salmon. The task of protecting and conserving wild fish stocks is important to British Columbians who are concerned about the persistent declines and risk of extinction of salmon stocks.

The purpose of this discussion paper is to stimulate ideas and dialogue about current and emerging challenges for the conservation of wild salmon.

STRATEGY MANDATE

For the past ten years, the PFRCC—Pacific Fisheries Resource Conservation Council—has been providing information and advice on strategies to improve the long-term sustainability of wild salmon.

We are marking the tenth anniversary of the PFRCC with a look ahead at the challenges of the coming decade, by sponsoring a September 18th workshop involving a group of participants from throughout the fisheries sector.

The PFRCC was created in an era of fisheries crises in coho, sockeye and steelhead in several areas of the province, and in the wake of the public review on the disappearance of millions of Fraser River sockeye. Many of those problems and challenges persist, in spite of applying new fisheries management practices. And, some new problems are becoming evident in light of research and observed trends, such as climate change.

The PFRCC is re-assessing the overall needs and issue priorities in salmon conservation. We are seeking the views of leading British Columbians—including scientists, streamkeepers, fish harvesters, and fisheries managers—who can help by identifying what should be the new priorities for salmon conservation.

RETROSPECTIVE

The Pacific Fisheries Resource Conservation Council provides public information and strategic advice on wild Pacific salmon and steelhead stocks, and on their freshwater and ocean habitats. The Council was established on September 18, 1998 under a federal-provincial agreement to report to the Minister of Fisheries and Oceans Canada and British Columbia Minister of Fisheries and the public. It is an independent body, with funding by the Government of Canada and reporting to ministers of both levels of government. The nine Council members combine an array of perspectives from commercial, First Nations, sports fishing, academic and advocacy backgrounds. During its ten years, the Council has issued 53 major reports on a wide range of salmon and fisheries conservation topics. It has produced advisories, commissioned studies, and published booklets and background papers—and has sponsored meetings and events—to help inform discussions and decisions related to wild salmon. It contributes ideas and recommendations for innovation to help shape conservation decisions by federal, provincial, municipal and First Nations leaders.

Over the past ten years, the PFRCC has provided recommendations and constructive criticism that has sometimes been disputed or unwelcomed. As an independent advisor to ministers, the PFRCC has taken the lead on some crucial issues and helped to refocus government attention and resources onto solutions to problems, such as the Broughton Archipelago pinks, that were being overlooked.

The PFRCC was assigned the task of focussing on strategic issues to enable more effective salmon conservation decisions by governments. It has avoided duplicating the work of other advisory groups and researchers that have their own important roles in matters such as catch allocation.

The issues that have occupied the PFRCC have typically been over-arching ones that have defied easy solutions or minor budget changes. The issues have been complex, challenging and long-standing.

PERSISTING PROBLEMS

The public concern about wild salmon that spurred the creation of the PFRCC has not abated. During the past decade, the number of stocks at risk has increased, and persistent poor returns continue for sockeye and other salmon and steelhead in many once-abundant spawning areas.

For some, this situation has been cited as a failure of the PFRCC and others to improve the prospects of salmon. At the same time, the failure of government agencies to heed or act on some advice has been a conscious choice by government decision-makers.

Recommendations and advice on priorities should not be expected to lead to immediate acceptance and adoption. The long cycles of government budget commitments, programs and personnel assignments have made it difficult for fisheries agencies to adapt to new conditions, however urgent the need has been.

The PFRCC has served as a leading edge for significant policy changes that, by necessity, have been often slow to be implemented by both levels of government. The landmark Wild Salmon Policy is a case in point.

By identifying and suggesting new priorities for salmon conservation, the PFRCC intends to re-orient its own research and attention to policy issues.

The PFRCC has concentrated on matters related to DFO and its primary role in salmon conservation, although addressing the fact that the Province has its responsibility and capacity in aspects that include steelhead and matters such as water management and riparian health.

The conservation perspective of the PFRCC has been to encourage risk-averse fisheries and environmental management by adopting the precautionary approach. This was to be applied operationally, guided by the following questions:

- Does this practice protect ecosystem functioning?
- Does it protect biological diversity?
- Is this practice consistent with the precautionary principle?
- Is this practice risk-averse?

INITIAL FOCUS

In the early stages of the PFRCC, attention was focussed on pressing topics that included:

Climate Change—The adaptation of fisheries practices and regulatory requirements has been an on-going priority issue, with emphasis on maintaining water quantity and ensuring appropriate spawning conditions such as water temperature.

Coho Recovery—The need to maintain multi-year fishing limits for coho was a position emphasized by Council members, in the face of strong pressure to restore previous catch levels.

Biodiversity—The imminent threats and extinction of distinct salmon populations led the Council to play a significant role from the earliest stages of DFO's Wild Salmon Policy.

Assessment Reduction—Budget reductions in escapement monitoring were a concern of the Council, particularly in the loss of ability to detect trends or provide reliable and timely information about crucial salmon stocks.

Habitat Projects—The Council provided information and perspectives on impacts associated with industrial projects that threatened salmon spawning and rearing areas and shifted the hydrology of streams to put salmon at risk.

EVOLVING ATTENTION

As the Council proceeded from its early stages, the members identified other matters that warranted attention in terms of their impact on wild salmon, including:

Ocean Productivity—The evidence of wide variations in marine survival, for unknown reasons and seemingly unrelated to their freshwater rearing conditions, has raised concern about the value of at least some of the investment in projects meant to improve salmon productivity.

Aquaculture—The interaction of wild and farmed salmon was a topic of a Council review meant to define areas where understanding of impacts was lacking and conflict prevailed.

Ecosystem-Based Management—The concept of managing each fish species separately needs to be replaced by holistic views of predators, prey, food supplies and other conditions affecting the health and prospects of salmon.

Hatchery Effects—The use of hatcheries to supplement declining salmon stocks has provoked considerable attention to impacts such as competition for food and intensity of fishing on wild stocks in enhanced fish areas.

Conservation Capacity—The ability and willingness of fisheries regulators to enforce the Fisheries Act and other protective legislation have been seriously undermined by a loss of focus on the conservation mandate—a situation noted by observers in communities across the province.

