



PACIFIC FISHERIES RESOURCE
CONSERVATION COUNCIL

**Advisory:
Wild Salmon and Aquaculture
in British Columbia**

REPORT TO THE MINISTER OF FISHERIES AND
OCEANS CANADA

REPORT TO THE MINISTER OF AGRICULTURE,
FOOD AND FISHERIES

REPORT TO THE CANADIAN PUBLIC

PFRCC
JANUARY 2003



Pacific Fisheries Resource Conservation Council

Conseil pour la conservation des ressources halieutiques du pacifique

20 January 2003

The Hon. Robert Thibault
Minister of Fisheries & Oceans
House of Commons
Ottawa

The Hon. John van Dongen
Minister of Agriculture, Food & Fisheries
British Columbia Legislature
Victoria

Dear Ministers:

This Advisory on matters concerning wild salmon and salmon aquaculture in British Columbia serves as a contribution by the Pacific Fisheries Resource Conservation Council to the public discussion and decisions about this crucial and controversial topic.

Last year, our Council selected consultants to carry out a review of the issues related to wild salmon and aquaculture in order to provide information and assessments of the current knowledge about the prevailing conditions and risks. We recently received their report and made it public to enable British Columbians to consider the perspective they presented.

In preparing our Advisory, we have drawn from the findings of the consultants' report as well as other information and viewpoints. We are presenting recommendations to you and your ministerial colleagues on measures we believe should be taken to deal with the risks to wild salmon stocks, the management of the fisheries and aquaculture industry, and the public perceptions of a confused and contradictory government role in the regulation and encouragement of aquaculture and the protection of wild salmon.

It is worth reiterating that wild salmon must come first; they cannot be replaced. Their survival depends, in large part, on the actions we take and the care we exercise. Like other activities that impact wild salmon, aquaculture has to be managed with a view to limiting all sources of potential mortality. The wild Pacific salmon represents a significant part of our natural heritage that we are bound, by duty and conscience, to protect for future generations.

We hope you will review the information and advice contained in this Advisory, and respond soon to what we are presenting. As we have pointed out in the Advisory, the failure to respond clearly and publicly to previous reports related to salmon aquaculture issues, such as that of the Senate's fisheries committee, has only worsened the atmosphere of a festering public debate.

Our Council recalls the experience of the forest industry in this province. There seem to be several parallels with what is being played out in the salmon aquaculture debate. The bitterness and intransigence of both companies and environmentalists in the forest industry confrontations began to be resolved only after irreparable damage to the reputation of the industry and all of British Columbia. The consensus-building and reconciliation that was finally achieved was too late to offset the damage created by the conflict. We should be careful to avoid any repetition of that mistake for the salmon resource.

We hope you will find our Advisory timely and helpful as you proceed with decisions that will shape the future of the aquaculture sector and ensure the health and survival of British Columbia's wild salmon populations.

Yours sincerely,

A handwritten signature in blue ink, appearing to read "J. A. Fraser". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

John A. Fraser
Chairman

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1. Introduction

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.

In the view of the members of the Pacific Fisheries Resource Conservation Council, decision-making about the future of salmon aquaculture in the province requires an innovative and widely-inclusive process to begin addressing the issues in what has become one of the most polarized and highly charged debates in the Pacific fishery.

Like many organizations concerned with fisheries, the Council spent considerable time and energy discussing matters related to salmon aquaculture during the past three years, but until now with limited results in terms of conclusions or possible advice to governments. The lively public debates and opposing opinions about aquaculture have left many British Columbians more confused than informed. The rhetoric seems to have generated more emotional heat than informed light in terms of public understanding.

The Pacific Fisheries Resource Conservation Council was criticized by some fisheries organizations for not joining with them in either opposing or defending the aquaculture industry. We pointed out to them that our Council is not an advocacy group and that our consideration of the public policy

issues regarding aquaculture required a process of rigorous fact-finding and analysis that seems to have been too often absent from the debate.

The Council determined in mid-2002 that it would take the initiative to contribute to the clarification of issues and assist the public to gain a clearer picture of the effects of aquaculture on wild salmon. At the same time, the Council decided that it could serve a useful purpose in providing advice if the analysis and evidence emerging from the investigation of the salmon aquaculture debate would warrant it. On some key policy issues, the Council subsequently determined that it should offer specific recommendations.

