

*A*

*B*

*C*

# ***Regulating Salmon Aquaculture in BC A Report Card***



*D*

*F*

## ***Regulating Salmon Aquaculture in BC—A Report Card***

by the Georgia Strait Alliance

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### **CAAR Members:**

David Suzuki Foundation  
Friends of Clayoquot Sound  
Georgia Strait Alliance  
Living Oceans Society  
Musgamagw Tsawataineuk Tribal Council  
Raincoast Conservation Society  
Raincoast Research  
T. Buck Suzuki Environmental Foundation  
Watershed Watch Salmon Society

### **For more information:**

[www.farmedanddangerous.org](http://www.farmedanddangerous.org)

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**Notes:**

1. If you wish to PRINT this PDF, we suggest you print just the first 22 pages which summarize the ten topics and our Recommendations.
2. This document is optimized for the screen, so many of the images are lower resolution than required for print publication. If you wish higher resolution images, contact [gsa@GeorgiaStrait.org](mailto:gsa@GeorgiaStrait.org).

### **REPORT CARD UPDATE—May 2007**

In the three years since the Georgia Strait Alliance first issued this Report Card, the BC government has done little to improve its failing grades. Despite claims that the problems we highlighted have been addressed, the provincial government is still failing to adequately enforce the regulation of BC's salmon farming industry, leaving that responsibility to the industry itself. The need for the provincial government to step in and protect wild salmon, marine ecosystems and coastal communities from destructive fish farming practices remains just as urgent as when the report was first published.

#### **First Nations**

Despite claims of increased consultation with First Nations, the province has completely forgotten the second part of its duty of "Consultation and Accommodation". BC continues to ignore calls by the Union of BC Indian Chiefs for a moratorium on new open net cage fin fish farm sites and expansion of existing sites.<sup>1</sup> It took a ruling from the BC Supreme Court to enforce proper consultation with the Xwemalhkwa (Homalco) First Nation, resulting in the removal of the Church House farm site altogether. Despite claims by the government of increased consultation, First Nations are seeing little benefit from the so-called "New Relationship." Although the number of consultations has increased, the results have remained the same.<sup>2</sup>

#### **Fish Health**

Government regulation continues to lag far behind the science. A recent study in the prestigious US journal, Proceedings of the National Academy of Sciences, shows that fish farms have greatly increased the frequency and severity of sea lice infections of wild salmon. Wild salmon are now infected with four times as many of these parasites as before.<sup>3</sup> Sea lice from salmon farms may be killing as many as 95% of wild juvenile pink and chum salmon.<sup>4</sup> Yet the provincial government continues to rely on the industry to inform it about sea lice outbreaks and to devise plans to deal with such events—the only fish health database is maintained by the BC Salmon Farmers Association. Freedom of Information requests of provincial government audits of sea lice levels and disease incidence have been refused by the Ministry, despite formal complaints to the Information and Privacy Commissioner's office. Neither the public nor the government have access to data that informs us of which farms are currently applying medication, what farms are experiencing disease outbreaks, etc.<sup>5</sup>

#### **Predator Control**

Predator control remains problematic. In April 2007, 51 California sea lions were entangled and drowned at one farm in Clayoquot Sound and we have no way of knowing how many more marine mammals have been killed in this manner. Salmon farm companies are only required to report mammals they shoot, not those that become entangled and drown in their predator nets. There is still no government auditing program to verify their information.<sup>6</sup>

#### **Siting**

No new siting criteria have been developed in response to new scientific understanding of issues like sea lice impact on wild salmon. And while regional advisory committees have recently been proposed to provide input into the siting of salmon farms, the proposals continue to exclude representatives from environmental and tourism organizations.<sup>7</sup>

#### **Waste**

When the current performance-based waste regulation was introduced five years ago, DFO scientists acknowledged that the allowable limits it set were too high, that it was likely to result in a significant loss of benthic biodiversity, and that they could find no scientific information to validate its approach.<sup>8</sup> Recent research in Scotland by Jason Hall-Spencer et. al. shows major loss of seabed flora and fauna from salmon farm wastes, even in strongly tidal areas.<sup>9</sup> Yet in BC the same flawed waste regulation, now five years old, remains in place.

#### **Alternative Technology**

Alternatives to open net cage salmon farming do exist. Closed contained tank systems with non-permeable barriers can prevent disease transmission, parasites, waste and fish escapes from fish farms

## **Regulating Salmon Aquaculture in BC—A Report Card**

to the ocean and prevent danger to marine mammal predators. This protects wild salmon and marine ecosystems from the impacts of salmon farming while maintaining a sustainable aquaculture industry for BC. Yet the provincial government has still not provided funding for a commercial scale closed containment demonstration project, the essential next step in this transition.<sup>10</sup>

### **Escapes**

Despite the threat that escaped farmed salmon pose to the survival of wild stocks, the provincial government continues to rely on self-reporting from the aquaculture industry to monitor escapes. The figures the industry provides, however, raise serious questions as to their accuracy.<sup>11</sup> The total number of escaped fish reported for BC in 2005 was 64. In Norway, where reporting requirements are far more stringent, 60 separate incidents of fish escaping were reported for 2006, involving 1.17 million escaped fish. The worldwide average for fish-farm escapes is about one escape for every 200 or 300 fish raised. The B.C. number of 64 escaped salmon would mean about one fish escape for every 700,000 salmon raised, yet the same salmon farming companies are involved in both Canada and Norway.<sup>12</sup> Discrepancies of this magnitude clearly show a continued need for better monitoring, reporting and prevention of escapes.

### **Conflict Resolution**

Membership on proposed aquaculture advisory boards remains weighted in favour of the industry, excluding environmental groups from participating in their deliberations. Local siting of salmon farms remains a highly conflictive issue.<sup>13</sup>

### **Implementation**

Rather than work with all affected groups—including First Nations, local residents, fishermen and environmentalists—to develop a comprehensive code of practice for BC fish farms, the provincial government continues to rely on industry to create its own voluntary code of practice, with no other credible or transparent input, and to largely follow industry recommendations when constructing the minimal regulations that do exist.

### **Risk Management**

Although the Pacific Salmon Forum, with funds from the provincial government and other sources, recently announced support for research into the Broughton ecosystem, including migratory routes, little research to date in BC has been designed to investigate the risks salmon farming poses to wild salmon stocks and the marine environment. DFO has gathered abundant data, but little has been published or made accessible for independent peer review. Nor has DFO conducted any research into the correlation between farmed fish disease outbreaks and the incidence of disease among wild salmon stocks or other species near fish farms, as far as we know. We continue to depend largely on independent scientists to research issues like the interactions between wild and escaped salmon and identification of sensitive fish habitat, including juvenile and adult salmon migratory routes. Where scientific studies have shown the risks to be greater than expected, industry spokespeople have attempted to dismiss or discredit the findings.

## **IN CONCLUSION**

When GSA issued this Report Card three years ago, we included a number of recommendations. Had the provincial government acted on them, coastal BC would be a very different place today. Meaningful consultation would have replaced conflict and confrontation. The provincial government would show respect for the views of coastal residents and not locate salmon farms where First Nations or other local communities object to their presence. They would be supporting the development of a truly sustainable industry. Local communities would have the power to veto the siting of salmon farms in their jurisdictions. Salmon farm operators would be required to give the public full information about disease outbreaks, drug and chemical use on their farms and predator deaths.

Had the provincial government followed the sensible and overdue recommendations in the Report Card, BC would have begun the transition to a safe, sustainable aquaculture, based on closed containment technology. We would be eliminating fish escapes, greatly reducing the risk of disease and parasite transfer to wild fish, and would be adequately treating fish farm waste water. As well, if the Report Card recommendations had been followed we'd be on the way to eliminating chemical and drug use.

The last three years have seen major advances in our scientific understanding of the risks posed by net cage salmon farming. Unfortunately, our recommendations remain as valid now as they were three years ago. With four years of government inaction, it is essential that they are immediately implemented.

## **Regulating Salmon Aquaculture in BC—A Report Card**

### **NOTES**

- 1 Resolution no. 2006-42 RE: Fish Farm Moratorium; <http://www.georgiastrait.org/aqua/salmon-news.php>
- 2 Backgrounder: Judicial Review of Church House Fish Farm Site; [http://www.georgiastrait.org/Articles2005/homalco\\_background.php](http://www.georgiastrait.org/Articles2005/homalco_background.php)
- 3 Dr. Neil Frazer submission to Special Committee on Sustainable Aquaculture (SCSA); <http://www.georgiastrait.org/aqua/submission-neil.php>
- 4 “Epizootics of wild fish induced by farm fish,” Proceedings of the National Academy of Scientists of the United States of America, October 17, 2006; <http://www.pnas.org/cgi/content/full/103/42/>
- 5 Laurie MacBride submission to SCSA; <http://www.georgiastrait.org/aqua/submission-laurie.php>
- 6 Westcoaster.ca, April 20, 2007
- 7 Regional District of Mount Waddington Report, March 12, 2007
- 8 Canadian Science Advisory Secretariat, Research Document 2002/75, C.D. Levings, J.M. Helfield, D.J. Stucchi, and T.F. Sutherland; [http://www.dfo-mpo.gc.ca/csas/Csas/DocREC/2002/RES2002\\_075e.pdf](http://www.dfo-mpo.gc.ca/csas/Csas/DocREC/2002/RES2002_075e.pdf)
- 9 “Impact of fish farms on maerl beds in strongly tidal areas,” Hall-Spencer et al, Marine Ecology Progress Series, Vol. 326; 1–9, 2006; <http://www.int-res.com/articles/feature/m326p001.pdf>
- 10 CAAR Closed Containment Briefing Notes, September, 2005; [http://www.farmedanddangerous.org/?action=d7\\_article\\_view\\_folder&Join\\_ID=82852](http://www.farmedanddangerous.org/?action=d7_article_view_folder&Join_ID=82852)
- 11 Eric Blueschke submission to SCSA; <http://www.georgiastrait.org/aqua/submission-eric.php>
- 12 “Escapes dramatically down, farms claim,” Bruce Constantineau, Vancouver Sun, August 4, 2006; <http://www.canada.com/vancouvernews/business/story.html?id=fe3f12c0-1a22-4042-86a7-8cd0032c2b17>
- 13 Regional District of Mount Waddington Report, March 12, 2007

Written by Murray Reiss and Ruby Berry, with gratitude for assistance and advice from our friends at the Coastal Alliance for Aquaculture Reform: Catherine Stewart, Living Oceans Society; Craig Orr, Watershed Watch Salmon Society; and David Lane, T.Buck Suzuki Environmental Foundation

## EXECUTIVE SUMMARY

This report card highlights the failure of the BC government to regulate the salmon farming industry. It evaluates the government's progress in implementing the recommendations that the provincial Environmental Assessment Office (EAO) handed down in 1997.

Many people, including the Minister of Agriculture, Food & Fisheries, have claimed over the intervening years that the government has successfully implemented the majority of the EAO recommendations. According to the government's own analysis, it has fully implemented 39 of the 49 recommendations. However, if you look more closely at the finer details spelled out in the EAO's report, you'll find instead, that the province has fully implemented only 10 of the 49 recommendations. As a result of this poor progress, we have given the BC government an overall failing grade (F) for its progress in addressing the environmental and social issues that were identified by its own Environmental Assessment Office.

### Report Card Highlights:

In this report card we have graded the BC government according to its progress in the following issue areas that were identified by the EAO:

- D Siting**
- D Escapes**
- D Fish Health**
- C- Waste**
- D Predator Control**
- F First Nations**
- C- Risk Management**
- D Alternative Technology**
- F Conflict Resolution**
- D Implementation**

The government received failing grades in 8 of the 10 issue areas. It scored lowest (F) in the First Nations and Conflict Resolution sections, and highest (C-) in the Waste and Risk Management sections.

The areas requiring the most improvement include:

- **Consultation with First Nations**
- **Inclusion of local input in the siting of salmon farms**
- **Public access to data on salmon farms**
- **Scientific understanding of the risks posed by net cage salmon farming**
- **Identification of sensitive fish habitat, including wild salmon migration routes.**

In addition to addressing the issues listed above, we are calling on the provincial government to reinstate the moratorium on new salmon farms, and to introduce reforms that protect wild salmon, coastal ecosystems and coastal communities from destructive fish farming practices. □



## BACKGROUND

*The 8-month long Salmon Aquaculture Review process explored the issues outlined in this Report Card.*

Photo: Georgia Strait Alliance



### **The Salmon Aquaculture Review**

In 1995, as a result of growing public concern about the impacts of net cage salmon farming, the government of British Columbia introduced a moratorium on new fish farms and made a commitment to undertake an environmental review of the industry. The eight-month long process, called the Salmon Aquaculture Review (SAR), began in September 1996 and was conducted by the provincial Environmental Assessment Office (EAO). It involved a Technical Advisory Team (TAT) who prepared discussion papers and recommendations, and a voluntary Review Committee of about 30 stakeholder representatives. The Review Committee, which provided input and advice to the TAT and EAO, consisted of appointed representatives from First Nations, local government, environmental organizations (including the Georgia Strait Alliance), tourism and recreation, the commercial and sport fisheries and the aquaculture industry and its support sectors. During the environmental review process, which lasted until April 1997, the SAR participants met in numerous coastal communities and members of the public submitted written and oral comments, but overall public consultation was limited.