NEXT DECADE'S CHALLENGES

In looking ahead, the members of the PFRCC have identified trends and emerging issues—along with questions—within the categories of human threats, ecosystem assumptions and management issues:

Human Threats

The continued rapid expansion of population and industrial activity in British Columbia will mean even greater pressure for gravel extraction and stream-altering projects. Urban and intense agricultural expansion will threaten riparian areas even more.

—Is the government environmental review process sufficient to protect Pacific salmon from extinction, or is another entity or process dedicated to salmon habitat protection and conservation needed?

Water extraction from salmon-bearing streams for agricultural, industrial and community uses has increased dramatically. The effect of this kind of competition among water users in Washington and Oregon, compounded by climate change, has left salmon access to water flows as an after-thought and severely undermined salmon stocks.

-What can be done in British Columbia to ensure that salmon are given sufficient priority in the allocation of water to ensure adequate spawning and migration?

A long-standing public perception is that overfishing is a primary source of wild salmon problems.

-Does overfishing remain a prevailing problem?

New Ecosystem Assumptions

The public debates have shifted in the past ten years from questions about whether or not climate change was real, to how much and how quickly it was impacting ecosystems and affecting salmon. Climate change effects on water flows and temperatures are the most immediate and widespread ones, and have observable effects on spawning and migration across the province.

-Given the pervasive and long-term nature of climate impacts on salmon, will fisheries managers soon be forced to concentrate on protecting those stocks with the greatest potential for survival, and leave the others to their fate?

Variability in salmon productivity is inevitable, and wild salmon populations are affected by an array of human factors as well as events and conditions that have nothing to do with human influences.

—Is it appropriate or necessary for governments to use fishing restriction as their primary regulatory measure instead of addressing root causes, in cases where declines in salmon populations are primarily driven by factors such as pollution impacts or other identifiable activities?

While there are several obvious sources of impacts and risks for salmon, other wild-card conditions can be expected to arise to devastate salmon stocks.

-How can we better anticipate or predict sudden and high-impact conditions, such as ocean regime shifts and water flow disruptions, and be prepared for them?

Management Tools

Single species management regimes have been recognized for their limited effectiveness in light of recent experience. While ecosystem management approaches are widely endorsed in theory, they have not been widely implemented with any speed or enthusiasm.

—What is needed to enable ecosystem management to become more widely applied in salmon management practice?

Considerable research in fisheries science has been sponsored in universities and government agencies, yet there seems to be limited application of the findings or knowledge from it.

-Are there better ways or a collaborative structure that could encourage more translation of fisheries research findings and discoveries into new technologies and management practices?

The ability to predict salmon returns and migration timing is a crucial element of salmon management. While advances have been made in this field of forecasting, there continue to be significant unknowns that cast doubt on the capacity to predict stocks and manage the fishery with reliability.

-Are there realistic prospects of improving the predictive capacity for salmon, or will greater precaution be required, involving further catch reductions for conservation purposes?

The implementation of the Wild Salmon Policy involves extensive research support and increased knowledge about local conditions and fish populations. To achieve the full value of this widely supported policy approach over the coming decade and beyond, the commitment of considerable financial and personnel resources is necessary.

-In light of the current fiscal priorities and outlook for the economics of wild salmon, is the Wild Salmon Policy likely to be assigned the anticipated resources to enable it to succeed?

Considerably more is known about salmon in their freshwater life phase than in the ocean. The wide variations and unpredictability in salmon returns suggest that gaining greater understanding of salmon in the ocean might be a wise investment.

-Would this suggested approach of shifting research emphasis and resources into investigation of the ocean phase be appropriate? Or practical?

Conservation Assumptions

Salmon is often cited as an icon of British Columbia, and a symbol assigned great value and held in esteem. Yet, the threats and risks seem to be increasing, as people apparently look the other way when economic benefits are at stake.

-Has salmon become devalued by British Columbians? Are we now more willing to sacrifice wild salmon for economic growth?

The compounding problems of conserving salmon populations have led regulatory agencies to ratchet down fishing opportunities and impose increasing restrictions. The continuation of this trend is expected, along with further measures necessary to protect weak stocks that will be identified within the Wild Salmon Policy framework.

-Should we assume that in the foreseeable future commercial salmon fishing might be virtually eliminated for all but rare opportunities?

Technology has offered surprising solutions to many of the challenges presented in other fields. The application or adaptation of techniques or equipment for salmon conservation purposes seems to have been rare.

-Are there any emerging technologies that offer the potential for applications that could be significant for salmon conservation?

The concept of no net loss for fisheries seems to have been difficult to achieve in practice, especially for salmon habitat.

-Do we have even the prospect of technical capacity to offset habitat impacts to achieve no net loss, especially given a burgeoning human population?

One of the past decade's high-profile initiatives was the selective fishing policy. It now seems to be given relatively little attention.

-Will selective fishing be revived, or could it be replaced by another effort to introduce innovation?

First Nations have taken an increasing role in fisheries management and decision-making.

-In what ways can this trend help to improve salmon conservation?

INITIATIVES AND IMPACTS

The information, advice and recommendations of the PFRCC over the past decade have led to fisheries conservation decisions in different ways and with varying degrees of influence, including the following high-profile issues and activities:

The severe **restrictions on coho fishing** that were introduced shortly before the PFRCC's creation were strongly opposed by many fishing advocates. The Council members became outspoken supporters of the coho conservation measures and endorsed the DFO minister's decision. The Council's involvement from its unbiased position had a significant effect in helping to maintain the coho fishing limits for precautionary purposes in subsequent years until tangible stock recovery became evident.

The Council has been engaged in the **Wild Salmon Policy** since its formative stages to ensure its concentration on biodiversity. The Council's serious concerns about the initial policy proposal led to delays in DFO's development of the policy, but the revised version was vastly improved. The PFRCC has also been intimately involved in the implementation phase. The PFRCC assisted in marshalling support from non-governmental organizations in the conservation community, as well as contributing expertise in the process of clarifying the policy.