The Council's mandate relates to the conservation of wild salmon and steelhead and their habitat. In keeping with that mandate, this Advisory is directed to the Minister of Fisheries & Oceans Canada, British Columbia's Minister of Agriculture, Food & Fisheries and the Canadian public.

This Council's primary consideration is wild salmon and their conservation in terms of biodiversity, geographic distribution, maintenance of stocks and their supporting habitat, avoidance of extinction, and assurance of their role in the cultural, social and economic future of British Columbia. The issues, from the Council's perspective, relate to any practices or activities in salmon farming that might be considered beneficial or harmful to wild salmon or pose a risk for their future.

A starting point for the Council's approach is that the management and governance of salmon aquaculture is crucial from the perspective that wild salmon cannot be put in jeopardy. The governments of both British Columbia and Canada, in conjunction with stakeholders from across the spectrum of views, have an obligation to enable the research and information-gathering that can illuminate the discussion of salmon aquaculture.

2. Summary of Recommendations

The following advice of the Pacific Fisheries Resource Conservation Council is provided here in digest form for quick reference, and is explained in further detail in section 6 of this report.

Recommendation 1:

The Council recommends that the precautionary principle should be applied in a much more rigorous way than is currently used in the evaluation of interaction risks between farmed and wild salmon stocks.

Recommendation 2:

The Council urges the aquaculture industry and governments to undertake a wide-ranging research and monitoring program on wild/farmed salmon interaction, and develop means and practices to mitigate farming impacts.

Recommendation 3:

The Council urges the Government of Canada to proceed immediately to formulate and implement a comprehensive wild salmon policy that explicitly states that wild salmon will be given priority in government decision-making.

Recommendation 4:

The Council recommends that government supervision and regulation of wild and farmed salmon, especially for fish health and disease surveillance, should be integrated into single-bay or area management units.

Recommendation 5:

The Council is proposing the creation of a Salmon Aquaculture Forum, including a multi-stakeholder scientific panel, to build public consensus about the future direction of the industry and identify ways to reduce the risk to wild salmon from British Columbia's netcage aquaculture operations.

3. Background

Earlier this month, a consultant's report commissioned by the Pacific Fisheries Resource Conservation Council was released. Its goal was to expand and deepen public understanding about the potential impacts of salmon aquaculture on wild salmon by examining, evaluating and assessing the information and assumptions supporting the arguments of those involved in the public debate.

That report, entitled *Making Sense of the Salmon Aquaculture Debate: Analysis of issues related to netcage salmon farming and wild salmon in British Columbia*, was commissioned in August 2002 by the Council to inform public discussion.

On behalf of the Council, the Chairman explained why the members chose to become involved in the controversy related to possible impacts of salmon aquaculture on wild salmon stocks. He pointed out:

Since the provincial government announced its intention to lift the moratorium on the expansion of the salmon aquaculture industry, there has been vigorous and aggressive marketing of viewpoints by government agencies, First Nations, industry representatives and environmentalists. While many have done their part to advance their positions, the Council believes that more needs to be done to independently evaluate arguments and determine their validity.

The Council was careful to ensure that its attention to the issues would be within its mandate to report on wild salmon. As a result, the Council's consideration would not include matters such as employment impacts, salmon prices, government legislative structures, or consumer issues. The scope of the Council's examination was to be defined in terms of any wild salmon impacts, rather than the full scope of public policy and commercial topics.

By dealing with this somewhat limited range of issues related to

salmon aquaculture, the Council felt that it could provide a useful contribution to some of the most crucial and controversial questions.

The Council chose Dr. Julia Gardner of Dovetail Consulting and Mr. David L. Peterson of Devon Knight Events as its consultants to carry out the project. Supervision and oversight of their work plan, methodology and activities was provided by a steering committee led by Council member Dr. Jeff Marliave and staff members Dr. Brian Riddell and Mr. Gordon Ennis. Their instructions to the consultants and their review of the findings were guided by the objective of ensuring a fair and factual portrayal of viewpoints and situations.

The Council's scrutiny of the consultants' work was intended to ensure that it would satisfy the highest standards of fairness and accuracy. The qualifications of the consultants and their record of quality work in previous assignments for governments demonstrated their credibility, as did the positive comments from several representatives of both industry and non-governmental organizations who were interviewed in the course of the process.