On August 26, 1997, the EAO provided its final 49 recommendations to the provincial government; however, it is important to note that the Review Committee had no involvement in drafting or reviewing these recommendations and a great many Committee members did not agree on the full substance of them. For this reason, we refer to the recommendations in this report as those of the EAO rather than the SAR. Some of the proposals supported by a great many SAR members that were ignored or dismissed by the EAO included, for example:

- *retention of the moratorium until social and environmental concerns are resolved*
- *closed containment technology*
- *mandatory labelling of farmed salmon*
- *a prohibition on the killing of marine mammals by salmon farmers*
- *a ban on the practice of night lighting*
- *removal of aquaculture from the Farm Practices Protection ('Right to Farm') Act*
- *whistleblower protection for fish farm workers*
- *a ban on the use of medicated feeds in open net cages.* (continued next page)



*Aerial photos show that many farms occupy prime territory in passages and coves. The recommendation that siting decisions be made in consultation with other user groups, such as ecotourism operators, fishermen and First Nations, has not been followed.*

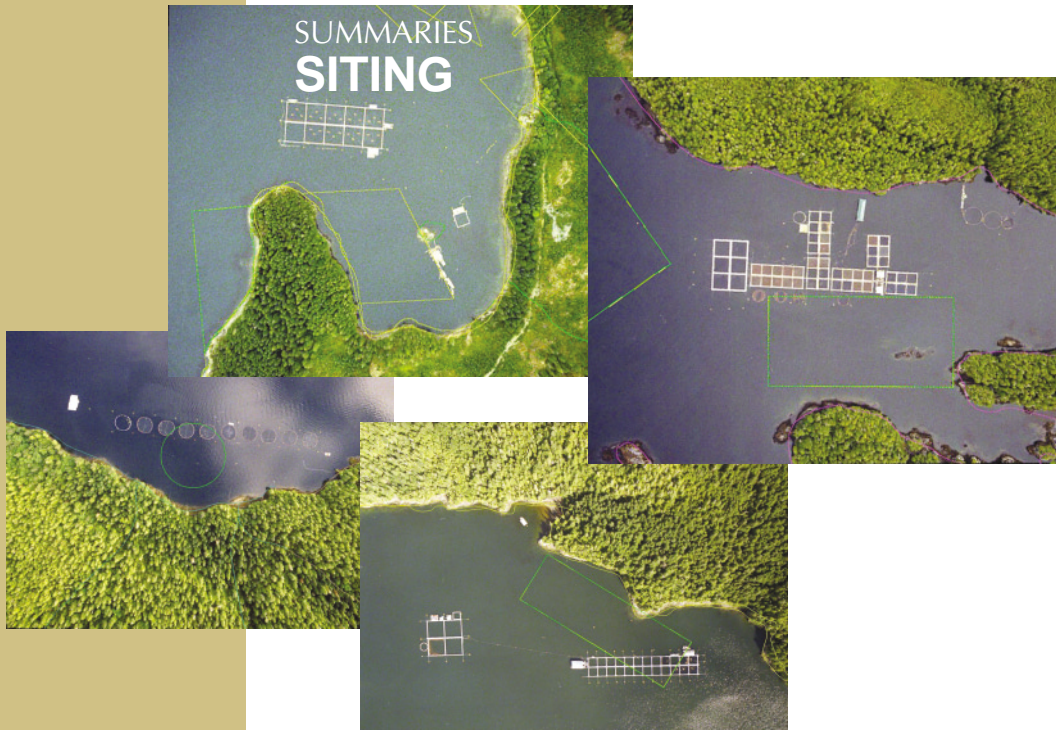
Many of the recommendations advanced by the EAO's own Technical Advisory Team were also excluded. These included: a move to all-female or non-reproductive Atlantic salmon; development of a broodstock program to minimize risks of genetic dilution of Pacific Salmon; genetic and physical marking of farmed Pacific salmon to enable monitoring of escaped farmed salmon; prohibiting salmon farming in freshwater lakes having important indigenous populations; assessing all existing farms for compliance within approved standards within one year; and locating fish farms an appropriate distance from seal and sea lion haul outs.

### Measuring government progress

Despite the inadequacies of the SAR process and outcome, we used the EAO's 49 recommendations as a benchmark on which to evaluate the government's progress, because this is the only real review that has been conducted on the BC salmon farming industry in the past decade. We have assigned letter grades according to the government's progress in the 10 different issue areas identified by the EAO. The government received grades for each of these sections based on the number of items they have implemented. Some items were weighted more heavily than others, depending on their scope and significance.

In addition to letter grades, we have included the government's own interpretation of its progress in implementing the EAO recommendations. It is interesting to note that according to government officials, the province has fully implemented 39 of the 49 recommendations. However, if you look closely at the specific details spelled out under each recommendation, you will discover that the government has only fully implemented 10 of 49.

Over the years, we have heard government officials refer to their success in carrying out the EAO recommendations as proof that the BC salmon farming industry is properly regulated and environmentally sustainable. This report card brings these claims into question and calls on the provincial government to introduce reforms that protect wild salmon, coastal ecosystems and coastal communities from destructive fish farming practices. □



*Government documents show that the province let 54 fish farm companies off the hook for at least \$1.5 million in trespass fines and back rent shortly after the Liberal government came to power in 2001. Here are a few examples of farms that had expanded operations or moved sites without approval (tenures marked in green).*

**LETTER  
GRADE:  
D**

#### **Overview of EAO recommendations:**

To develop a system for reviewing current and future salmon farm sites, with a focus on understanding and minimizing the potential negative impacts this industry could have on the environment and other marine users.

#### **Government claims:**

5 of 10 recommendations fully implemented.

#### **The facts:**

Only 1 of 10 recommendations fully implemented.

#### **Why a D?**

The government avoided an F because it has identified and started relocating the salmon farms that are causing the most significant environmental impacts, and has invested time and resources into improved mapping for the BC coast (however, these inventories remain incomplete).

This mark was low because: regional and local advisory committees have not been set up to provide input into the siting of salmon farms; First Nations are not represented on the government committee responsible for reviewing applications; threatened species, sensitive habitats and salmon migration routes have not been thoroughly mapped; important issues like potential impacts from sea lice have not resulted in new siting criteria; and at least 12 farms have still not been relocated despite evidence that they are creating serious environmental impacts and despite the government's promise to complete these relocations by the end of 2001. Although the EAO did not address the issue of industry compliance with site tenures, a recent report (Aug. 2003) from the BC government shows that only 24% of fish farms are in compliance with their required net cage configuration (number, size and layout of pens).

## SUMMARIES

# ESCAPES

*Fishermen's nets were clogged with Atlantic salmon in August 2000 after two escapes from Stolt Sea Farms operations in the Broughton Archipelago.*



Photo: Georgia Strait Alliance



Photo: © Alexandra Morton

*Atlantic salmon caught on the Wakeman River in March 2001.*

### Overview of EAO recommendations:

To improve the monitoring, reporting and prevention of escapes, EAO recommended new technology and husbandry practices; escape prevention and recovery plans; siting restrictions to protect sensitive habitat and wild stocks; and a mandatory tracking system for farmed fish.

### Government claims:

4 of 4 recommendations fully implemented.

### The facts:

Only 1 of 4 recommendations fully implemented.

### Why a D?

The government avoided an F because it now requires salmon farm operators to develop inventory tracking systems and escape prevention and recovery plans. These systems are mandatory and farms that fail to follow them are penalized.

This mark was low, however, because there are no restrictions on which species of salmon can be farmed based on local site conditions; there is no licensing requirement to keep escapes to a specified number; some inventory data is not available to the public; and survey programs for escaped farmed salmon are very limited in scope, covering only a small number of rivers and streams and relying largely on volunteer reporting by fishermen.

**LETTER  
GRADE:  
D**

SUMMARIES  
**FISH HEALTH**

*A gravid (pregnant) sea louse on a pink salmon smolt. Net pens serve as lice incubators, potentially passing lice on in fatal numbers to salmon smolts on their way to sea. Independent research indicates a massive collapse of eight pink salmon runs in the Broughton Archipelago as a result of lice infestations.*

*Dead pink smolts with heavy lice loads found near a fish farm.*



Photos: © Alexandra Morton

**LETTER  
GRADE:  
D**

**Overview of EAO recommendations:**

To develop a committee for creating and overseeing a comprehensive set of policies for managing fish health on fish farms and at hatcheries, including, among other measures, a surveillance program to track and identify fish diseases; enforceable fish health standards; a fish health database; restrictions on the importation of fish eggs; requirements for reporting diseases in fish that are imported into BC; the opportunity for First Nations, community organizations etc. to provide input into fish health policies; the listing of fish diseases under the Animal Disease Control Act; and procedures for managing drug use on salmon farms.

**Government claims:**

7 of 8 recommendations fully implemented (one of the 8 is outside provincial jurisdiction).

**The facts:**

1 of 8 recommendations fully implemented (one of the 8 is outside provincial jurisdiction).

**Why an D?**

The government claims it has implemented the recommendations because it has created a committee to develop and oversee fish health policies; implemented a surveillance and auditing program for fish diseases; established enforceable fish health standards; and maintained the importation restrictions on fish eggs.

However, this mark was low because the fish health data base (maintained by the salmon farm companies) is not accessible to the public; the reporting of fish diseases is not required under the Animal Disease Control Act; salmon farm operators are not required to post written notices or use flag indicators when they are medicating their fish; the fish health committee does not solicit input from First Nations and community organizations; and the disease surveillance program does not include training for First Nations and community fishermen.

## SUMMARIES

# WASTE

*Fish farm mort tub found unattended and leaking decayed fish with potential disease pathogens and chemicals into the marine environment.*

### Overview of EAO recommendations:

To develop a new regulation for managing waste from salmon farms that minimizes impacts at farm sites and eliminates impacts beyond tenures, the EAO recommended that this regulation include standards for ensuring the environment below net cages can recover shortly after fish are removed. Other recommendations included: creating management and monitoring standards for water quality and sediment; adopting existing standards for metals in sediments and the water column; establishing annual fees for contaminants discharged into the environment; requiring farms to produce and implement waste management plans; developing test criteria for ocean floor sediment sampling; creating a registry of active fish farms; enforcing stringent auditing and monitoring of fish farms for waste discharge; requiring companies to remediate sites that have been impacted; and developing a research program with First Nations on potential impacts from fish farms on shellfish and other wild fisheries.

### Government claims:

10 of 11 recommendations fully implemented (one of the 11 considered not applicable).

### The facts:

Only 5 of 11 recommendations fully implemented.

### Why a C-?

The government passed this section because it introduced a new waste control regulation that includes a monitoring program to test sediments for biological, chemical and physical parameters; a fish farm registry where companies are required to keep records of feed usage; a requirement for fish farms to remediate or relocate sites that exceed standards; and an auditing program with violations subject to fines.

This mark was low, however, because the new regulation does not include water quality and sediment standards for metals; fails to require operators to pay fees based on chemical contaminants (i.e. heavy metals or antibiotics); and establishes a tolerance level for pollutants that, according to a peer-reviewed report by federal Fisheries and Oceans scientists (2002), is too high to prevent a loss of productive capacity and biodiversity in the vicinity of salmon farm operations. As well, government agencies have not developed a program with First Nations to study the impacts of fish farms on shellfish and other wild fisheries.



Photo: Laurie MacBride

**LETTER  
GRADE:**

**C-**

## SUMMARIES

**PREDATOR CONTROL**

*According to federal records, about 5000 sea lions and seals were shot from 1990 to 2000 with permits from the federal department of Fisheries and Oceans. In addition, there were many unreported killings (for example, see page 16).*

Photo: Laurie MacBride

**LETTER  
GRADE:  
D**

**Overview of EAO recommendations:**

To prevent predators like seals, sea lions, minks and birds from tearing net pens and causing fish escapes, the EAO recommended stricter controls on the shooting of predators; mandatory predator control plans; the phasing out of acoustic deterrent devices; and the introduction of methods that reduce predator access to farmed fish. The EAO also called for a halt in new authorizations for night lighting until further research is conducted on potential impacts to wild fish.