The adoption of protective measures in 2003 for migrating **pink smolts in the Broughton Archipelago** was a policy urged and negotiated with BC Fisheries to minimize exposure to salmon farms and sea lice. Several organizations were instrumental in advocating action by the governments and salmon farming companies, but the PFRCC was the one that changed government policy regarding research and monitoring of farmed and wild salmon. The Council's chair and members worked in a hands-on role with provincial government officials to ensure that the migration routes and other aspects of the protective measures would be both practical and comprehensive.

The PFRCC has sponsored a **series of community meetings** across the province each year to hear first-hand the fisheries conservation views of British Columbians. These sessions have become a valued forum for discussions about local issues, and they are both well-attended and extensively reported by community news media. The Council's reports on these meetings have been communicated to government officials and they served as a basis for some of the most pertinent and practical information to supplement PFRCC's research studies and background papers.

The series of **innovative salmon habitat studies** that were undertaken by the PFRCC over the past four years were intended to fill a serious void in knowledge related to ecosystem indicators. This groundbreaking work in habitat indicators has helped refine the approach that could bridge the gap between science and decision-making.

OPTIONS FOR STRATEGIC ADVICE

The fisheries ministers in Victoria and Ottawa are considering the possibility of establishing a new joint strategic advisory body for Pacific salmon. This may have the effect of bringing the PFRCC and BC Pacific Salmon Forum together. While the PFRCC serves as a ministerial-level advisor to both governments, it has been financially supported only through DFO and most of the members have been named by the federal minister. The BC government has worked cooperatively with the Council throughout the past ten years, but has not been an equal participant or contributor to the extent originally envisaged.

The PFRCC is unlike the several consultative and advisory groups composed of representatives of stakeholders or interest group advocates. The PFRCC reports to ministers, and is mandated to work at a strategic level for policies and major issues related to the sustainability of salmon.

Most of the conditions that led to the creation of the PFRCC are still evident, including the public distrust of government fisheries agencies and officials. The need for an unbiased and authoritative source of information about Pacific salmon from the conservation perspective continues to be apparent.

The PFRCC has provided valued advice to both levels of government. And, if a new advisory body is formed, PFRCC members have suggested that the new arrangement or organization should have the following characteristics:

- Independent, with capacity to set its own agenda and address issues without undue influence by departmental officials or fisheries stakeholders.
- **Reporting to Ministers**, with arrangements to ensure direct access, frank dialogue and commitments for timely consideration of advice and provision of substantive responses.
- Focus on Conservation, to concentrate on long-term sustainability of wild salmon and the measures needed to protect freshwater habitat and improve ocean-phase survival.

Whatever the ministers decide about an advisory organization, the acid test will be its value in terms of improving the future prospects for the salmon resource. They might find it useful to consider views related to the following questions:

- Would it be beneficial to establish a broader mandate for a conservation advisory organization to deal with all of the major fish species in the Pacific region, not just salmon?
- Are there organizational structures or consensus-building procedures that could help establish agreement across the commercial, First Nations and recreational fisheries to work together towards conservation goals?
- What is the single most crucial fishery or salmon conservation issue that should be jointly addressed by the federal and provincial ministers in cooperation with their advisory group?

Pacific Fisheries Resource Conservation Council 858 Beatty Street, Suite 290 Vancouver, British Columbia V6B 1C1 Phone 604-775-6070 Fax 604-775-5622 www.fish.bc.ca

4.3 FUTURE THREATS TO WILD PACIFIC SALMON—TENTH ANNIVERSARY WORKSHOP SUMMARY

Pacific Fisheries Resource Conservation Council Vancouver, September 18th, 2008

To celebrate the first decade of their work and to look toward the emerging agenda for salmon and steelhead conservation, the Pacific Fisheries Resource Conservation Council sponsored a September 2008 workshop involving current and past Council members and leaders from the conservation community. This report presents a thematic compilation of the views and perspectives of the participants in the workshop.

1. Preamble: The Fate of Wild Salmon

Salmon evolved over the ages to take advantage of the relatively protective freshwater environment in their early life stages, then moving to the richer and more dangerous ocean pastures later in life before returning to regenerate. Their anadromous life style has put them in close proximity of land creatures for their migrating, spawning and rearing habitat. Homing spawners bring to the land the nutrients of the sea, food for land-dwellers, including people. Extensive human use of rivers, lakes and estuaries have seriously eroded salmon habitat. On both sides of the Atlantic, wild salmon have been decimated and are now found only over a small fraction of their former range. While their Pacific relatives are doing better, they are also subject to pressures from a wide range of human activities and their consequences. Many groups who recognize the value of wild salmon have advocated measures to protect them. The Pacific Fisheries Resource Conservation Council (the PFRCC) is one such group.

2. The Pacific Fisheries Resource Conservation Council

The PFRCC has a unique role that differs from other conservation groups concerned with wild salmon. It is a government-mandated but independent advisory body, created in 1998 by a Canadian Federal-Provincial (British Columbia) agreement, to advise ministers responsible for fisheries on strategic issues related to salmon conservation.

Its terms of reference specify that the PFRCC is not to be involved in the in-season management of the fishery nor the allocation of fisheries resources. Part of the PFRCC's mandate is also to consult and inform the public on the state of the salmon and related habitat, reporting to the ministers and the general public. Its extensive reports, advisories and other communications are available on its web site: www.fish.bc.ca.

Given the overwhelming economic and social interests in salmon harvesting, as well as the long-term dangers to its freshwater habitat from human activities, sharply exemplified in the fate of wild Atlantic salmon, there is a need for an independent and authoritative voice speaking for conservation of salmon stocks and their habitat. That is the PFRCC's role.

3. The Form and Achievements of the PFRCC

The topic of the Council itself received attention in the workshop discussion because ministers are considering possible changes to the Council's mandate or adopting a new advisory organization form. The PFRCC was initially structured and organized to focus on providing strategic and independent advice to ministers that was not otherwise available. The Council's members have been appointed by ministers and serve in their own capacity, and not as spokespersons of any particular interest groups or fisheries stakeholders. They bring different perspectives—commercial, sport, First Nation fisheries, as well as from the public advocacy and academia—to form a widely representative group that gathers scientific and traditional knowledge and presents advice on a consensus basis.