The Council recognized that substantial effort had been devoted by governments in the recent past to encourage dialogue and seek agreement on information and options related to salmon aquaculture. Unfortunately, there has been little to show for the effort to bridge the gulf between the

advocates. The failure of that effort to make much progress towards common understanding or agreement does not preclude the need for it to be pursued again in other ways.

4. Comment on Consultants' Salmon Aquaculture Report:

The consultants' report provided an initial foray into the task of sorting rhetoric from reality in the highly charged debates about salmon aquaculture in British Columbia. It addressed only those issues related to wild salmon – an important but partial segment of the array of public policy issues on this subject. The production of the report was not meant to be an inquiry or a public consultation. Instead, it was to involve research, analysis and reporting, and be based on interviews, literature reviews, investigation and compilation of the positions of a cross-section of informed and concerned individuals.

The report did not offer a simplified or single-minded appraisal of the primary issues related to the interaction of farmed and wild salmon. The report put forward a fair and balanced perspective that neither condemned nor endorsed the salmon aquaculture industry.

The consultants' report illustrated that the aquaculture industry in British Columbia has produced neither the faultless benefits suggested by its most avid supporters nor the horrendous disasters claimed

by its most vigorous foes. We urge British Columbians to read the report and thoughtfully consider the issues it addresses, particularly the notion of risk and its minimization.

There are some risks involved in wild salmon fisheries, such as catching too many fish and endangering future production. Over the past decades, science and fishery management have worked towards identifying and quantifying these wild salmon risks. On the other hand, salmon aquaculture is a relatively new industry, and its risks must become better understood, particularly where there is interaction with wild salmon. At this stage, there is a shortage of quantified information, and a precautionary management approach is especially warranted. Future study and analysis should identify and quantify the emerging risks.

The report revealed that there is insufficient scientifically-derived knowledge and a lack of relevant data being made available about salmon aquaculture in British Columbia. It inferred that government management of the wild salmon resource is hampered by uncertainty about the extent of disease risks and other possible aquaculture impacts. By concentrating on the levels and types of risk to wild salmon, the consultants' report inherently suggested a need to re-direct the focus of research and monitoring onto issues associated with interactions of salmon farming and wild salmon. Current uncertainty about impacts of farmed salmon on

wild stocks supports a contention that the research agenda is excessively weighted towards increasing operational efficiencies and reducing production costs, rather than addressing matters concerning interaction with wild salmon, such as disease and sea lice, escapes and habitat impacts.

The Government of British Columbia lifted its moratorium on new salmon aquaculture facilities in 2002, and expressed a commitment then to ensure that environmental effects would be taken fully into account before any new licenses would be issued. The moratorium on new salmon farms during the preceding years was intended, among other objectives, to give time to investigate the problems and mitigate them in any new aquaculture development. The consultants' report suggests that, in terms of wild/farmed salmon interaction, there was insufficient progress made towards reaching this expanded environmental knowledge objective before the decision to lift the moratorium.

The consultants' report revealed the limited extent of data gathering and monitoring. It suggested that considerably more is required for effective decision-making for both industry self-regulation and government oversight. The sheer lack of knowledge about salmon aquaculture in terms of wild salmon impacts has been the most significant factor hampering public understanding and the establishment of an effective and credible regulatory structure for the industry. It has also been the basic reason for

the lack of confident conclusions being drawn from among the competing claims and arguments by the aquaculture industry and those who oppose it.

The consultants provided what they described as a snapshot of current conditions and risks based on the available knowledge and trends. Their review revealed that sufficient knowledge does not exist about four areas of relatively higher risk:

- Sea lice, and the interaction of farmed and wild salmon;
- Bacteria and viruses, and the potential sources of infection for wild salmon;
- Pacific farmed salmon escapes, and their likelihood of successful breeding with wild stocks; and,
- Atlantic salmon escapes, and the spawning and colonization that might occur.

In assigning subordinate risk levels to some issues, such as escaped Atlantic salmon, the consultants may have inadvertently given an impression that they were satisfied that future problems would be negligible. In the Council's view, the assignment of risk levels across the array of issues may be adjusted dramatically as scientific research and evidence reveals changing trends and conditions, particularly concerning any interaction between farmed and wild salmon. The assignment of lower risk to some issues at this point should not be taken to imply that there is no need for concern or careful attention to them in the near or distant future.