**Government claims:**

3 of 4 recommendations fully implemented.

**The facts:**

Only 1 of 4 recommendations fully implemented.

**Why a D?**

The government avoided an F because all salmon farm operators are now required to submit predator prevention plans and report and record all predator kills. In addition, acoustic deterrent devices are now prohibited (although it should be noted that these fall under the jurisdiction of federal Fisheries and Oceans, not the province).

This mark was low because there is no auditing program to verify reported predator kills; no method for ensuring that the only predators killed are those found in net pens; no monitoring process to enforce the recovery of carcasses; and no requirement for operators to report their use of night-lights. As well, research into the potential impacts of night-lights has not been published.

## SUMMARIES

# FIRST NATIONS

*Protest by Heiltsuk and Nuxalk chiefs opposed to the construction of a salmon aquaculture hatchery in Ocean Falls in January 2003.*



Photo: © Ian McAllister/Raincoast Conservation Society

### Overview of EAO recommendations:

To develop strategies to address First Nations concerns related to salmon farming, including offering First Nations a seat on the government review committee; avoiding unjustified infringement of aboriginal rights; ensuring that First Nations are represented on policy advisory committees; developing a strategy for First Nations training in scientific monitoring, disease management and identification; involving First Nations in identifying research into the potential impacts of salmon farming; and including First Nations in the alternative technology pilot project program.

### Government claims:

2 of 2 recommendations fully implemented.

### The facts:

0 of 2 recommendations fully implemented.

### Why an F?

The government received a failing grade on this section because despite its claim that First Nations are being properly consulted, at least five legal actions have been launched by First Nations against the provincial and federal governments for failing to consult with them; First Nations have not been offered a position on the Project Review Team (the committee responsible for reviewing fish farm applications); and consultation and decision-making with First Nations are not consistent with the principles outlined in the EAO report.

## LETTER GRADE:

# F



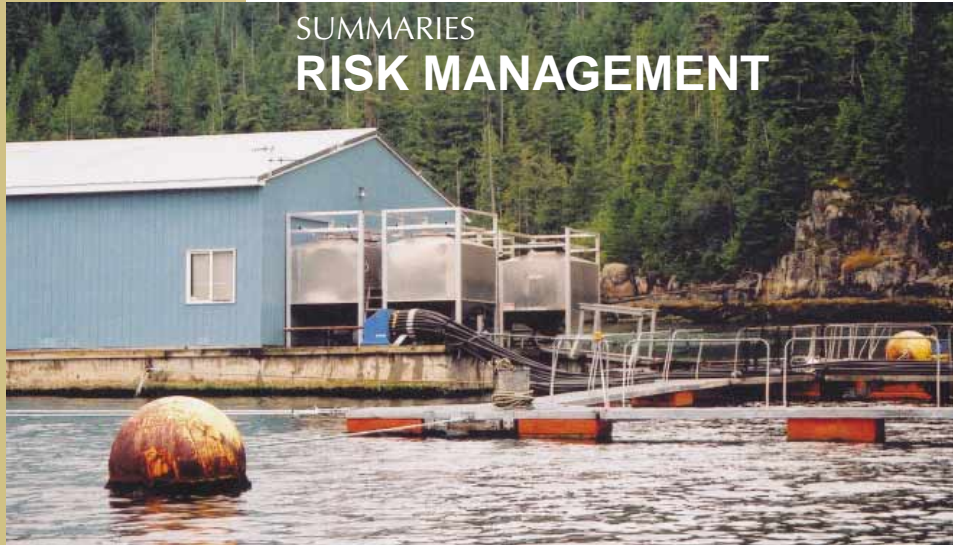


Photo: Laurie MacBride

## SUMMARIES RISK MANAGEMENT

*Siting industrial operations in the marine environment poses risks to the environment, wildlife and other user groups, such as fishermen and ecotourism operators.*

**LETTER  
GRADE:  
C-**

### **Overview of EAO recommendations:**

To increase our understanding of the risks posed by salmon farming through continued research into fish health, escaped farmed salmon, waste discharges and interactions with marine mammals and other species. The EAO recommended that the government acknowledge the uncertainty surrounding the salmon farming industry by implementing performance based programs and adapting its regulations as new information becomes available. Also, the EAO suggested that the industry share the cost of ongoing research with government.

### **Government claims:**

2 of 2 recommendations fully implemented.

### **The facts:**

1 of 2 recommendations fully implemented.

### **Why a C-?**

The government passed this section because monitoring programs have been established for fish escapes, fish health, site allocation and waste management, and performance-based regulations for escape prevention and waste control have been implemented. We are also encouraged by a government plan for future legislation to require operators to pay for research and development projects.

This mark was low, however, because the government has failed to conduct the research recommended by EAO. For example, to our knowledge the government is not undertaking or supporting any research on the interactions between wild and escaped farm salmon, the potential impacts of night lighting on other marine life, or identification of sensitive fish habitat, including juvenile and adult salmon migration routes.

## SUMMARIES

**ALTERNATIVE TECHNOLOGY**

*AgriMarine Industries operates a land-based tank farm in Cedar, south of Nanaimo, for raising farmed salmon.*



Photo: courtesy of AgriMarine Industries

**Overview of EAO recommendations:**

To explore new technologies for harvesting farmed salmon, including offshore marine systems, and land or marine-based closed contained salmon farms.

**Government claims:**

1 of 3 recommendations fully implemented.

**The facts:**

0 of 3 recommendations fully implemented.

**Why a D?**

The government avoided an F because it has approved four closed contained pilot projects and established two funds for salmon aquaculture research. This mark was low, however, because the government has not provided funding for pilot projects; the pilot program only allowed for five marine sites in total and the government rejected calls for additional pilot projects; the pilot projects chosen represented only two types of closed containment systems; closed contained systems have not been tested in a variety of habitat types; and no multi-sector task force was established to provide input into the pilot project program.

**LETTER  
GRADE:  
*D***



*In January 2003, Canadian and US fishermen, First Nations and environmentalists protested Omega Salmon Group's plan to build an aquaculture hatchery at Ocean Falls.*

## LETTER GRADE: **F**

### **Overview of EAO recommendations:**

To develop a system to help fish farm companies, First Nations, local residents and other marine users to avoid and resolve disputes, which would include: strengthening First Nations and public participation in the locating of salmon farms, developing policy objectives with input from the key groups affected by salmon farming; and requiring fish farm companies to sponsor open houses and meet with local advisory committees.

### **Government claims:**

3 of 3 recommendations fully implemented.

### **The facts:**

0 of 3 recommendations fully implemented.

### **Why an F?**

The government received a failing grade on this section because it has not increased public participation in the locating of salmon farms; the advisory committee set up by the government to gain input from key groups has been dismantled and was never mandated to address issues such as local siting, which is one of the most conflict-ridden issues; the government did not develop its policy objectives with input from key stakeholders; and local advisory groups have not been established.

## SUMMARIES IMPLEMENTATION

*First Nations meet with members of the BC Cabinet at the Legislature in Victoria after the SAR wrapped up, to demand that fish farms be removed from their territories.*



Photo: Georgia Strait Alliance

### Overview of EAO recommendations:

To respond to the priority items identified by EAO that require immediate attention, including developing a comprehensive code of practice with input from all key interests and making amendments to legislation, regulations and policies to broaden their relevancy to salmon farming.

### Government claims:

2 of 2 recommendations fully implemented.

### The facts:

0 of 2 recommendations fully implemented.

### Why a D?

The government avoided an F because the Aquaculture and Waste Control Regulations have been amended; the licensing procedures reflect changes to the legislation; the Aquaculture regulation describes operational standards; and the government has produced an enforcement and policy manual available on the Internet. This mark was low, however, because government did not work with all affected groups to develop a code of practice for fish farms in BC and instead, allowed the industry to create its own voluntary code of practice, with no input from other groups. Also, the Aquaculture Waste Control Regulation was not revised until September 2002, three years later than the timeline recommended by EAO. □

**LETTER  
GRADE:  
D**

**DEVELOPMENTS SINCE SAR**

Photo: Friends of Clayoquot Sound

*Slaughtered sea lion corpses piled in a pit at Indian Bay in Clayoquot Sound in April 2000.*

Both the salmon farming industry and the provincial government have often pointed to the SAR as “exhaustive” and thorough, but a great deal of important evidence came to light only after the SAR was completed in August of 1997. Since these incidents occurred after the SAR’s deliberations ended, the EAO did not consider them when it developed its policy recommendations to the provincial government. While the recommendations coming out of the SAR were described by the government at that time as a cautious “yellow light” for the industry, this should have been changed to a red light in consideration of the new evidence of salmon farming’s environmental damage from around the world. To list just a few of these incidents:

- *Atlantics salmon were found to have spawned in the Tsitika, Amor de Cosmos and Adam Rivers on Vancouver Island—something the industry and government had said could never happen. (It is not known if they have spawned in other BC rivers as well, as only a few rivers have been studied for juveniles.) [Research by Dr. John Volpe, University of Alberta].*
- *Infectious Salmon Anemia (ISA), a highly contagious fish disease, spread among New Brunswick fish farms, eventually forcing the slaughter of farmed fish. ISA was later found to have spread to wild salmon [Atlantic Salmon Federation Research Update, 11 October 1999].*
- *ISA outbreaks in Scottish fish farms forced the quarantine of more than a quarter of the farms and major losses to the industry. The ISA virus has since been found in wild salmon, trout and eels [The Scotsman, 5 November 1999].*
- *Amnesiac Shellfish Poisoning in Scotland has been linked to salmon farming [“Scotland’s Secret: Aquaculture, Nutrient Pollution, Eutrophication and Algal Blooms”, World Wildlife Fund, 2001].*
- *Infectious Hematopoietic Necrosis (IHN), a highly infectious fish disease, has caused major losses at many BC fish farms.* *(continued next page)*

- *Kudoa, a fish disease caused by a parasitic worm, is affecting large numbers of farmed salmon. In its extreme form, the disease causes the fish's flesh to liquefy three to six days after slaughter when it has already reached the fish counter.*
- *Biologist Alexandra Morton conducted extensive sea lice research on juvenile pink salmon in the Broughton Archipelago (located off northeast Vancouver Island), and found that as they passed the fish farms on their migration out to sea, they became infested with sea lice at levels that experts consider lethal. In 2002, when these same fish should have returned to spawn, there was an unprecedented, near-total collapse of eight pink salmon rivers in the Broughton Archipelago. Ms. Morton's research on sea lice infection rates on juvenile pink and chum salmon was recently published in the Canadian Journal of Fisheries and Aquatic Sciences.*
- *Documents obtained by the Sierra Legal Defence Fund and released publicly in February 2004 reveal that in 2001, just after the Liberal government took power in BC, the province returned and forgave from \$1.5 million to \$2.3 million in fines for trespass and back-rents that were owed by 10 aquaculture companies, for operating 54 fish farm sites outside of their approved tenures. The provincial Auditor-General is investigating the case. □*

Photo: Georgia Strait Alliance



Here in BC and around the world, a growing number of consumers are turning away from farmed salmon in response to environmental and health concerns. A recent poll found that one in five British Columbians plans to consume less farmed salmon in the next year.

Photo: CAAR photo files



Photo: Laurie MacBride

## RECOMMENDATIONS

With reference to the Environmental Assessment Office recommendations, we call on the provincial government to:

- *reinstate the moratorium on new salmon farms*
- *engage in meaningful consultation with First Nations regarding salmon farm siting and other issues*
- *allow for local government veto power in the siting of salmon farms*
- *require salmon farm operators to disclose all information to the public concerning disease outbreaks, drug and chemical use on their farms and predator kills*
- *increase scientific understanding of the risks posed by net cage salmon farming*
- *identify sensitive fish habitat including juvenile and adult salmon migration routes.*

In addition, we recommend that the BC government eliminate net cage salmon farming and require the industry to:

- *use technology that eliminates the risks of disease transfer and fish escapes*
- *guarantee waste is not released into the ocean*
- *label their fish as ‘farmed’ so consumers can make informed choices*
- *develop fish feed that does not deplete global fish stocks*
- *ensure that wildlife is not harmed as a result of fish farming*
- *prohibit the use of genetically modified fish*
- *eliminate the use of antibiotics in fish farming*
- *ensure contaminants in farmed fish don’t exceed safe levels*
- *stop locating fish farms in areas opposed by First Nations or other local communities*

These recommendations are supported by the Coastal Alliance for Aquaculture Reform (CAAR)—a coalition of environmental groups, fishermen and First Nations organizations whose goal is to protect wild salmon, coastal ecosystems, coastal communities and human health from destructive fish farming practices. For more information go to [www.farmedanddangerous.org](http://www.farmedanddangerous.org). □

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LET US REMEMBER WHAT IS AT STAKE



## **APPENDICES**

**APPENDIX 1 — DETAILED ASSESSMENTS**

**APPENDIX 2 — TABLES**

## APPENDIX 1—DETAILED ASSESSMENTS

Each EAO Recommendation is followed by an Assessment of the degree of implementation.