In its evaluation of salmon conservation issues, the Council draws on information from government fisheries agencies, the Pacific Salmon Commission and other regulatory and research bodies. It invites briefings by scientists, managers and policy planners; it has sought out information and opinions from advocacy groups and fisheries stakeholders; and, it has consulted widely by holding community meetings in many areas of British Columbia. In selecting its priority issues each year, the Council has used this input and has made use of the specialized resources of consultants and fisheries professionals for contracted studies, background papers and reports.

Over the past ten years, the Council has published more than fifty reports, and it has sponsored information documents on conservation issues in commercial, sport and First Nation fisheries. In doing so, it has drawn attention to the problems of water availability in salmon streams and to the impact of climate change on salmon habitat, suggesting practical strategies for mitigation and adaptation. In the face of the decline of coho and chinook stocks in the Strait of Georgia, the Council raised questions concerning the role of hatcheries and precautionary management. It has advocated ecosystem-based studies and their application to the management of Strait of Georgia fisheries. The Council also played a pivotal role in shaping the development of the Wild Salmon Policy, and sponsored ground-breaking analysis for the application of salmon habitat indicators. The Council's reports are all on-line at www.fish.bc.ca.

4. Future Challenges to Salmon Conservation

The workshop participants noted that the PFRCC was originally recommended by a public inquiry panel in the wake of an episode of "missing salmon" in the Fraser River. At that time, the main conservation concerns perceived by the public and signalled by the enquiry were associated with overfishing, inadequate enforcement, intersectoral rivalries of harvesters, and mixed-stock harvesting. Over the decade, some of these issues have ebbed in terms of public attention while others have emerged, such as habitat degradation, climate change impacts, aquatic invasive species, and ecosystem management failures. Looking to the future, the challenges to salmon conservation identified by the workshop participants fell into the categories and topic headings outlined below.

5. Natural Variability

Fluctuations in numbers and quality of spawners in different stocks in different areas have occurred and continue to do so as a result of variability in the oceanic and freshwater environments and ecosystem interactions. The PFRCC's attention was drawn to the Strait of Georgia ecosystem in the wake of the alarming decline in local chinook and coho stocks, in spite of fishing restrictions and hatchery production. The cause of such declines is unclear. Might they be linked to phenomena occurring in ocean waters beyond human control? Could the main factors be inter-species predation, or fish preying on juvenile salmon, or lack of suitable food, or competition between wild and hatchery juveniles for food in coastal environments, or disease? Are we replacing wild productivity with enhanced? A better understanding is needed of the links between changes in the environment, be they inter-annual or associated with long-term trends, and the various trophic levels of the ecosystem.

The PFRCC should continue its strong advocacy of ecosystem-based approaches, anticipating that scientific research, especially ecosystem modeling, will yield practical results applicable in the management of the fisheries. The Council encourages the evolution of Fisheries and Oceans Canada's annual report—"The State of the Oceans"—as a valuable information tool towards ecosystem-based perspectives.

6. Climate Change

Climate change consists of long-term trends superimposed on environment variability, raising the baseline about which fluctuations occur. To quote Overland *et al*, (EOS, 88, 16; 17 April 2007) "Combined influences from modest projected trends in sea surface temperature and a continued large range in decadal natural variability will initiate ecological consequences over large areas of the North Pacific before 2040." Such consequences may include: shifts in species distribution in response to changes in ambient conditions; emergence of conditions (e.g., warm water) beyond the tolerance of some species; changes in runoff patterns; appearance of new predators extending their range; and shifts in food availability and suitability.

For the PFRCC's future workplans, the focus should be to consider an appropriate far-reaching response to the anticipated consequences of climate change which will require a deepening of ecosystem understanding to include sensitivity to climate change and expected impacts, as well as the development of adaptation strategies.

7. Human Interventions

Fisheries management involves managing people, not fish: it is just as important to understand the behaviour of people as that of the ecosystem itself. Measures aimed at harmonizing human activities with the requirements of salmon conservation will be required in a number of areas:

7.1 Water Availability. Salmon and people compete for finite water resources. Water extraction from salmonbearing streams for agricultural, industrial and community uses has increased dramatically and competition for this resource will increase. The PFRCC welcomed the BC government's "Living Water Smart" initiative, its focus on protecting stream health, adapting to climate change and regulation of groundwater, all from the perspective of ensuring water availability for salmon. Procedures to ensure water access for salmon will have to be implemented to prevent the kinds of situations that have arisen in other Pacific coast jurisdictions.

7.2 Invasive Species. A changing climate brings in new species extending their range; there is nothing to be done to prevent that, although understanding its impact on the ecosystem for harvest planning purposes is important. More amenable to regulation is limiting the importation of foreign species by humans, for example, yellow perch in interior lakes which may displace or feed on young salmon. Public education and careful regulatory intervention are required.

7.3 Harvesting. The dangers of overharvesting have received attention throughout the world's fisheries. However, Canada's Pacific salmon problems should not be primarily attributed to this cause. A continuing issue is the harvest of mixed stocks and the need to improve catch selectivity. Dividing a limited resource among competing users is always fraught with difficulties and perils for stock conservation. A better understanding of ecosystem interaction and evolution, through research that involves both scientists and stock managers, will be required to make a convincing case for a suitably precautionary approach to harvesting.

7.4 Habitat Loss. Human encroachment on habitat continues through farming, logging, roads, urban and port development. Other activities (e.g., pollution, fish farms) impact fish populations directly and indirectly. Within a conservation framework, protective planning, including early intervention before irreparable damage is done (e.g., the coal-bed methane issue), is necessary as well as coordination among the many agencies whose jurisdiction impacts on the natural environment.

8. Overarching Policy Issues

Fisheries management has too long been focused on maximization of short-term benefits to harvesters and a series of crisis conditions for high-profile salmon stocks. An effective approach to the husbandry of renewable fisheries must incorporate scientific information on the state and prospects of the resource, more risk-averse management attitudes in the face of incomplete information, and frameworks for collaboration among all concerned parties. These points have been made repeatedly and are by now incorporated in the Wild Salmon Policy, but other broad policy matters will need to be addressed.