The Council has taken the view that the consultants' report should speak for itself. Their report has broken new ground in moving the public debate on salmon aquaculture into a more productive and positive direction. The report and this Council's recommendations can and should be used to build a constructive dialogue on the full range of salmon aquaculture issues, but it will take the goodwill of the advocates and stakeholders in the debate to make that happen.

Most of all, it will take the resolve of the governments of British Columbia and Canada to reconsider their current approach, which inadequately deals with aquaculture in terms of wild salmon impacts. Both governments are obliged to act on their duty and responsibility to protect wild stocks and maintain their habitat.

5. Council's Observations:

As a preamble to its recommendations, the Council has comments on four aspects of the wild/farmed salmon aquaculture debate.

5.1 Informed Decisions

The first observation is that more and better information is needed to inform public understanding and enable governments to act effectively and decisively wherever necessary.

Science has not been used to its best advantage in pursuing knowledge about

British Columbia's aquaculture-related salmon issues. The work of various scientists appears to lack coordination and does not seem to focus on the most pertinent public policy questions concerning aquaculture. While new research committees are being formed and short-term science reviews are being initiated within both levels of government, there is no comprehensive round-table to encompass all science interests and stakeholder capacities. By beginning to work together, the scientists from across the spectrum of aquaculture-related organizations could establish a baseline of the scientific information that will be necessary for improved government decisions about the future of salmon aquaculture.

The Council does not simply call for more spending on aquaculture technology and research, but suggests that some of the funds currently being invested in aquaculture technology and research be re-directed to address the issues of sea lice, viruses, and escaped farmed salmon.

While more overall spending on aquaculture research would be a worthwhile outlay of government funds, the more important step should be to orient the funds already earmarked for aquaculture research into projects that address the areas of greatest controversy and jeopardy.

Similar advice to place more emphasis in salmon aquaculture research funding on impacts on wild fish and the environment was proposed more than two years ago by the Science Advisory Committee of Fisheries & Oceans Canada, but without effect. That inaction should not continue. The Governments of Canada and British Columbia, together with researchers for the industry and non-governmental

organizations, should adjust their scientific work and investment accordingly.

5.2 Structure for Consensus-Building

The second observation of the Council is that the controversies about salmon aquaculture have been fueled in most cases by a lack of scientific knowledge, by insufficient information and data, and by stark differences in the views on how risk could be managed. In the absence of relevant research and understanding, the public debates about salmon aquaculture have tended to become ideological, rather than rooted in fact or based on evidence and logical inference.

In the view of the Council, the problems of aquaculture and wild salmon are not impossible to address. However, an impasse has been reached in the debates on the significant matters of public concern. The problems of aquaculture require new ideas, public consensus and creative solutions that are not now being generated by governments and stakeholders within the existing institutions and framework for discussing the future of wild salmon and aquaculture. A challenge for everyone involved in these issues is to establish a new institutional framework or organization that enables more rational discussion and encourages the development of public consensus.

5.3 Change of Attitude

The third observation of the Council is that a tone of negativity, exaggeration and confrontation seems to prevail too often in discussion of the issues of wild salmon and aquaculture. That tone hampers any progress towards building public consensus or enabling public awareness.

The debates around wild salmon and aquaculture generally reflect a lack of trust and a perceived unwillingness on all sides to engage in meaningful dialogue. In the view of the Council, a change of attitude and strategy by government officials and stakeholders is an essential first step towards rebuilding common ground in which both environmental and commercial interests can be frankly but constructively discussed and accommodated.

The Pacific Fisheries Resource Conservation Council wants to emphasize that the seriousness of the wild salmon and aquaculture issues should not be underestimated. British Columbia has seen the effects of protracted environmental battles in the resource sector, and a repetition of such damaging events in salmon aquaculture is emerging. Its continuation would be regrettable for everyone.

The current atmosphere of mistrust and poor communication is not a situation caused by anyone's mismanagement or reluctance to participate, but has been a systemic problem that has built up over years of incremental decisions, failures to communicate, and short-term responses to a series of crisis conditions.

The two governments and the salmon aquaculture industry have an opportunity now to lead a process of renewed and open public dialogue and engage in more relevant scientific research. In the absence of such leadership, the public debate could simply become more bitter, acrimonious and counter-productive.

5.4 Governance

The roles and responsibilities of the federal and provincial governments in setting the

policies and regulating salmon aquaculture and wild salmon stocks have always been somewhat confusing -- all the more so in light of the current debates. Each government has a set of licensing and management responsibilities related to wild and farmed salmon, as well as dual roles as regulators and industry promoters.