### 1) SITING

**RECOMMENDATION 1: Establish permanent regional Fish Farm Review Committees to ensure coordinated salmon farm siting and management decisions.**

- *The existing Vancouver Island Fish Farm Review Committee should be confirmed for that region as a permanent structure for making recommendations on site tenure and aquaculture license issuance, replacement, modification and enforcement.*
- *Similar committees should be formed for other administrative regions, as appropriate (e.g., Lower Mainland region; Central Coast region).*
- *First Nations in whose territory salmon farming applications are made should be invited to join the committee; local governments in the area of the tenure application should also be invited to serve as members and to establish liaison with the local advisory working committee proposed in Recommendation 7.*
- *The regional Fish Farm Review Committees should establish their rules of operation including the use of consensus principles and should provide advice to statutory decision-makers. Where the provincial agencies experience disagreements that cannot be resolved within the committee, differences should be referred to the appropriate regional Inter-agency Management Committee for guidance or decision, or to the appropriate Assistant Deputy Ministers or Deputy Ministers.*

**ASSESSMENT:**

- There is only one overriding fish farm review committee (FFRC) called the Project Review Team (PRT). The PRT includes representatives from the Ministry of Water, Land and Air Protection (MWLAP), the Ministry of Agriculture, Food and Fisheries (MAFF), the Department of Fisheries and Oceans (DFO) and Land and Water BC (LWBC). There are no First Nations representatives on this committee. The Project Review Team conducts the initial assessment of the application before a government review. It is our understanding however, that professionally well qualified people on this committee who identified environmental concerns with fish farms were usually ignored. In fact, officials from the salmon farming industry lobbied government to sanction these people and their input was constrained by senior officials.
- Regional fish farm review committees and local advisory committees have never been established.

**RECOMMENDATION 2: Develop integrated coastal zone management plans.**

- *The province should, over time, prepare integrated coastal zone management plans that designate specific geographic areas that are suitable for different intensities and types of activities, including salmon aquaculture.*
- *The province should complete the Land and Resource Management Plans (LRMPs) for Central Coast and the Queen Charlottes in accordance with announced policy and timing, and should include salmon aquaculture in the terms of reference for each LRMP.*
- *The coastal zone management plans should be based on a thorough assessment of all biological resources in relation to the interests and demands of coastal users.*
- *Coastal zone management plans should be developed with the participation of all key stakeholders in a consensus-seeking setting.*
- *Plans should be prepared at both the sub regional level (e.g., Central Coast) and at the local level (e.g., Nootka Sound).*

**ASSESSMENT:**

- The Ministry of Sustainable Resource Management (MSRM) is working with other government agencies to develop coastal zone management plans but these are not integrated coastal zone planning processes, as they do not take into account all human uses or the whole ecosystem. The marine component of the Central Coast Land and Resource Management Plan (LRMP) was completed in March 2001 and the government approved the plan in principle pending the completion of the terrestrial portion in March 2004. Among other things, this plan calls for a cap on new salmon farms in the Central Coast until all of the EAO recommendations are fully implemented; an expansion of the closed containment pilot project program; a transition to closed containment systems upon confirmation that these systems are economically viable; a requirement for all fish farms to be sited only in areas suggested by the Heiltsuk, Nuxalk, Kwakiutl Territory Fisheries Commission, Musgamagw Tsawataineuk Tribal Council and Oweekeno First Nations; and a coastal zoning process that includes the identification of areas that are unsuitable for fish farming. The Queen Charlotte LRMP has just begun, but it will not address marine issues including salmon aquaculture.
- Coastal zone management plans are based on limited biological information and much of it is dated. Coastal zone management plans are not developed in a consensus-seeking setting, but according to the government they are developed with the participation of all key stakeholders. Environmental groups and First Nations have complained that the coastal zone planning process is rushed and does not allow for proper consultation.
- Locally, the government has completed coastal plans for the North Island Straits, however conservation groups do not believe that these are adequate for managing the environmental impacts of salmon farming. At the sub-regional level, two LRMPs have coastal components (the Kalum plan and the Central Coast Plan), however the provincial government has largely ignored the coastal component.

**RECOMMENDATION 3: Pending the development of coastal zone management plans, proactively identify and allocate suitable salmon aquaculture sites.**

- *Pending the development of fully integrated coastal zone management plans at the sub-regional and local levels, the provincial government should employ site allocation techniques that assess and allocate individual salmon farming sites in groups on a “regional” basis, where other uses are considered concurrently, and opportunities are provided for federal and provincial agency, First Nations, local government, and public input.*
- *Salmon farming sites that are identified using this approach should be granted through a competitive proposal calls process where proposals are evaluated on the basis of environmental, economic and social criteria. The evaluation framework for such proposals would require development.*

**ASSESSMENT:**

- MSRM has developed Aquaculture Opportunity Studies (AOS) to identify aquaculture sites on a regional level. Studies have been developed for Kyuquot, Quatsino, North Island Straits, North Coast and Nootka regions. An AOS is currently being developed as part of the Johnstone Strait/Bute Inlet planning process. As part of the AOS process, MSRM initiated discussions with First Nations and local government councils but some First Nations say that their input was completely ignored. Other members of the public are not regularly consulted in the development of these plans. Aquaculture Opportunity Maps are available at [www.agf.gov.bc.ca/fisheries/siting\\_reloc/aos.htm](http://www.agf.gov.bc.ca/fisheries/siting_reloc/aos.htm).
- Proposals submitted for sites are granted on a first come first serve basis, not using the approach suggested in this recommendation.

**RECOMMENDATION 4: Adopt revised salmon farm siting criteria.**

- *Salmon farms should be sited using the criteria shown in Table 13 in locations where:*
  - *there is no integrated coastal land use plan or local government zoning bylaw already in place that provides clear direction on salmon farm siting, and*
  - *government has not conducted an “interim” salmon aquaculture-related planning process to pre-select and market salmon farming sites.*
- *These criteria should be adjusted over time to respond to new information and possibly to respond to new technology.*

**ASSESSMENT:**

- According to the MAFF web site, all tenures granted after October 2000 must meet 15 salmon farm siting criteria ([www.agf.gov.bc.ca/fisheries/pdf/Provincial\\_Siting\\_Criteria\\_March\\_2000.pdf](http://www.agf.gov.bc.ca/fisheries/pdf/Provincial_Siting_Criteria_March_2000.pdf)). The SAR report lists 23 siting criteria and 3 guidelines. Some examples of recommended siting criteria that are *not* on the current list include: No salmon farms in critical habitats required by red- or blue-listed species, and locate salmon farms in accordance with approved coastal zone management plans and local assessments of environmental carrying capacity.

- Threatened species, sensitive habitats and salmon migration routes have not been thoroughly mapped and are not being incorporated into the siting decision-making process. According to one of the siting criteria, farms should be located an “appropriate distance from sensitive fish habitat”, however salmon farms are not restricted from sensitive wild salmon migration routes and there is no working definition of what might constitute a significant salmon migration route. For example, in 2003 a salmon farm site at Humphrey Rock (in the Broughton Archipelago) was approved despite the fact that it is located on a pink salmon migration route.
- The siting criteria have been revised slightly since they were implemented, however the sea lice outbreak in the Broughton Archipelago in 2000 is a good example of new information that should have initiated a change in siting criteria.

**RECOMMENDATION 5: Require salmon farm applicants to submit an assessment of proposed salmon farm sites and potential impacts on other resources and uses.**

- *As part of the standard salmon farm site application procedure, applicants should be required to submit a package of information describing the resources and uses affected by the proposed farm, and potential impacts on environmental resources, human populations and user groups.*
- *The FFRC should, on a priority basis, document guidelines for use by proponents in developing an application.*
- *The site assessment should be assembled by qualified individuals using government resource inventories and mapping, site surveys and studies, and local consultation.*
- *Government should prepare a guide for the preparation of site assessments which contains advice to proponents on information sources, and documents appropriate site assessment methods and content of site assessment submissions, including required categories of impact, map scale requirements, local consultation requirements, and submission format.*

**ASSESSMENT:**

- Salmon farm operators are conducting assessments and receiving input from third party professionals when their expertise is required, but not all resource information is being provided. Environmental impacts and impacts on user groups are incomplete or non-existent. In terms of local consultation, the companies provide open houses, but this in no way implies that they are consulting with residents or gaining local consent for their applications.
- Government has prepared a guide for industry outlining environmental and social considerations pertaining to potential sites. An electronic version of this guide is available on the MAFF web site.

**RECOMMENDATION 6: Continue to improve the quality of coastal resource inventory mapping.**

- *Government should continue to develop and improve inventories and mapping of coastal resources (at map scales ranging from 1:250,000 to 1:20,000) as a key tool for integrated coastal zone planning and management, and for salmon farm siting decision-making.*

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- *Government inventories and mapping should incorporate federal and provincial databases, local and traditional knowledge, and mapping assembled and provided by private industry.*
- *Salmon aquaculture suitability maps, based on best available inventory information, should be prepared that classify the relative potential of B.C.'s coastal areas for salmon farming use. These maps should be used to counsel salmon farming proponents on appropriate salmon farming locations to pre-select and market suitable salmon farm sites, and as an important information input into coastal zone planning processes.*
- *Coastal resource inventory information should be available to agencies and other interested parties in both hard copy and electronic format at reasonable cost. The province should develop and implement a standardized policy respecting the public distribution and costing of this information, as a basis for facilitating its wide availability and use. Sensitive First Nations cultural data respecting resource harvesting and traditional use areas should continue to be protected, unless the relevant First Nations approve the release of those data.*

### **ASSESSMENT:**

- MSRMC has developed resource inventory maps for all current salmon farm tenures, which identify ecological and social resources in the surrounding areas. But coastal resource inventory mapping is spotty at best. The Department of Fisheries and Oceans (DFO) has not defined “sensitive fish habitat”, which has made it impossible to judge what areas should be surveyed. Most fish stock information is based on fish catch statistics, not on fisheries inventory data. Clam beds for the BC north central coast and north coast are not currently surveyed. Almost all eelgrass beds (with local exceptions) have not been surveyed. Salmon streams are generally well mapped, but several small streams in the BC central and north coast have been missed. Marine mammals have only been partially surveyed (e.g. there are no seal surveys for most of the north central coast and north coast and sea lions are only mapped by major colonies). Herring spawn data is only available in a very coarse scale; fine scale herring data is available, but has not been released by DFO.
- Information for government inventories and mapping is obtained from government databases and maps assembled by private industry. Local and traditional knowledge sources are not fully incorporated.
- Salmon aquaculture opportunity maps have been produced for several regions through the Aquaculture Opportunity Studies (recommendation 3). These maps, however, have not been developed for the purpose of identifying environmentally unsuitable siting locations based on the full set of EAO siting criteria. In fact, the criteria used to decipher what areas are suitable for aquaculture under the AOS are not available. The opportunity maps help to inform Land and Water BC as to whether or not they should accept an aquaculture application. This information is also used to inform the coastal zone planning processes.
- Salmon aquaculture opportunity maps are available to the public for a nominal fee but are not available in electronic format despite repeated requests. The government is currently restructuring its process in order to make this information more accessible. At present if the data belongs to the industry then it can be considered proprietary information; if it belongs to the government then it is

accessible to the public; sensitive First Nations cultural data is not released without the First Nation's permission.

**RECOMMENDATION 7: Ensure the opportunity for public participation in salmon farm siting and management decisions by establishing local advisory working committees.**

- *Establish local advisory working committees, comprising a balanced cross section of local interests, to advise government on salmon farm siting and management questions.*
- *Committees should establish their operating procedures and accept comment from the public on a salmon farm siting proposal for a period of time established by the committee once the public have been notified of the proposal.*
- *Invite local government representatives to serve as liaison between this committee and a regional Fish Farm Review Committee.*
- *Utilize appropriate existing committees for this purpose wherever possible (e.g., existing LRMP Table sub-committee, Local Round Table, Community Resource Board, or Advisory Planning Commission) and call on federal and provincial agencies from the FFRC as needed.*

**ASSESSMENT:**

- No local advisory committees have been set up.
- Input from local communities regarding proposed sites is informal at best and is only obtained through open houses and through advertising and referral processes.