8.1 Ecosystem and Human Health. Wild salmon are an integrative index of the health of the Pacific ocean and freshwater aquatic ecosystems. People basically depend on healthy ecosystems to survive: polluted unproductive waters and riverine environments are unhealthy for aquatic life and all that depends on it, including human society. There is a link between healthy salmon stocks and a healthy population that needs to be investigated in a more systematic and determined way.

8.2 Conservation: A Moral Issue. Wild Pacific salmon have traditional social relevance as well and economic values; they are a prized heritage of First Nations and of all British Columbians. Wild salmon conservation is a matter of moral responsibility rather than a mere economic issue, a point forcefully presented by the Honourable David Anderson in his presentation at the PFRCC's 10th anniversary workshop. Moral issues, such as the freedom of expression and right to education, define the nature of our society. Salmon conservation and care for valued natural resources also fall in this category and should be viewed in terms beyond monetary values. The managers and beneficiaries of the fisheries resource have a moral responsibility to conserve it for all Canadians. Greater consideration and definition of what constitutes moral responsibility for salmon should be given attention by government officials, not only conservation advocates.

8.3 Salmon Strongholds. While government intervention through implementation of the Wild Salmon Policy may help to stem or prevent losses of endangered Conservation Units, involvement in salmon conservation needs to be encouraged on a community and regional basis. Canadian participation in the voluntary Salmon Strongholds Partnership may be one way to build and harmonize conservation resources where salmon values are highest and salmon sustainability is particularly crucial.

9. Toward a Sustainable Conservation Framework

In the absence of an effective conservation policy, human encroachment and economic needs will drive wild Pacific salmon to the same remnant state as their Atlantic cousins. The effective protection of salmon stocks and habitat is a function that must be driven by public determination and understanding of what is at stake.

A working conservation policy must be based on an understanding of the marine and freshwater ecosystems. Scientific knowledge and data must be improved to the point that they can reliably guide management decisions with confidence in the outcome of regulatory measures. An ecosystem-based management framework will be necessary to provide simultaneous guidance for the harvesting and conservation of many species, not just wild salmon and steelhead. A coordinated effort by federal, provincial, municipal and First Nations government agencies is required to achieve the results, particularly where fish habitat is at risk. The practical application of the concept of sustainability needs to become a primary task for salmon conservation.

4.4 PFRCC PUBLICATIONS

- Annual Report 1998–1999 (Released June 1999) This report and its four accompanying background papers were the first products of the Pacific Fisheries Resource Conservation Council. Together, they were intended to present a package of information and advice to governments and the Canadian public on the conservation of Pacific fish populations and habitat in British Columbia.
- *Freshwater Habitat* (Background paper authored by Dr. Marvin Rosenau and Mark Angelo, June 1999) Salmon and steelhead habitats in British Columbia are almost as varied as the province's geography. The rich biological diversity of species and stocks of salmonids—the family to which salmon and steelhead belong is an evolutionary response to the physical and chemical variability of the habitats in which these fish live.
- *Salmon Stocks* (Background paper by Dr. Carl Walters and Josh Korman, June 1999) Providing a species-byspecies overview of stock status and trends, this paper presents an overview of the fisheries management issues associated with determining stock status. The aim was not to provide a detailed or complete enumeration of all local conservation issues, but rather to highlight major concerns and identify needs for more detailed analysis.
- *Fraser River Sockeye* (Background paper authored by Dr. Richard Routledge and Ken Wilson, June 1999) This paper details historical trends regarding Fraser River sockeye runs. It also addresses stock management concerns and concludes with recommendations.
- *Coast-Wide Coho* (Background paper authored by Dr. Richard Routledge and Ken Wilson, June 1999) Canada's management and protection of freshwater coho habitat leaves much to be desired. The effect of loss and degradation of freshwater coho habitat in the decline of southern BC coho is complex and widespread. Most biologists agree that habitat loss represents a significant long-term threat to wild coho production.
- *Climate Change and Salmon Stocks* (October 1999 conference summary) This report on the one-day workshop hosted by the PFRCC focused on responses to the questions, "What is the most alarming potential impact of climate change on salmon stocks?" and "What is the best strategy to adopt?"
- *Annual Report 1999–2000* (Released May 2000) This annual report of the Council reviews the state of salmon stocks and related habitat conditions, and includes particular attention to a set of areas, salmon populations and habitat situations that are at-risk. It looks at four issues in particular—climate change, the *Pacific Salmon Treaty*, salmon in the Central Coast, and strategic management.
- *Water Use Planning: A Tool to Restore Salmon and Steelhead Habitat in British Columbia Streams* (Background paper by Dr. Marvin Rosenau and Mark Angelo, May 2000) Many western North American heritage plants and animals are being lost due to careless use or lack of water, and this cannot be rectified until they attain preferred status for access to this important life-giving resource. Salmon and steelhead populations are among the species impacted by excessive human use of water.
- Review of the Coho and Chinook Salmon Sections of the "Agreement Under the Pacific Salmon Treaty" between Canada and the United States, dated 30 June 1999 (Background paper by Randall Peterman and Brian Pyper, May 2000) This report reviews the "Agreement under the Pacific Salmon Treaty". The terms of reference given to the authors by the PFRCC focused this review on how adequately the Aggregate Abundance-Based Management rules specified in the Agreement would deal with conservation issues for Canadian coho and chinook salmon.