While the governments may be carrying out their legislated responsibilities, they are not putting forward a convincing case to many people that they are doing all that needs to be done to protect and conserve wild salmon. The question of “who’s-in-charge?” in dealing with the controversies about wild salmon and aquaculture may reflect the long-standing Canadian ambiguity about federal and provincial jurisdiction. But, neither level of government has been good at explaining its policies related to wild salmon and aquaculture, nor at addressing much of the public concern that has arisen.

The perceived governance failures and confusion about the accountability of the levels of government seem to have been worsening as government budgets have been cut. They have become all the more apparent as salmon aquaculture has become another growing and shared regulatory responsibility.

These shortcomings in governance and communications, whatever their causes, have created challenging conditions that require new and creative solutions.

6. Detailed Recommendations:

Based on the information provided by the consultants’ report and the deliberations of the Council members, the following advice

is offered to the Minister of Fisheries & Oceans Canada, British Columbia’s Minister of Agriculture, Food and Fisheries, and the Canadian public:

Recommendation 1:

The Council recommends that the precautionary principle should be applied in a much more rigorous way than is currently used in the evaluation of interaction risks between farmed and wild salmon stocks.

The Council takes the position that the federal and provincial governments should be more specific and rigorous in adopting a precautionary approach to salmon aquaculture. Both governments should be pro-actively scanning and analyzing the issues as they develop, rather than waiting for serious or irreversible harm to be inflicted on wild salmon stocks. The introduction of procedures for the management of salmon aquaculture and wild salmon stocks should involve using the best information available, rather than waiting for irrefutable evidence that is typically available too late. This is consistent with the adaptive management approach that leads to revised procedures as new information becomes available.

The consultants’ report cited several interpretations in a long list of versions of the precautionary principle, some of which contained watered-down forms that gave little more guidance in terms of application than a vague admonition to “be careful.”

The Pacific Fisheries Resource Conservation Council, in its first annual report in 1999, endorsed the interpretation of precautionary principle contained in the United Nations’ Code of Conduct for Responsible Fisheries:

The absence of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures.

The Council described its view in the following way:

The precautionary principle was first described in the context of marine pollution in the North Sea, establishing that it is the resource users, harvesters, and parties engaged in potentially harmful activities who must bear the burden of proof with respect to fish conservation and habitat protection. The principle is based on the understanding that scientific uncertainty about the impacts of human activities upon ecological systems constitutes grounds for restraining potentially harmful activities, rather than an excuse to allow such activities to proceed.

The Council believes that there is a pressing need to instill public confidence in the process of ensuring environmental integrity of salmon aquaculture operations. The assurance of more open and transparent decision-making on salmon farm siting and licensing based on conservation principles, for instance, would help to alleviate the concern that many British Columbians have expressed about the possibility of ecosystem and wild salmon impacts being given insufficient weight in the evaluation of new aquaculture development proposals. At the same time, salmon farmers must become more aware of the extent of their environmental responsibilities and public expectations. The adoption and stringent application of the precautionary principle by the salmon farm companies should be integral to their own self-regulation and environmental procedures across the industry. It is up to the aquaculture industry to assume a more visible leadership role in

its own governance and environmental stewardship.

Recommendation 2:

The Council urges the aquaculture industry and governments to undertake a wide-ranging research and monitoring program on wild/farmed salmon interaction, and develop means and practices to mitigate farming impacts.

The serious knowledge gaps that exist about farmed/wild salmon interaction, and specifically the risk-related significance of sea lice, require a concerted research effort related to Pacific salmon, as well as immediate action in some instances. The response should involve the re-direction of existing government and industry resources and research programs into the study of the interaction between salmon farms and wild Pacific salmon.

The Council repeats the advice it offered in its recent Advisory on pink salmon in the Broughton Archipelago, and reiterates the importance of a timely response by both levels of government. In November 2002, the Council issued the Advisory entitled *The Protection of Broughton Archipelago Pink Salmon Stocks* to provide the governments with advice on how to respond to the dramatic decline of pink salmon spawners in the Central Coast region.

That earlier Advisory illustrated the importance of scientific research and monitoring and it urged that action be taken as soon as possible, with implementation of an action plan. Given the high risks of further declines, the Council proposed decisive action to enable the safe passage of pink salmon juveniles in the Spring of 2003. That determination of an appropriate response was made on the basis of the Council's suggestion that the precautionary

approach should guide the governments and industry.