**RECOMMENDATION 8: Assess existing salmon farms to determine if the farms are causing significant negative impacts that need to be corrected.**

- *MAFF, MELP [MWLAP] and DFO should cooperate in an assessment of all existing salmon farm sites to identify whether or not the farm is causing significant negative impacts and conflicts that require remediation.*
- *Agencies should prioritize existing salmon farms for site evaluation, based on:*
  - *knowledge of past performance at the site,*
  - *available site monitoring information,*
  - *the point at which the site tenure comes due for replacement, and*
  - *concerns raised by First Nations.*
- *Where it is concluded from a site assessment that an existing salmon farm is causing significant impacts that need to be addressed, the above agencies should cooperate with the farm operator to prepare a remediation plan. The plan might include measures to reduce production levels, amend husbandry practices, introduce new technology, or relocate the site.*
- *Where government requires immediate remediation by salmon farmers whose site tenures and other licences/permits are in good standing, then remediation costs should be borne by the provincial government, recognizing that those salmon farmers are operating in compliance with approved licences and permits. Where the need for remediation is less pressing, government may elect to put the tenure holder on notice that remediation will be required as a condition of site tenure replacement, making the costs of remediation the responsibility of the operator.*



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- *An assessment of resources needed to support site relocation should be made by MELP [MWLAP] and MAFF prior to considering new tenure applications or preselecting tenures for competitive bidding (refer to Recommendation 3) to ensure existing tenure holders' needs are met.*
- *Agencies should consult with First Nations in developing a strategy for the review and prioritizing of sites causing significant negative impacts as recommended in Chapter 9.*
- *Tenure holders should be consulted and be a part of this strategy.*

### **ASSESSMENT:**

- An assessment of all existing salmon farms has taken place and according to the government, the worst farms have been required to relocate. Twenty-two fish farms have been relocated or remediated (some of these have switched to growing shellfish or smolts). Twelve are still operating and have not been relocated. Many stakeholders, including environmental organizations, were never consulted in determining which sites needed to be relocated and believe that many other sites should be shut down or moved.
- It is important to note, however, that one of the main criteria in prioritizing sites for relocation during the first wave of relocations involved whether or not the site was economically viable. If the salmon farm company and MAFF believed that it was not economically viable, it received priority for relocation before most sites that were causing environmental damage. Site suitability was also based on modified siting criteria, information from the Ministry of Water, Land and Air Protection's environmental monitoring program, current information pertaining to site performance and concerns expressed by First Nations already on file.
- When government concludes that a salmon farm is causing significant impacts, the farm operator is required to prepare a remediation plan. The options for remediation include injecting air or oxygen to increase the natural remediation rate; using mechanical rakes to turn over sediments and increase aeration and covering the contaminated sediments with sand or fill.
- Fish farm operators must pay their own remediation costs.
- It is up to the operator to supply the necessary resources for site relocation.
- According to a government official, government staff attempted to consult with First Nations in developing a strategy for selecting priority sites for relocation. Tenure holders with problem sites were contacted and asked if they had made changes to their operations; if they hadn't made any changes, they were told that their farms needed to be relocated.

### **RECOMMENDATION 9: Develop and implement consistent guidelines for assessing and approving salmon aquaculture facilities in freshwater.**

- *Government should prepare and adopt standardized guidelines for assessing nitrification risks, and risks to indigenous fish populations from escaped young salmon, which are potentially associated with salmon aquaculture activities in freshwater lakes.*
- *Government should prepare and adopt standardized guidelines for location and construction standards of hatcheries.*
- *The guidelines should reflect that salmon aquaculture facilities in freshwater lakes*

*will be authorized only where risks of negative eutrophication impact and risks to indigenous fish populations are low.*

- *No new salmon aquaculture development in freshwater lakes should be approved until the proposed guidelines are in place.*

#### **ASSESSMENT:**

- MAFF and MWLAP have developed a set of guidelines for the siting of freshwater aquaculture operations that address the risks listed in this recommendation, however these guidelines have not been formalized into a freshwater aquaculture policy.
- In 1998, MAFF developed guidelines for the location and construction of hatcheries and land-based operations.
- According to MAFF's guidelines, freshwater aquaculture facilities will only be approved in cases where eutrophication impact and risks to native fish are low. However, it is important to note that MAFF approved a salmon aquaculture operation in Victoria Lake, which according to MWLAP files is the most naturally productive lake on Vancouver Island.
- According to a government official, MAFF had draft guidelines in place for freshwater aquaculture operations before the Salmon Aquaculture Review took place. Since 1997 when the recommendations were completed, at least 2 freshwater aquaculture facilities have been approved.

#### **RECOMMENDATION 10: Develop and enforce water quality standards for dissolved waste discharges from lake cage operations.**

- *MELP [MWLAP] should establish and enforce water quality standards for dissolved waste discharges from aquaculture facilities in freshwater lakes.*
- *The standards should be made enforceable through regulation under the Waste Management Act. Operators should be responsible for regular water quality monitoring and submission of monitoring data to MELP [MWLAP].*

#### **ASSESSMENT:**

- No such policy has been finalized.
- Water quality standards for lake aquaculture are currently being developed by MAFF and MWLAP.

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## **2) ESCAPES**

#### **RECOMMENDATION 11: Continue to allow both Pacific and Atlantic culture, but restrict the species farmed to take into account local site conditions.**

- *Government should continue to allow both Atlantic and Pacific salmon to be farmed in marine net-cages.*
- *Government should prohibit farms with Pacific salmon from being located near streams with sensitive wild stocks.*
- *Government agencies should further develop existing stream classification programs to ensure accurate data regarding the current status of salmon stocks in*

## **Regulating Salmon Aquaculture in BC—A Report Card**

*coastal streams is available for the appropriate siting of salmon farms.*

- *Government should continue to prohibit the commercial farming of transgenic salmon in marine net-cages.*

### **ASSESSMENT:**

- The government continues to allow the farming of both Atlantic and Pacific salmon in net cages.
- No restrictions have been placed on which species of salmon can be farmed based on local site conditions. There are no policies in place to restrict farmed Pacific salmon (chinook and coho) in areas that could impact on local sensitive wild stocks, other than a general requirement that sites be located at least 1 kilometre from the mouth of a salmon-bearing stream which is deemed significant by the DFO and the provincial government. There is no scientific evidence to show that keeping salmon farms 1 kilometre from local salmon streams will protect those streams or other streams in the area. Norway has instituted a complete ban on salmon farms in fjords with significant wild salmon runs.
- The provincial government continues to work on stream classification and assessment.
- The provincial government continues to prohibit the commercial farming of transgenic salmon.

### **RECOMMENDATION 12: Advance the goal of eliminating escapes by focusing on escape prevention as the principal management strategy for eliminating and/or reducing ecological risks from salmon farm escapes.**

- *Government should amend the Aquaculture Regulation to:*
  - *establish a requirement for salmon farmers to specify in an aquaculture operational plan, the specific measures (i.e., technological/engineering controls and husbandry practices) that will be adopted at the farm to prevent farm salmon escapes and constitute enforceable elements of the aquaculture licence, and*
  - *establish a specific requirement written in the aquaculture licence for salmon farmers to keep the level of escapes from their farm within a threshold of three per cent of total fish stocked. If the threshold number is exceeded (through individual escape “events” or through chronic leakage), the farm should be subject to a review of the aquaculture operational plan, with modification to the escape prevention measures that are specified in the management plan being required if deemed inadequate.*
- *Failure to comply with regulatory requirements should lead to disciplinary measures such as fining or licence revocation.*
- *Provincial agencies and industry should, as part of an overall salmon aquaculture “code of practice,” cooperate to develop and maintain a description of best available and feasible technology and husbandry practices for preventing escapes. This information should be made available to salmon farmers for use in developing modern and effective escape prevention measures in their individual aquaculture operational plans.*
- *Provincial agencies should regularly review the threshold number of salmon escapes and reduce it as warranted based upon improvements in technology,*

*husbandry practices and demonstrated ecological need. The threshold should be lowered to as close to zero per cent as possible within five years.*

#### **ASSESSMENT:**

- The government has amended the Aquaculture Regulation to include a mandatory requirement for salmon farmers to develop best management plans to prevent fish escapes.
- If operators fail to comply with regulations they are subject to fines or licence revocation.
- There is no requirement in the aquaculture licences to keep the level of escapes within a threshold of three per cent of total fish stocked.
- Fish farm companies have been fined for failing to comply with regulatory requirements.
- Provincial agencies and industry have developed and maintained a description of best available and feasible technology and husbandry practices for preventing escapes and this information has been made available to salmon farmers.

#### **RECOMMENDATION 13: Implement a mandatory standardized information collection and reporting program.**

- *Government and industry should further develop the existing computer-based inventory tracking system into a standardized system that is implemented industry-wide. This inventory system should clearly show: numbers of salmon transferred to each farm, numbers lost to disease, numbers lost to predation, numbers lost to chronic leakage, numbers lost due to escape events, numbers of recovered salmon, numbers harvested, and date and size of fish at each event.*
- *All farms should be required to maintain this inventory tracking system and report this information to government for every production cycle as a condition of the salmon aquaculture licence. These data should also be open to government inspection at any time.*
- *Inventory data should be made available to the public in a manner that protects proprietary information through annual reports prepared on a regional basis by MAFF.*
- *Farms that are proved to be misreporting numbers should be subject to disciplinary action.*

#### **ASSESSMENT:**

- An inventory system has been implemented but it does not include chronic leakage or the number of fish harvested. Without this crucial information it is not truly an inventory system and it is impossible to know the precise number of fish on farms during grow out or harvest.
- The industry maintains a partial inventory tracking system, which they report to government for every production cycle as a condition of their licence. Government inspectors have access to this data at any time during normal business hours.
- Some inventory data is not available to the public. This includes the number of fish on the farms; the number of fish lost to disease; and the number of fish lost to predation. The number of escaped and recovered fish is made available to the public, but it is important to note that this data is acquired through industry

reports and is not independently verified.

- Operators that are found to be misreporting numbers are subject to disciplinary action. However, it is unclear how there could be disciplinary action as there is no mechanism for identifying mis-reporting.

**RECOMMENDATION 14: Reduce the risk of ecological effects from escaped farmed salmon.**

- *Adopt regulatory measures that minimize the potential for ecological risks from farm salmon that do escape, recognizing that although strategic priority should be on escape prevention, the likelihood of escapes of at least minimal numbers will remain. The measures should focus on remediation of significant escape events through adoption and implementation of escape recovery plans. A regulatory approach to enabling escape recovery plans will be required from DFO.*
- *Require salmon farmers to develop approved regional strategies for escape recovery and farm-specific escape recovery plans in consultation with federal and provincial agencies with the mandate to regulate and manage wild fisheries.*
- *Require salmon farmers to keep the level of escapes from their farm within a threshold number that is specified in their licence document. If the threshold number is exceeded through individual escape events, then the farm must implement the escape recovery plan. Salmon farmers failing to implement the escape recovery plan should be subject to disciplinary action.*
- *MAFF, in consultation with MELP [MWLAP] and DFO, should work with industry to define an appropriate threshold number that would be applicable to all farms, and should produce a guide to assist industry with the development of effective escape recovery plans.*
- *Continue and expand the Atlantic Salmon Watch Program to help determine the fate and behaviour of escaped Atlantic salmon.*
- *Conduct research, subject to consideration of other research priorities, into further domestication of farm salmon and development of all-female or non-reproductive Atlantic salmon. Designate agency personnel to regularly review and report on the results of other relevant research.*
- *Monitor other relevant research being conducted in BC and other jurisdictions for results useful to improving the management of salmon farming in BC.*

**ASSESSMENT:**

- All active farms have submitted escape prevention plans, which may include a recovery component. Companies that fail to implement these plans are subject to penalties.
- Salmon farmers are required to develop regional strategies for escape recovery and farm-specific escape recovery plans.
- Salmon farmers are not required to keep the level of escapes from their farm within a threshold number specified in their licence, although the objective of both government and industry is to eliminate all escapes. Operators are required to respond to and report all escapes to government authorities within 24 hours. Operators who fail to implement their escape recovery plans are subject to disciplinary action.
- MAFF has produced a guide to assist industry with the development of effective escape recovery plans (now referred to as escape prevention plans).

- The Atlantic Salmon Watch Program is being continued with funds from both the federal and provincial governments but its scope is largely limited to documenting known escapes and reported recoveries. The stream survey program has been expanded but the program still is focused on a small minority of coastal streams. In general, the geographic and funding limitations of the program ensures that escape and recovery numbers are under-reported to an unknown degree.
- Some research has been conducted on further domestication of farm salmon and development of all-female or non-reproductive Atlantic salmon. An experiment to test all-female Atlantic salmon through the Pilot Project Technologies Initiative was approved but never completed. Government monitors and reports on relevant research conducted in BC and other jurisdictions.