- Sand and Gravel Management and Fish-Habitat Protection in British Columbia Salmon and Steelhead Streams (Background paper by Dr. Marvin Rosenau and Mark Angelo, May 2000) Sand, gravel and other sediments within and adjacent to spawning and rearing streambeds are fundamental to the productivity of salmon and steelhead stocks. The high levels of production formerly seen in many of British Columbia's chum, pink and sockeye populations were, in part, the result of the conditions of the spawning sediments, primarily gravel, available for these fish.
- State of Salmon Conservation in the Central Coast Area (Background paper by Allen Wood, May 2000) Areas 6 to 10 of British Columbia's Central Coast were selected for study because this region provides a good measure of the current state of domestic stocks and their management. This is one of the few relatively undeveloped areas left on the coast.
- The Wild Salmon Policy and the Future of the Salmonid Enhancement Program (Council Advisory, June 2000)
 The federal government's Wild Salmon Policy Discussion Paper was part of a series of Fisheries and Oceans
 Canada projects flowing from the New Directions policy initiative which was begun in October 1998.
 Fisheries and Oceans engaged in a round of public consultations with respect to its proposed Wild Salmon
 Policy, as well as the future of the Salmonid Enhancement Program, and the PFRCC provides its views in this
 Advisory.
- Salmon Conservation in the Central Coast (Council Advisory and background paper prepared for the Council by Allen Wood, March 2001) The conservation status of chinook and coho salmon populations in the Central Coast has become a matter of growing concern. Poor returns of salmon and other important fish species have undermined the commercial and aboriginal fisheries and affected communities throughout the region. The PFRCC's sponsorship of this background paper was intended to provide a factual and analytical basis for the Council members to provide comments and recommendations, and to present technical information that can enable the public to understand the situation.
- *A Crisis in Fisheries Education* (Council Advisory, September 2001) Capable personnel to manage the fisheries on sound conservation principles are essential if we are to maintain both biodiversity and healthy salmon stocks in British Columbia. The human resources in the fisheries sector and the skills they apply are increasingly crucial to the success of activities intended to safeguard and enhance the prospects for wild salmon.
- *The Role of Public Groups in Protecting and Restoring Freshwater Habitats in British Columbia, with a Special Emphasis on Urban Streams* (Background paper by Dr. Marvin Rosenau and Mark Angelo, September 2001) There has been an upsurge of community and public involvement in the protection and rehabilitation of British Columbia rivers and streams, and an evolution towards a more collective engagement in the management of these resources. This has begun to result in some remarkable successes.
- Annual Report 2000-2001 (Released December 2001) This report provides a preliminary summary of the state of stocks in 2001. The report also summarizes research findings and thinking to date on the subject. Related issues are discussed, and some important conservation and management questions are put forward.
- Annual Report 2001–2002 (Released October 2002) This report is innovative in assembling information not otherwise available to the public in any other publication. It considers Pacific salmon in four regions of southern BC: Fraser River basin; Okanagan; Strait of Georgia; and West Coast of Vancouver Island. For each region and species, the report summarizes trends in spawning population sizes since the early 1950s, explains the annual monitoring of these populations, and identifies conservation concerns.

- *The Protection of Broughton Archipelago Pink Salmon Stocks* (Council Advisory, November 2002) The European experience indicates that sea lice abundance can be associated with salmon farming. This advisory makes recommendations on how to safeguard the wild pink salmon runs of the Broughton Archipelago.
- Making Sense of the Salmon Aquaculture Debate: Analysis of Issues Related to Netcage Salmon Farming and Wild Salmon in British Columbia (Report commissioned by the PFRCC, prepared by Julia Gardner, Ph.D., and David L. Peterson, January 2003) This report takes a look behind the debate, examines the information and assumptions supporting the arguments of opposing interests, and deepens the current public understanding about the potential impacts of salmon aquaculture on wild salmon. The report's focus was on the interplay of salmon farming and wild salmon, not on all aspects of the potential impacts of salmon farming. Instead, the report concentrates on the most pressing issues pertaining to farmed salmon/wild salmon interactions.
- *Wild Salmon and Aquaculture in British Columbia* (Council Advisory, January 2003) This Advisory provides information and recommendations for action on the potential and perceived impacts of salmon netcage aquaculture on wild salmon and their habitat in British Columbia.
- *The Salmon Aquaculture Forum: Discussion Paper on Practices & Findings* (Authored by the Honourable John A. Fraser and Kenneth Beeson, December 2003) The authors report on their extensive stakeholder discussions and public policy research on best practices across North America and Britain to produce this paper on resolving salmon aquaculture controversies and establishing consensus on the future of fish farming. It cites the importance of First Nations involvement and constructive public participation. It suggests a broader framework and initiatives for government advisory systems to work more productively.
- *The Salmon Aquaculture Forum: Briefing Note to Ministers* (Authored by the Honourable John A. Fraser and Kenneth Beeson, December 2003) This report sets out the principles and criteria for the new Forum, and proposes the key elements that will be necessary to make it acceptable to all participants and effective in fostering public dialogue and understanding of the issues. It offers some alternatives in terms of the scope and scale of the Forum's activity.
- Annual Report 2002–2003 (Released August 2003) This annual report puts forward the current findings related to stock status and habitat conditions, and it presents a summary of the Council's viewpoint on some of the most significant and immediate matters of concern. In some instances, the comments summarize and clarify the positions explained in previous Council reports. In other cases, such as salmon aquaculture, this report contains the Council's more recent consensus views.
- **Conflicts Between People and Fish for Water: Two British Columbia Salmon and Steelhead Rearing Streams in Need of Flows** (Background paper authored by Dr. Marvin Rosenau and Mark Angelo, September 2003) Using the Nicola and Englishman rivers as examples, this background paper explains how water levels and flows influence the productivity of salmon. It describes the regulatory regimes for water access and how there has been increasing competition for water for urban development, agricultural and industrial uses. It suggests adopting a hydrological budgeting process to allocate water to fish and other uses in a fair and transparent manner, and enforcing the water license system more effectively.