At the same time, the risks related to bacteria and viruses, Atlantic salmon escapes and farmed Pacific salmon escapes may become more or less important considerations as research uncovers possible trends and emerging conditions.

These issues, combined with better information on habitat impacts, merit further research and analysis, and should not be overlooked simply because insufficient information or inconclusive evidence about wild salmon impacts is currently available.

Within the consultants' report, there were a number of specific solution-oriented activities and opportunities that should be given particular consideration as issues for study and initial responses by governments and the aquaculture industry. They included the following:

- Institute single age-class or single year class stocking, keeping only fish of the same age at a farm site, as successfully practiced in Norway and Scotland.
- Develop and implement methods for cost-effective identification and tagging of fish to facilitate tracking and analysis of escapes, particularly by Pacific salmon, and to determine the sources and their impacts on wild fish and habitat.
- Design and support appropriate surveys to evaluate the abundance and distribution of Pacific and Atlantic salmon escapes in British Columbia rivers.
- Develop techniques for measuring cumulative habitat impacts from multiple industries, so that those generated from salmon farming can

be distinguished from impacts of forestry, fishing and other sources.

- Follow the example of at least one salmon aquaculture firm by adopting environmental management standards, such as those of ISO 14001, to measure and improve sustainable practices.

Recommendation 3:

The Council urges the Government of Canada to proceed immediately to formulate and implement a comprehensive wild salmon policy that explicitly states that wild salmon will be given priority in government decision-making.

A wild salmon policy is long overdue, and would provide the essential underpinning of clear government priorities to deal with issues of aquaculture impacts. The work of Fisheries & Oceans Canada in formulating a wild salmon policy has been stalled for more than two years, following an initial effort that involved extensive public participation and enthusiastic support for the objective.

While the Council took exception with some aspects of the principles outlined in the draft wild salmon policy issued by Fisheries & Oceans Canada in early 2000, it encouraged the establishment of a policy statement as a prerequisite to making effective conservation decisions.

The issuance of a revised draft wild salmon policy for public discussion should proceed immediately, and should be accompanied by an implementation plan dealing with specific matters such as how the proposed conservation units would be used in management decision-making. The definition of conservation units and index runs under a wild salmon policy will have to account for the presence and potential for salmon farms, and accommodate the needs

of salmon farming management. It should explicitly deal with the regulatory and management framework that would be required to avert any negative impacts of wild and farmed salmon interaction.

The wild salmon policy would provide the essential context for government decisions on matters such as the siting of salmon aquaculture facilities and the determination of acceptable risk levels. The setting of development criteria on risk management, through the introduction of the wild salmon policy, is crucial.

Recommendation 4:
The Council recommends that government supervision and regulation of wild and farmed salmon, especially for fish health and disease surveillance, should be integrated into single-bay or area management units.

An integrated area management strategy should be implemented. The approach being taken in Europe is to enable governments to look beyond the “silo” perspectives of government officials who look exclusively at wild or farmed fish. Instead, it considers the proximity and interactions of the fish within overall ecosystem conditions in a geographic area. By coordinating their work on an area or regional basis, governments in British Columbia could gain a better understanding of interactions between farmed and wild salmon. For example, European experience has been that whole bay fallowing in the spring has proven to be effective in breaking the sea lice life cycle.

At the same time, the single-bay management unit would enable effective monitoring and resource planning. It would also facilitate adoption of localized standards and possible measures, such as the

Norwegian “lice per fish” standards that approach zero lice per farmed fish.

Localized management units could facilitate the development of fish health strategies on a single-bay basis and may better enable the development of treatment protocols and establishment of waste disposal agreements. These measures would significantly reduce the risk of pathogen transfer, including sea lice transfer from adult to juvenile fish within the farms. This integrated approach is crucial to any effective implementation of a wild salmon policy, and should help reduce the farm/wild salmon impacts wherever feasible.

The scope for expansion of salmon farms is not unlimited. What are not readily known are the criteria for evaluating appropriate overall production levels and stocking densities. While industry and government forecasts assume substantial growth rates for the foreseeable future, there is little information available about the implications of future growth to the capacity to produce wild salmon and other fish and aquatic invertebrate species. The development of methodologies to deal with this marine capacity concern would be innovative and should be encouraged.