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### 3) FISH HEALTH

#### **RECOMMENDATION 15: Establish a Fish Health Working Committee to promote integrated and corporate fish health policy development in BC.**

- *Government should mandate a Fish Health Working Committee to develop and oversee management policies concerning all aspects of fish health, including: field investigations and surveillance, inspections, monitoring, assessment, and reporting.*
- *The committee should comprise federal and provincial representatives with demonstrated expertise or resources in the fields of: fish biology and physiology, fish disease science, and pharmacology.*
- *The terms of reference for the Fish Health Working Committee should specify that the committee will solicit input and advice from interested parties, including: First Nations, MOH, Health Canada, Agriculture and Agri-Food Canada, Environment Canada, industry, and community organizations.*
- *All intensive fish culture operations, including: commercial grow-out sites, commercial hatcheries and broodstock programs, public and community enhancement hatcheries, and other relevant wild fish stock enhancement activities, should be subject to the policies of the Fish Health Working Committee.*

#### **ASSESSMENT:**

- The government set up a Fish Health Working Committee (FHWC) in 2001 to advise and implement provincial fish health policy at all fish culture operations.
- The FHWC includes representatives with relevant expertise or resources from MAFF, DFO (science and habitat branches), MWLAP and the aquaculture industry.
- The terms of reference for the FHWC do not specify a requirement to solicit input from First Nations, community organizations or environmental organizations.
- All fish culture operations are subject to policies currently under development by the FHWC.

**RECOMMENDATION 16: Strengthen disease surveillance and control programs.**

- *The proposed Fish Health Working Committee should develop and implement active disease and disease-causing organism surveillance programs.*
- *First Nations fisheries staff, community fishers and salmon aquaculture industry staff should be trained to recognize various types of fish disease in order to assist with the surveillance. Protocols for data collection and sampling should be established.*
- *Using results of the active surveillance programs, the proposed Fish Health Working Committee should determine what diseases are of concern and are to be reportable under the Animal Disease Control Act.*
- *Until results of the active surveillance programs are available and sufficient to determine the diseases of concern (and thus to enable reportable diseases to be listed), operators should be required to acquire diagnosis from a recognized laboratory when the daily mortality rate (not due to predation or harmful algal blooms) is threefold larger than the mean daily mortality rate for the previous month, and report the results of the tests to the provincial Fish Health Veterinarian.*
- *Fish diseases should be identified by the proposed Fish Health Working Committee that are to be designated diseases under the provincial Animal Disease Control Act, to ensure that disease reporting requirements and other provisions become applicable to farmed fish, including the powers for inspectors to quarantine, seize and dispose of farmed fish based on the triggering of specific criteria. The proposed Fish Health Working Committee should regularly: review the reportable disease list, review and recommend the criteria, and make recommendations regarding effective quarantine and destruction of fish under legislation.*
- *Legislation should have a regulated cost recovery system that can be applied when intervention by government is necessary to cover costs to government of quarantining, seizing and/or disposing of farmed fish, and the existing cost recovery mechanisms under the Animal Disease Control Act should be reviewed by the committee for adequacy.*

**ASSESSMENT:**

- MAFF has implemented a Disease Surveillance and Auditing program (available at: <http://www.agf.gov.bc.ca/fisheries/health/fhasp.htm>). The province is divided into a series of fish health zones, which are used as sampling areas. Farms are randomly audited and samples are collected. The samples are screened for Infectious Hematopoietic Necrosis Virus (IHNV), Infectious Pancreatic Necrosis Virus (IPNV), Infectious Salmon Anemia (ISA), Viral Hemorrhagic Septicemia (VHS North American strain) and *Piscirickettsia salmonis*. It is important to note, however, that there is no legislation in place requiring salmon farm operators to report diseases on their farms to this committee. In fact, the operators have set up their own fish health database and the government does not have direct access to their data.
- First Nations staff and community fishers are not integrated into the surveillance program. Protocols for data collection and sampling have been established for the program.

- Results from the Disease Surveillance and Auditing program will be used to determine which diseases are of concern. Diseases have not been made reportable under the provincial Animal Disease Control Act.
- An interim measure for surveying diseases on farms was not implemented as recommended by EAO.
- The powers to quarantine, seize and dispose of farmed fish remain unclear and not established under legislation.

**RECOMMENDATION 17: Develop standards for managing farmed salmon health as part of a salmon aquaculture code of practice, and enforce the standards as a condition of the salmon aquaculture licence.**

- *Enforceable standards for managing farmed salmon health should be developed as part of a salmon aquaculture code of practice, and should include standards respecting: disease prevention and management protocols, minimum health record requirements, outbreak management protocols, drug use, and disease reporting requirements.*
- *The provincial and federal governments should contribute to research into vaccine development.*
- *Initial standards should be in place within one year and apply to all new licences and licence renewals.*
- *The standards should be comprehensively and regularly reviewed for effectiveness after implementation by the proposed Fish Health Working Committee.*
- *The standards should apply to all intensive fish culture operations, including: commercial grow-out sites, commercial hatcheries and broodstock programs, public and community enhancement hatcheries, and other relevant wild fish stock enhancement activities.*

**ASSESSMENT:**

- An enforceable Fish Health Management Plan is being established for every farm and required standards of fish health management are being drafted.
- Some government funds have been put into vaccine development.
- Initial standards for managing farmed salmon health were developed five years after the SAR recommendations were published. These standards apply to all new licences and licence renewals
- The Fish Health Management Advisory Committee will review the farmed salmon health standards.
- The fish health standards will apply to all fish culture operations.

**RECOMMENDATION 18: Improve the quality and accessibility of fish health information.**

- *The provincial and federal governments should cooperate to develop a single, comprehensive fish health database which will store and link results of: field investigations and surveillance, inspections, monitoring, assessment, and reporting.*
- *Data from all intensive fish culture operations, including: commercial salmon grow-out facilities, private hatcheries and broodstock programs, and public and community enhancement hatcheries, should be integrated into the database.*



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- *Mandatory published government reports on: the distribution and incidence of disease, pathogens and parasites in the waters of BC, and at all intensive fish culture operations should be produced annually in a manner that protects proprietary information. The fish health database should be accessible and searchable, subject to screens on proprietary information, by the public through government staff on a cost recovery basis and accessible to First Nations on a government-to-government basis.*

### **ASSESSMENT:**

- The provincial and the federal governments are not developing their own fish health database. Instead, the BC Salmon Farmers Association has established its own privately operated database. The aquaculture industry will track fish health status over time and geographically, reporting to government on general trends only, on a quarterly basis.
- Information from all fish culture operations will be incorporated into the database.
- It has been approximately 6 years since the EAO recommendations were released to the public and the government is only now finally publishing a report on the distribution of disease, pathogens and parasites in BC waters and at all fish culture operations (due to be released March 31, 2004). This fish health report consists of quarterly reports from the industry database in conjunction with the results from the surveillance program. The fish health database developed by salmon farm operators is not directly accessible to First Nation or the general public.

### **RECOMMENDATION 19: Strengthen policies and programs respecting importation.**

- *The 'surface-disinfected, fertilized egg only' policy for importations should continue to apply to all Atlantic and Pacific salmon imports originating from outside of B.C. Importation of live fish, unfertilized eggs or milt should be prohibited under all circumstances. Current policy respecting other importation practices should remain in place.*
- *A standard maximum number of allowable imported fertilized eggs per year for Atlantic and Pacific salmon should be established by the proposed Fish Health Working Committee, in cooperation with the Fish Transplant Committee, based on consideration of the minimum requirements for broodstock development and research. An equitable arrangement to allocate eggs among operators should be adopted, based on annual needs of individual operators.*
- *Importation policies should apply equitably to all intensive fish culture operations, including: commercial salmon grow-out facilities, private hatcheries and broodstock programs, and public and community enhancement hatcheries.*
- *The proposed Fish Health Working Committee should review the schedule of sampling and reporting requirements for disease, pathogens and parasites related to a transfer event, to ensure that the program is adequate, appropriate and transparent. The proposed Fish Health Working Committee should work closely with the Federal-Provincial Fish Transplant Committee to review and suggest criteria which must be satisfied and health information which must be made available before fertilized eggs can be considered for importation into the province. Respective roles concerning importations should be resolved. Within*

*one year of operation, the proposed Fish Health Working Committee should make recommendations on the frequency and nature of sampling for monitoring and reporting of the health status of fish related to an importation event*

- *All diseases, pathogens and parasites that are foreign to BC, or are only known to exist in distinct regions within the province, should be made reportable. The proposed Fish Health Working Committee should create a list of reportable diseases and update it annually, as a basis for listing reportable diseases under the Animal Disease Control Act.*
- *Sampling or reporting should be standardized, irrespective of the origin of, or destination for, the importation, until the level of scientific knowledge is sufficient to appropriately adjust protocols to determine if variable standards are justified based on risk assessment.*
- *The proposed Fish Health Working Committee should proactively develop for management agencies, a recommended response to diseases and disease-causing agents which are detected or diagnosed, and are previously unrecognized in BC.*

#### **ASSESSMENT:**

- The ‘surface-disinfected, fertilized egg only’ policy remains in place.
- The Fish Health Working Committee is not responsible for setting the maximum allowable number of imported fertilized eggs; this is the responsibility of the Federal government.
- Importation policies fall under the jurisdiction of DFO.
- The Fish Transplant Committee has considered the schedule of sampling and reporting for diseases, pathogens and parasites related to a transfer event as recommended by the EAO.
- The Fish Transplant Committee consists of provincial and federal representatives. We expect that the committee reviews the criteria and health information required before fertilized eggs can be imported into BC. There is protocol in place regulating the frequency and nature of sampling for establishing the health status of fish that are imported.
- Diseases, pathogens or parasites that are foreign to BC or are only known to exist in distinct regions are not made reportable.
- The sampling and reporting processes for imported fish are standardized.
- We understand that DFO is responsible for handling previously unrecognized diseases through their National Aquatic Animal Health Plan

#### **RECOMMENDATION 20: Strengthen the requirements for sampling and reporting of diseases in fish being transferred within BC.**

- *The proposed Fish Health Working Committee should review the schedule of sampling and reporting requirements for diseases, pathogens and parasites related to a transfer event to ensure the program is adequate, appropriate and transparent. The committee should work closely with the Federal-Provincial Fish Transplant Committee to review and suggest criteria which must be satisfied and health information which must be made available before fish can be considered for transfer within the province. Respective agency roles concerning transfers within the province should be clarified.*
- *All diseases, pathogens and parasites that are foreign to BC or are only known to exist in distinct regions within the province should be reportable regardless of the*

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*nature of the transfer event. The list of diseases to be made reportable should be created by the Fish Health Working Committee, and updated periodically.*

- *Sampling or reporting should be standardized, irrespective of the origin of, or destination for, the transfer, until the level of scientific knowledge is sufficient to appropriately adjust protocols to determine if variable standards are justified based on risk assessment.*

### **ASSESSMENT:**

- The Fish Health Working Committee has reviewed the sampling and reporting procedures required for diseases, pathogens and parasites related to the transfer of fish. The committee has developed criteria that must be satisfied before fish can be transferred within BC.
- Diseases, pathogens or parasites that are foreign to BC or are only known to exist in distinct regions are not made reportable.
- We expect that the sampling and reporting procedures related to fish transfers are standardized.

### **RECOMMENDATION 21: Enhance fish health inspection practices at fish processing facilities.**

- *Provincial and federal government agencies mandated with the protection of human health should review, and if necessary, enhance standards and protocols for post-slaughter fish inspection for diseases, pathogens and parasites. Criteria for determining sampling protocol and schedule should be transparent.*
- *Case-specific sampling should be determined by an inspector with use of an accredited laboratory, requiring periodic “unannounced” audits and validation of industry claims of drug use and withdrawal based on case information.*
- *Sampling should be increased from present levels to reduce sampling error to statistically acceptable levels.*
- *Costs of monitoring and auditing should shift to a cost recovery basis as provincial and federal governments’ cost-recovery policy is implemented for other food industry sectors.*
- *Drug treatment records with farmed fish shipments to processing plants should be regularly reviewed by the proposed Fish Health Working Committee to identify trends and anticipate potential issues.*
- *Results of fish health inspections at processing facilities should be integrated into the Fish Health Database. Similarly, drug treatment records with shipments to plants should be integrated and data periodically audited*

### **ASSESSMENT:**

- This recommendation concerns issues under federal jurisdiction so we have not included it in our assessment.