- Pacific Salmon Resources in Central and North Coast British Columbia (Authored by Dr. Brian Riddell, February 2004) This report summarizes the status of all salmon stocks in the central and north coast areas of BC and complements Council's 2002 report on the status of south coast salmon stocks. Data on escapements are presented, over time, for all five species of Pacific salmon. Inconsistent and inadequate data have created assessment challenges. While these salmon are threatened by economic development, climate change and human population growth they also remain a diverse, highly dynamic and resilient group of species.
- Advisory: Salmon Conservation Challenges in British Columbia with Particular Reference to Central and North Coast (Council Advisory, February 2004) This report summarizes Council's advice based upon an extensive analysis of stocks in the central and north coast areas. The advisory points out serious shortcomings in DFO's salmon assessment program. Budgets for assessment are decreasing at a time when international protocols, the new Species at Risk Act and an increasingly aware and concerned public demand better information. This Council advisory recommends a core assessment program aimed at the generation of quality information.
- Making Sense of the Debate about Hatchery Impacts: Interactions Between Enhanced and Wild Salmon on Canada's Pacific Coast (Report commissioned by the PFRCC and prepared by Julia Gardner, David L. Peterson, Allen Wood and Vicki Maloney, March 2004) This report sets out the various positions expressed by scientists and others, with a focus on interactions between enhanced and wild salmon. It explores the opinions and arguments surrounding the impacts and explains the various concepts, theories, practices and research in this field. Risks are examined in the context of over-harvesting un-enhanced stocks, genetic impacts, ecological impacts, disease and negative impacts on habitat from the enhancement facilities.
- *Annual Report 2003* (March 2004, released April 2004) This annual report summarizes initial findings from Council's analysis of the status of all salmon stocks in the central and north coast areas. It also provides a summary analysis of past recommendations to both levels of government and the influence that advice had on government decisions. This advice is summarized in terms of five topics or themes: biodiversity of Pacific salmon, effective management, adequacy of information, risk minimization and the development of a guiding policy framework.
- **Does Over-Escapement Cause Salmon Stock Collapse?** (Technical paper prepared by C. Walters, P. LeBlond and B. Riddell, April 2004) This report looked at all available information from British Columbia on whether large spawning populations that exceeded "normal", target or historical numbers, were followed by stock collapses. There was evidence that there was a levelling-off of salmon production for runs having a high escapement, but there was no evidence of over-escapement causing stock collapse.
- **Reality Stewardship: Survival of the Fittest for Community Salmon Groups** (Report commissioned by the PFRCC and the Vancouver Foundation, prepared by Brian Harvey and David Greer, July 2004) Given funding cuts from government, this report recommends strategies for survival including a focus on activities that will appeal to private donors and foundations. Projects are suggested that will allow volunteers and professionals to work together rather than compete for limited funds, and require the science-based planning approach that has sometimes been missing from ad-hoc community stewardship.

- *The Evolution of Commercial Salmon Fisheries in British Columbia* (Report commissioned by the PFRCC, prepared by Stuart Nelson and Bruce Turris, December 2004) This paper traces the trends in commercial fisheries from the 1960s to the present period. The report explains how the fishery evolved from a large industrial scale to the current smaller more controlled scale designed to improve salmon conservation. The report argues that conservation of wild salmon and economically viable commercial fisheries are not mutually exclusive.
- **Annual Report 2004** (April 2005) This annual report presented a summary of the publications and primary recommendations of the PFRCC in the preceding year. It also provided an account of the activities in support of salmon protection and habitat restoration, and the perspectives of Council members on matters including the capacity of regulatory and management agencies to conserve Pacific salmon.
- *Perspectives on Salmon Enhancement and Hatcheries: What the Council Heard* (May 2005) This report summarizes the results of public meetings, one-on-one meetings and written submissions related to the subject of salmon hatcheries. British Columbians believe that salmon hatcheries and enhancement are needed to protect wild stocks. Others are concerned that hatcheries can create negative impacts and that enhancement needs to be done right.
- *Conflicts Between Agriculture and Salmon in the Eastern Fraser Valley* (Background paper authored by Dr. Marvin Rosenau and Mark Angelo, June 2005) This paper was presented to the Council describing issues and challenges related to agricultural impacts in the lower Fraser River from Hope to Sumas and its tributaries. It highlighted the ways in which environmental remediation could occur efficiently, and how aquatic ecosystems and salmon protection can be enhanced without undermining agricultural viability.
- Selection and Use of Indicators to Measure the Habitat Status of Wild Pacific Salmon (February 2006) This report was produced in support of "Canada's Policy for the Conservation of Wild Pacific Salmon" which amongst other things makes a commitment to monitor the status of salmon habitat. It presents a synthesis of the literature plus the results of an expert workshop on indicators of habitat status. It recommends indicators related to water quantity and quality, physical habitat, aquatic and riparian ecosystems, estuarine ecosystems, ecosystem biodiversity and land use conversion. The report also recommends a pilot program to gather information on levels of required effort, expertise, costs and effectiveness.
- Managing Pacific Salmon for Ecosystem Values: Ecosystem Indicators and the Wild Salmon Policy (March 2006) This report outlines the role that Pacific salmon play in shaping aquatic and terrestrial ecosystems. It proposes indicators that might be used to measure this ecosystem role and future work needed to eventually guide policy makers on how to incorporate ecosystem values in their management considerations. It addresses the issues in Strategy 3 of "Canada's Policy for the Conservation of Wild Pacific Salmon".
- *First Nations, Salmon Fisheries and the Rising Importance of Conservation* (April 2006) Cooperation between First Nations, commercial and recreational fishers is vital to ensure that adequate numbers of salmon make their way to the spawning beds, helping to perpetuate future runs. So, too, is the need to resolve intertribal issues over the allocation of salmon resources. This report outlines positive results of First Nations initiatives to conserve salmon runs. Examples of selective, conservation-focused salmon fisheries abound.