Specifically, the selection and approval of fish farm sites should recognize and avoid wild salmon migration routes and feeding locations. The current site guideline of a specified distance from a salmon stream is not, in many cases, sufficiently precautionary. The choice of fish farm locations appears to have given inadequate attention in many cases to the likelihood of contact by the farmed salmon with nearby wild stocks.

There is often little information available about the extent of salmon migration

patterns or feeding areas when salmon farm sites are being evaluated. The environmental impact assessment guidelines for fish farms should begin to give sufficient weight to the need to prevent exposure for the wild stocks.

Recommendation 5:

The Council is proposing the creation of a Salmon Aquaculture Forum, including a multi-stakeholder scientific panel, to build public consensus about the future direction of the industry and identify ways to reduce the risk to wild salmon from British Columbia's netcage aquaculture operations.

The discussions and interviews leading to the consultants' report to the Council revealed the desire of many British Columbians for a new institutional arrangement to continue the work of gathering accurate information accessible to the public about the full array of aquaculture impacts, positive and negative. The establishment of a new organization -- a Salmon Aquaculture Forum -- would bring together all governments, interested parties and stakeholders to begin the process of determining common ground in which environmental and commercial interests could be acknowledged and accommodated.

The aquaculture industry is regulated by both levels of government, and needs consistency in its treatment by those governments. The proposed Forum would provide a productive atmosphere to address the issues of salmon aquaculture that would otherwise continue to be played out in highly partisan and negative ways through media campaigns, boycotts, and trading of accusations.

The gaps in scientific information and knowledge about salmon aquaculture are

significant, but little has been done to bring all parties into a process to establish a comprehensive or coordinated research agenda and identify the priorities. Within the proposed Salmon Aquaculture Forum, all of the scientific interests should be brought together in a panel to determine the most important research and monitoring requirements.

This scientific panel, working within the Forum organization, should identify the crucial gaps and encourage the setting of research priorities to address the most immediate questions, especially those that feature possible wild salmon impacts. The work of aquaculture researchers in academic institutions, government laboratories and private sector facilities should be harmonized through the Salmon Aquaculture Forum. The various science funding sources should become more mutually reinforcing.

The Forum should, in addition to addressing the consultants' report, revisit the information and observations contained in the important recent reports on salmon aquaculture that do not seem to have been given sufficient government consideration. These include the Senate's fisheries committee and Leggatt Inquiry reports, as well as the Auditor General of Canada's aquaculture review and recommendations.

The Salmon Aquaculture Forum could consider the extent to which there should be a balance between public disclosure and commercial confidentiality of fish health information. The establishment of a reliable public-interest source of testing -- an equivalent to the human public health system -- might help to alleviate the perception that fish health problems could go unchecked.

It could provide a setting to discuss options with the insurance industry regarding the current disincentives to remove diseased fish and empty sites when an infection is spreading. The current insurance terms require morbidity and may encourage the growing out of diseased fish, with consequent risks of further disease transmittal.

The Salmon Aquaculture Forum's mandate would fill the serious void where there is currently no effective institution to enable constructive dialogue on salmon aquaculture issues and develop public consensus.

7. Council Profile:

The Pacific Fisheries Resource Conservation Council was established in 1998 to provide advice to the Governments of Canada and British Columbia and the public on matters dealing with the conservation of Pacific fish populations, specifically wild salmon and steelhead, and their freshwater and ocean habitat.

It was created to assist the governments to take a more comprehensive conservation approach and contribute to a better understanding of complex freshwater and marine ecosystems and the requirements of Pacific fish populations. Its reports and recommendations have been intended to provide an overview perspective on long-term strategic priorities and present information about wild salmon stock status and habitat conditions.

The Council is chaired by the Honourable John A. Fraser, formerly Minister of Fisheries & Oceans Canada and Speaker of the House of Commons. The Council consists of members with distinguished backgrounds and experience in academic

institutions, media, public groups and fisheries organizations. The Council members are Mark Angelo, Mary-Sue Atkinson, Frank Brown, Murray Chatwin, Merrill Fearon, Dr. Paul LeBlond, Dr. Jeff Marliave, Marcel Shepert, and Dr. Carl Walters. Ex-officio members are Dr. Richard Beamish from Fisheries & Oceans Canada and Arnie Narcisse from the BC Aboriginal Fisheries Commission.