### **RECOMMENDATION 22: Strengthen control of drug use on salmon farms.**

- *When drugs are being used on a net-cage site, visible flag indicators should be required to be used at all times and throughout the prescribed withdrawal period. Similarly, written notice of the specific drug being applied should be posted and visible from outside the tenure boundary.*
- *All drugs used on intensive fish culture operations should be under prescription*

*by a veterinarian with appropriate expertise and experience in fish health.*

- *Drug use at salmon farms should be regularly evaluated by the proposed Fish Health Working Committee for changing patterns, with appropriate measures taken or analyses referred to management agencies.*
- *All information related to drug prescription and use on intensive fish culture operations should be integrated into the Fish Health Database.*

#### **ASSESSMENT:**

- Flag indicators and written notices to signify drug use are not required in BC, though they are required in Norway. Up until 1994/95 salmon farm operators in BC were required to apply for pesticide permits before treating their fish with chemicals like Ivermectin (formerly used for sea lice treatment); however when the industry realized that the Pesticide Act required them to advertise the use of chemicals applied as a “pesticide”, they simply stopped applying and instead had their veterinarians prescribe the use of the chemical as a “drug”. It is important to note that the chemical is not given directly to the fish as it is with other domestic livestock, but rather, is placed in the feed, which is broadcast into the water. The active ingredient in the chemical currently used (SLICE) is the same as that in pesticides used to control terrestrial pests like caterpillars. There are strong warnings to avoid contaminating aquatic areas with these pesticides as they are known to be highly toxic to a wide range of organisms.
- A veterinarian must prescribe all drugs used on intensive fish culture operations.
- The Fish Health Management Advisory Committee evaluates drug use.
- Information pertaining to drug prescription and use on intensive fish culture operations is not integrated into the Fish Health Database.

#### **RECOMMENDATION 23: MoH and Health Canada should undertake further review of issues related to antibiotic and other drug use at salmon farms.**

- *MoH and Health Canada should assess the risks associated with the potential for the increase of antimicrobial resistance arising from the use of antibiotics at salmon farms and determine appropriate course of action.*
- *MoH and Health Canada should undertake a preliminary review of the administration and regulation of antibiotics used in livestock species raised for human consumption, including farmed salmon, to determine whether further action is needed by federal and provincial Ministers of Health.*
- *Health Canada should consider whether the process used to approve drugs under the Food and Drug Act adequately addresses potential environmental impacts resulting from the administration of those drugs to farmed salmon and determine whether further action is needed.*

#### **ASSESSMENT:**

- A joint MoH and Health Canada study into the risks of antibiotic use was undertaken, but the study was never published or made public.

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**4) WASTE****RECOMMENDATION 24: Develop a regulation under the Waste Management Act that implements a Performance Based Waste Management Model. The regulation should require:**

- *Management of the uneaten feed and fish faeces from salmon farms to avoid adverse effects to the environment and within the assimilative capacity of the environment over a stocking and grow-out cycle.*
- *Management of salmon feed and waste by measuring the environmental effects and managing farms to achieve the objective of operating within the assimilative capacity of the site over that period of time.*
- *Establishment of standards based on quantitative sediment parameters that are indicative of environmental conditions.*
- *No measurable adverse impact beyond the edge of the tenure.*
- *Standards to ensure that sediments under net-cages are not degraded and support levels of biological activity that ensure sediments will return to ambient or near ambient standards within a short period of time of removing fish from a site.*
- *Sediment standards return to ambient or near ambient conditions (some enrichment) prior to restocking a site with fish.*
- *The adoption of existing water quality and sediment standards for metals.*
- *Standard sampling protocols, including methods and frequency, for ongoing monitoring of the adopted performance standard.*
- *The development of a waste management plan for each farm site. The plan should outline the methods for handling farm materials in a manner that prevents pollution and for removing dead fish from the site for offsite treatment, and the operational practices by reference to the code of practice (see Chapter 15) for managing fish and fish feed to prevent adverse environmental effects. The current policy, "Environmental Management of Marine Fish Farms", July 1990, provides a basis for development.*
- *Inclusion in the waste management plan of a contingency plan for dealing with spills of all materials held on site, and remedial action or mitigation plans to alter farm practices or production, should performance standards not be met.*
- *Implementation of mitigation plans as directed, by the regional manager or at the end of a grow-out cycle, if the standards are not met.*

**ASSESSMENT:**

- *In September 2002, a new Finfish Aquaculture Waste Control Regulation (FAWCR) was introduced, but some DFO scientists considered the regulation to be inadequate. Some scientists with the MWLAP also disagreed with the standards established in the Waste Control Regulation, but senior government executives overrode their concerns. The independent scientific panel appointed by the government to review the waste standards expressed concern with the high tolerance level for pollution in this regulation.*
- *Under this regulation, environmental effects are measured using chemical, biological and physical parameters. The only automatic chemical triggers under FAWCR are free hydrogen sulphide levels. These standards only apply to farms located above soft bottoms where material can be sampled; to date there are no standards for measuring hard bottom surfaces. Outside of FAWCR, there are*

provincial guidelines under the jurisdiction of the Regional Waste Manager who can request a remediation plan if toxic levels of zinc, copper or other contaminants are found in the sediment.

- The regulation includes standards based on quantitative sediment parameters. Staff with the Ministry of Water, Land and Air Protection conducted two years worth of research in order to find a chemical indicator for toxicity to benthic organisms. According to these studies, when sulphide levels reach the lower end of the compliance range provided in the Waste Control Regulation (1300 micromoles), the benthic community becomes dominated by only 6 species, a reduction of approximately 90% in species diversity.
- The regulation requires no statistically significant difference in chemical or physical indicators beyond the edge of the tenure. It also specifies the frequency of monitoring required.
- Scientific information collected prior to the introduction of the waste control regulation shows recovery for most sites. Under the regulation, recovery must be monitored before fish can be re-stocked at a site.
- The regulation does not include water quality and sediment standards for metals. Sediments are monitored under the provincial Sediment Quality Guidelines.
- The waste control regulation includes standard sampling protocols including methods and frequency available on the MWLAP web site.
- Under this regulation, Best Management Practices Plans are required which address the points detailed in this recommendation.
- The Best Management Practices Plans require contingency plans for dealing with spills of all materials held on a site. If the performance standards are not met, remedial action or mitigation plans must be implemented to alter farm practices or production.
- If the standards are not met, mitigation plans as directed by the regional manager are required under this regulation.

**RECOMMENDATION 25: In order to set benthic sediment standards, government should test criteria for establishing the standards to ensure feasibility and consistency with government policy.**

- MELP [MWLAP] should establish sampling program and protocols for testing criteria with biological, chemical and physical parameters to be monitored.
- MELP [MWLAP] should establish reference sites that represent ambient conditions.
- Sampling and analysis should be conducted by qualified third-party specialists and submitted to MELP [MWLAP] within 30 days of collection.

**ASSESSMENT:**

- The Waste Control Regulation requires a monitoring program that tests for physical (such as currents), chemical and biological parameters. A chemical test is used for soft bottoms and video surveys are required for hard bottoms.
- Reference sites are required to represent background or ambient conditions.
- Third party specialists conduct the sampling and analysis. The regulation does not require that the data be submitted within 30 days of collection.

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### **RECOMMENDATION 26: (Option to Recommendation 25)**

- *Adopt the performance-based sediment monitoring programs of New Brunswick if MELP [MWLAP] is unable to develop standards within 18 months of this report.*

#### **ASSESSMENT:**

- The New Brunswick program was not adopted as an interim measure, and it took approximately five years from the release of the EAO recommendations before the Waste Control Act was implemented in 2002.

### **RECOMMENDATION 27: Apply existing regulatory scheme until performance based regulation enacted.**

- *Until a new regulation is enacted, apply the current regulatory framework.*
- *The monitoring program needed to test and establish benthic standards should be stipulated by the manager under the Aquaculture Waste Control Regulation, or alternatively, requested as information under that regulation.*
- *Farm owners should, in this period of time, develop waste management plans in consultation with MELP [MWLAP] for existing sites.*
- *Consider making an interim amendment to the existing regulation exempting all farms from the requirement to hold a permit, provided that a waste management plan is adopted which the regional manager approves.*

#### **ASSESSMENT:**

- Before FAWCR was passed, there was no benthic monitoring program. Instead, farms using over 630 tonnes of feed per year were required to have a Waste Management Permit under the Aquaculture Waste Reduction Regulation. At this time there was almost total non-compliance with the Waste Regulation. By 1998 very few salmon farms were using less than 650 tons of feed, and despite this only about 8 of them had waste management permits.
- Before FAWCR was passed, fish farm companies were required to develop waste management plans; however, these became obsolete under the new regulation.

### **RECOMMENDATION 28: Establish registry of farms with prescribed fees under the new performance based regulation.**

- *A registry of farms should be established by the regulation recommended in #24 above. The regulation should require that the holder of a salmon aquaculture licence be required to file annually with MELP [MWLAP] disclosing whether or not the site under licence will be operational during that year and if so for which months. An annual fee should be prescribed (\$100-\$300) which would cover the administrative costs of the registration and replace the fee currently paid under Schedule A of the Waste Management Permit Fees Regulation.*
- *Schedule C of the regulation should be made applicable to all farms and fees should be recovered for the contaminants listed by that regulation that are discharged to the environment (ammonia, nitrogen/nitrates, phosphates, suspended solids, metal, antibiotics). If the farmer can demonstrate that these contaminants are not being discharged to the environment due to the implementation of new technology, the fees would not be payable.*
- *Fees should be payable at the end of each year, based on the amount of feed used on a farm, which would also provide a basis for the calculation of the*

*contaminants discharged.*

- *The operator should be required to keep records of feed usage which would be subject to audit.*

#### **ASSESSMENT:**

- Under the Waste Control Regulation, fish farm operators are required to register their farms with MWLAP. The regulation does not require holders of salmon aquaculture licences to annually disclose whether or not their sites will be operational during that year and for which months. The companies are required to pay an annual fee to cover the administrative costs for registration.
- Fees are recovered for suspended solids, ammonia, nitrogen/nitrates, but not for phosphates, metals or antibiotics as recommended. Each farm is required, by January 31, to submit the quantity of feed used in the previous year, and then MWLAP calculates the fees and invoices the companies by March 31. Since fees are calculated from the nutrient components of the feed used, not on chemical contaminants, companies that can demonstrate they are not discharging contaminants due to new technology would still be subject to the annual fees and thus the incentive to improve technology, as suggested by the EAO, has not been implemented.
- Fees for the discharge of contaminants are calculated according to the amount of feed and the characteristics of feed used on a fish farm. Companies are required to keep records of feed usage, but auditing is not done on a regular basis.

#### **RECOMMENDATION 29: Develop regulatory provisions to ensure consistent enforcement and audit systems.**

- *Farmers, as stewards of the resources under tenure, should be monitoring their sites more frequently than required by MELP [MWLAP], to ensure that wastes are being managed and to make appropriate husbandry adjustments as necessary to ensure compliance.*
- *The new regulation should require the farm operator to prepare a mitigation strategy or remedial action plan approved by MELP [MWLAP], for a full grow-out cycle. If standards are exceeded, the plan would outline steps to be taken, including changes to husbandry practices, moving net-cages within tenures and moving some or all of the stock from the tenure.*
- *Monitoring data and reports required by MELP [MWLAP] should be routinely assessed and periodically audited. The regulatory framework should establish disciplinary policies which provide steps to be taken when standards are not met. MELP [MWLAP] should consider the following as part of that disciplinary policy:*
  - *advise the operator of the apparent problem,*
  - *undertake analysis to reassess data; if the problem is confirmed, advise the farmer to implement the mitigation plan if not yet implemented,*
  - *ensure the regional manager considers whether or not to issue a pollution abatement order and/or a pollution prevention order depending on the circumstances,*
  - *reassess after implementation of mitigation plan, and*
  - *implement appropriate punitive action for non-compliance.*
- *Steps should be taken to have fines imposed as ticket information offences.*



**ASSESSMENT:**

- If companies exceed the standards set out in the Waste Control regulation, they are required to prepare and submit remediation plans.
- MWLAP conducts an annual monitoring and audit program spread out over 6 months, but this is limited to only about 12 sites per year. The regulatory framework for this program contains the disciplinary policies outlined in this recommendation.
- If an operator fails to comply with the requirements of the Finfish Aquaculture Regulation they are subject to violation tickets or formal investigations. In 2003, several operators were not in compliance with the Finfish Aquaculture Waste Control Regulation and they are presently being investigated.