- *The Evolution of Recreational Salmon Fisheries in British Columbia* (June 2006) This report explains how the recreational and sports salmon fishery evolved in British Columbia and how it has undergone significant growth in the last century. The dual challenge of designing conservation measures and ensuring fishing opportunities for anglers is one of the themes of the report. The authors explain that the long-term sustainability of both salmon and the sports fishery are inextricably linked, and effective conservation is an imperative.
- *Feeling the Heat: Can We Help Salmon Survive* (June 2006) This pamphlet report reminds us that to reproduce mature sockeye salmon must survive a "marathon swim that makes Olympic athletes look like couch potatoes." More frequent weather extremes and changing conditions are threatening the survival of Pacific salmon. This report outlines climate conditions that salmon must deal with and the research being done to better understand the factors affecting salmon. Salmon are resilient and adaptable but climate change dispels the notion of certainty in fisheries management; stocks are now threatened and they need our help to survive.
- **Annual Report 2005** (June 2006) This Annual Report reviewed the recommendations to DFO regarding the proposed Wild Salmon Policy. Most were adopted during finalization of the Policy document but the Council stressed the need for adequate funding to implement that Policy. It also reviewed other Council work including the hosting of a symposium on climate change and Fraser River sockeye salmon; the analysis of acoustic tags to better monitor and protect Cultus sockeye; and the review of the impact of agriculture on wild salmon in the eastern Fraser Valley.
- Advisory: Implementing the Habitat and Ecosystem Components of DFO's Wild Salmon Policy (October 2006) This advisory describes a framework for the joint implementation of the habitat and ecosystem management components of the Wild Salmon Policy. It recommended different intensities of monitoring with broad scale indicators being used throughout BC's salmon waters and detailed monitoring only where high-valued habitat is under threat. It stressed that monitoring and management actions must be linked, recognizing the vital role that the province plays in resource development and inventory. To ensure success, DFO should also work cooperatively with First Nations, industry and local stewards of salmon.
- *What's Happening to Wild Salmon in Your Community? What the Council Heard: Vancouver Island Public Meetings* (October 2006) This report summarizes the public meetings held on Vancouver Island in March 2006 involving shared information on how climate change is impacting Pacific salmon and hearing from the participants about how wild salmon were doing in their community. This report includes comments made in plenary sessions, as well as round-table discussions and mapping exercises. Key themes were stock status, habitat impacts, ecosystem management, predation from seals and sea lions, fish farming, local stewardship programs, and reduced program funding.
- What's Happening to Wild Salmon in Your Community? What the Council Heard: BC Interior Public Meetings (June 2007) This report summarizes the results of public meetings held in the BC Interior in October 2006. During the meetings, the PFRCC shared information on how climate change is impacting Pacific salmon. It itemizes the comments made in plenary sessions, as well as the smaller round-table discussions and the results of mapping exercises where individuals were provided an opportunity to outline areas of greatest concern and opportunity—providing tangible examples of the broader concerns expressed earlier.

- *Advisory: An Ecosystem-based Approach to Managing Salmon in Georgia Strait* (June 2007) The Council members issued this Advisory proposing an ecosystem-based approach to replace the single-species management in order to deal with the array of crucial environmental factors and interactions of species that would be more appropriate in establishing salmon conservation strategies.
- **Annual Report 2006** (June 2007) The Council's eighth annual report emphasized the importance of innovation in fisheries management, such as applying research findings into management practices, and encouraging public participation in more productive ways to encourage new perspectives in salmon conservation.
- Report on Habitat Threats: Major Impacts on British Columbia Fish and Fish Habitat and Human Activities that Cause Those Impacts (June 2007) This brief background paper was produced by fisheries biologist Otto Langer to provide a perspective for the Council on the types of changes in streams, watersheds and riparian areas, and the causal factors and sources of the changes in relation to salmon.
- Helping Pacific Salmon Survive the Impact of Climate Change on Freshwater Habitats (September 2007) In this background paper prepared by Essa Technologies Limited, the authors propose a four-phased approach to enable community leaders and government officials deal with the effects of climate change, particularly in reference to the water flows, temperatures and other factors affecting salmon productivity.
- Helping Pacific Salmon Survive the Impact of Climate Change on Freshwater Habitats: Case Studies (September 2007) This case studies document was prepared by Essa Technologies Limited as a supplement to its background paper, explaining examples of climate change and responses in six areas of British Columbia.
- Saving the Heart of the Fraser: Addressing the Human Impacts to the Aquatic Ecosystem of the Fraser River, Hope to Mission, British Columbia (November 2007) In this extensive background study, the authors Mark Angelo and Marvin Rosenau describe the complex salmon ecosystem in a crucial stretch of the Fraser River and present several options to deal with the impacts of development, as well as procedures to stem the losses of these valuable and irreplaceable ecosystems.
- What's Happening to Wild Salmon in Your Community? What the Council Heard: North Coast Public Meetings (March 2008) This report summarizes the results of public meetings held in the Skeena basin in March 2007. During the meetings, the PFRCC shared information on several issues, including how climate change is impacting Pacific salmon. This report summarizes the comments made in plenary sessions, as well as the round-table discussions and the results of mapping exercises that looked at local and regional priorities.
- *Mountain Pine Beetle: Salmon Are Suffering Too* (March 2008) The Council's public information brochure was produced to explain the consequences for salmon of the extensive beetle infestation in its detrimental effects on salmon spawning and living conditions. Segments of the brochure were reproduced in daily and community newspaper advertorial forms to make the information widely available to British Columbians.
- *Climate Effects on Pacific Salmon in the Ocean* (Background paper authored by Dr. D.B. Preikshot, April 2008) This literature review and summary of research themes and institutions provided an overview for the Council of the climate change data, information and findings with relevance to wild Pacific salmon. The author suggested the establishment of a research institute to focus on the effects of climate variation and change on oceanic salmon populations.

- *What's Happening to Wild Salmon in Your Community? What the Council Heard: Mid and Upper Fraser Public Meetings* (July 2008) This report summarizes the results of public meetings held in the mid and upper Fraser in October 2007. During the meetings, the PFRCC members explained how climate change is impacting Pacific salmon. The report reviewed the comments made in the plenary sessions, round-table discussions and mapping exercises that have become the trademark format for the PFRCC's community meetings.
- *Computer Modelling of Marine Ecosystems: Applications to Pacific Salmon Management and* Research (Background Paper authored by Dr. D.B. Preikshot, October 2008) The use of models to forecast salmon conditions, such as abundance and impacts of other species, is the subject of this technical report that reviewed the application of information technologies for ecosystem-based management approaches. The report explains the uses and findings from various modeling applications, and points out the opportunities for refinement of the approach.
- Public Summary—Computer Modelling of Marine Ecosystems: Applications to Pacific Salmon Management and Research (Summary of the report authored by Dr. D.B. Preikshot, October 2008) Brief review of the contents and findings contained in the author's technical background paper on this complex subject, for reference by news media, educational institutions and general public.



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Pacific Fisheries Resource Conservation Council Suite 290, 858 Beatty Street, Vancouver, BC V6B 1C1 www.fish.bc.ca