**RECOMMENDATION 30: On a priority basis, examine measurements of existing benthic conditions below sites and remediate existing sites where conditions of degradation are visible.**

- *On the basis of existing data, MELP [MWLAP], in cooperation with MAFF and all farmers, should identify sites with significant adverse benthic impacts.*
- *At the identified sites, farmers, in consultation with MELP [MWLAP], should develop for MELP's approval, plans to improve the benthic conditions.*

**ASSESSMENT:**

- Sites with significant benthic impacts have been identified and according to government officials the worst sites have been either re-located or put on a list for relocation.
- Under the Waste Control Regulation, farm sites must meet the standards specified. As of September 2003, all farms must conduct their tests and issue a report within one month of their peak production. If they exceed the standards they must file a remediation plan within 30 days. To date, no farms have reported higher levels than those allowed under the regulation, however as stated previously, standards under this regulation establish a high tolerance level for pollutants and waste.

**RECOMMENDATION 31: Undertake focused research projects that assess the impacts of salmon farming on shellfish and other wild fishery resources on a priority basis.**

- *MOH, Health Canada, MELP [MWLAP] and MAFF, in consultation with First Nations, DFO and Environment Canada, should develop a program to assess potential impacts of salmon farming on shellfish and other fishery resources, especially with respect to:*
  - *antibiotics used at farms; including the dispersion of antibiotics into the water column, the uptake of antibiotics by adjacent shellfish resources, and the impacts on other mobile organisms,*
  - *suspended solids emanating from farms, including an assessment of siltation and suspended solids levels in waters adjacent to salmon farms and impacts on adjacent resources, if levels are found to be above ambient, and*
  - *quality, taste, growth, and mortality rates of shellfish in the vicinity of farms.*
- *Salmon farmers should:*
  - *involve First Nations in research and analysis,*
  - *determine if a turbidity standard is needed for water quality based on the*

*outcome of the assessment,*

- *disclose and discuss the results of these studies with First Nations and other coastal users directly reliant on the resource and make results of studies available to coastal resource users through publication, and*
- *review TAT recommended siting standards regarding distances from shellfish resources on the basis of results of these assessments and change the standard adopted in Chapter 4 if indicated by the results.*

#### **ASSESSMENT:**

- The agencies named in this recommendation have not consulted with First Nations to develop a program to assess the potential impacts of salmon farming on shellfish and other fishery resources. DFO has a research project underway to determine the near-field impact of salmon farm waste on the benthic environment, and this research has been integrated into the salmon farm waste regulation. ACRDP (a DFO program that requires industry funding) is researching salmon farm waste impacts on mussels, oysters and scallops, analyzing them for metals, antibiotics, fecals and particulates. These research projects have not addressed key research questions raised in this recommendation, nor have they resulted in policy changes.
- There has been no review of the siting standards regarding distance between shellfish beds and salmon farms based on a review of impacts.

#### **RECOMMENDATION 32: Review existing policy prohibiting polyculture.**

- *MAFF, MELP [MWLAP] and DFO in consultation with Environment Canada should review the policy regarding monoculture with a view to determining whether or not polyculture could be practical.*

#### **ASSESSMENT:**

- This policy has been reviewed and no changes are currently proposed.

#### **RECOMMENDATION 33: Incorporate results of monitoring and research into MAFF site assessment model**

- *Once performance standards have been set, upgrade the MAFF site assessment model to improve predictive capability, taking into account sediment characteristics, flow and water currents information acquired during the standards establishment and research studies.*
- *If possible, incorporate the results of the assessment of the siltation and pharmacokinetics of antibiotics into the siting model as a means of better site selection.*

#### **ASSESSMENT:**

- A recent upgrade of the MAFF Rapid Assessment Model has been completed. The new model has been improved to incorporate water current information and bathymetry.
- The Rapid Assessment Model does not include a module for calculating the distribution, partitioning and decay of antibiotics and other pharmaceuticals that farmed salmon are treated with.

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**5) PREDATOR CONTROL****RECOMMENDATION 34: Implement enforceable predation prevention plans at all salmon farms.**

- *Government should require all salmon farms to develop and implement a “predation prevention plan” that identifies the specific predator net systems or other physical barriers to predators that will be used at the farm site to prevent predator problems.*
- *Predation prevention plans should be incorporated as enforceable requirements of the aquaculture licence.*
- *Government agencies should, in consultation with industry, prepare and maintain up-to-date guidelines describing best available anti-predation net systems and other technologies, and appropriate husbandry practices, to assist operators in preparing effective predation prevention plans.*
- *Predation prevention plans should be developed and in force at all salmon farms in BC within two years. This time frame may be shortened and expectations respecting predation prevention plans may be varied, pending the potential adoption of alternative technologies such as closed marine systems which would significantly reduce predator interactions (see Recommendation 43).*

**ASSESSMENT:**

- In order to acquire a licence, salmon farming companies are required to submit a Best Management Practices (BMP) Plan including measures for preventing predator problems.
- The predator prevention requirements are enforceable under the aquaculture licence.
- The provincial government continues to work with DFO and the industry to develop more effective predator prevention technologies and practices.
- Predation Prevention plans were enforced at all salmon farms in BC as of October 2000, approximately 3 years following the release of the Salmon Aquaculture Review. The two-year time frame recommended by the SAR was not shortened pending the adoption of alternative technologies, which reduce predator interactions.

**RECOMMENDATION 35: Strictly control the killing of predators at farm sites.**

- *Government should permit killing of predators (mammals and birds) at farm sites only if the predator is inside the predator or growing nets and is actively attacking farmed fish, or is about to do so.*
- *Government should require under the permit (federal and provincial) that persons undertaking the shooting have completed the provincial firearm safety course.*
- *Government should require that all predator kills be recovered, recorded and reported to the appropriate government staff (i.e., provincial conservation officer or DFO fisheries officer, as appropriate).*
- *Where a farm is having ongoing problems with persistent predators, government should encourage operators to contact the local provincial conservation officer or DFO fisheries officer (as appropriate) who may, at their discretion, trap or kill individual predators; and who may recommend that changes be made to the*

*farm's predation prevention plan to make it more effective.*

- *Government staff should keep records of all predator kills at farm sites as a basis for monitoring the effectiveness of individual predation prevention plans, and for incorporating changes to such plans, as warranted.*

#### **ASSESSMENT:**

- Government has no mechanism to monitor whether or not fish farm operators are only shooting predators that are inside pens, and anecdotal evidence suggests marine mammals are being shot outside pens.
- People who are licensed to shoot predators at fish farms are required to take the Canadian Firearms Safety course.
- The government requires that fish farm operators record and report all predator kills (records are kept by DFO and MWLAP, but there is no independent monitoring or auditing process to verify these numbers. The government requires that predator carcasses be recovered, but this is not enforced.
- Fish farms with persistent predator problems are encouraged to hire a contractor to trap or kill predators. Conservation Officers and DFO Fisheries Officers can recommend changes to predation prevention plans if they are deemed inadequate.
- In order to monitor the effectiveness of predator control plans and make adjustments where necessary, predator kill statistics are recorded 3 times per year and entered into a database.

#### **RECOMMENDATION 36: Discontinue the use of acoustic deterrent devices (ADDs) at BC salmon farms.**

- *Government should phase out the use of all existing ADDs over a two-year period to coincide with the development and implementation of “predation prevention plans” at each salmon farm. As this is a recommendation that impacts DFO, active consultation between MAFF and DFO will be necessary to develop a joint approach to this recommendation.*
- *Approved predation prevention plans should prohibit the use of ADDs.*
- *Federal and provincial agencies should actively monitor the effectiveness of this recommendation on predation levels and impacts, to determine if discontinuance of ADDs in favour of physical prevention systems successfully addresses the predation issue, and to determine if there is an effect on the rate of shooting of predators.*

#### **ASSESSMENT:**

- There are currently no Acoustic Deterrent Devices (ADDs) still in use in BC, however the government did not phase out all ADDs by 1999 as recommended. To our knowledge, DFO and MAFF corresponded to develop the current policy prohibiting ADDs.
- Approved predation plans prohibit the use of ADDs.
- No formal research is being conducted to monitor the effectiveness of discontinuing ADDs in favour of other predator prevention systems.

**RECOMMENDATION 37: Restrict the practice of “night lighting”, pending the results of further research.**

- *Government should restrict the practice of “night lighting” (i.e., photo period manipulation) to those existing farms that are approved to conduct this activity.*
- *Government should not issue any new approvals for “night lighting” at fish culture operations, pending the conclusion of additional scientific research into the effects of this practice on local biota. This should be undertaken on a priority basis.*
- *On the basis of study results, government should determine if their use should be continued or stopped.*

**ASSESSMENT:**

- There is no policy requiring the industry to report their use of night-lights. It is estimated that 16 sites are currently using night lighting. There is no approval process for the use of night-lights at salmon farms.
- DFO has conducted some unpublished research concerning night lighting and the interactions between farmed and wild fish. According to the provincial government, further research is necessary.

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**6) FIRST NATIONS****RECOMMENDATION 38: Develop strategies to address First Nations concerns about siting of salmon farms.**

- *Government should develop and implement regional strategies to deal with renewal of tenures prior to issuing new tenures, to ensure compliance with the Crown Lands Activities Policy of avoiding unjustifiable infringement of aboriginal rights.*
- *Government should integrate strategies for regional review of tenured sites with further assessment of sites for waste impacts and with regional and coastal planning exercises.*
- *Government should offer First Nations representation on the Fish Farm Review Committees and ensure that direct First Nations consultation is carried out in the appropriate manner consistent with the Crown Lands Activities Policy and existing interim measures agreements or protocols for new tenures, renewals and amendments.*
- *Consultation and decision-making should be consistent with the principles outlined in Chapter 9 and Volume 2 of this report.*

**ASSESSMENT:**

- Land and Water BC (LWBC) states that it consults with First Nations according to the provincial consultation guidelines and the Aboriginal Interest Assessment Procedures. The government has developed a policy for consulting with First Nations which is available at <http://srmwww.gov.bc.ca/clrg/alrb/cabinet/ConsultationPolicyFN.pdf>. However, at least 6 lawsuits have been launched against the provincial or federal governments, wherein First Nations contend that they are not being consulted regarding salmon farming issues.
- Government has integrated a regional review of tenured sites with waste impact

assessments, regional planning (Aquaculture Opportunity Studies) and coastal planning.

- First Nations have not been offered representation on the Project Review Team (formerly called the Fish Farm Review Committee).
- Consultation and decision-making with First Nations is not consistent with the principles outlined in the EAO report. These principles include:
  1. The relationship between the province of BC and the First Nation must be based on respect. This requires full disclosure of information relevant to a decision by the province.
  2. Each First Nation is independent and possesses its own rights; therefore, the First Nation in whose traditional territory an application for a tenure is made must be consulted.
  3. Each First Nation may establish its requirements for consultation.
  4. First Nations must be involved in decision-making in a genuine manner on a government to government basis.
  5. When implementing policies and regulations, the province will recognize, affirm, and respect aboriginal rights.
  6. First Nations must be involved in decisions regarding:
    - application for approvals for new fish farms
    - changes to existing farms (threshold of change not specified)
    - renewal of fish farm “licences”
    - management of fish farms.

**RECOMMENDATION 39: Develop strategies to involve First Nations in policy development, and research management.**

- *Government should ensure representation of First Nations on organizations established to provide policy advice to government regarding salmon farming.*
- *Government should encourage the employment of local people, including First Nations, by the salmon farming and support industries. A staffing and hiring plan should be submitted as part of the proposal with the tenure application at the time of tenure review.*
- *Government should identify the training needs necessary to ensure First Nations have technical capability to provide scientific monitoring services directly to industry or to government and should develop a strategy to access resources for implementing the training programs necessary to address those needs.*
- *Industry, MAFF and MELP [MWLAP] should rely on the services of First Nations to assist with providing environmental monitoring and audit services.*
- *Government should provide training programs regarding fish health, fish disease identification and disease management to interested First Nations.*
- *Government should develop a strategy to provide access to the fish health database (to be developed following implementation of recommendations in Chapter 6) to interested First Nations.*
- *Government should involve First Nations (as under the KTFC MOU) in the development of research proposals and in priority research into the potential impacts of salmon farms on local seafood resources, especially with respect to antibiotics used on farms (as outlined in Chapter 6), and potential impacts of the use of lights on farms.*
- *Government should involve interested First Nations directly in development and*

*implementation of pilot programs for closed marine technologies (discussed in Chapter 11).*

- *Government should assist interested First Nations in developing strategies to participate directly in the salmon farming industry.*

#### **ASSESSMENT:**

- First Nations were represented on the provincial Salmon Aquaculture Implementation Advisory Committee (SAIAC), but the committee is no longer meeting. The Pacific Fisheries Resource Conservation Council (PFRCC) is planning a new process, but it is not yet in place and First Nation representation is unknown. First Nations are not represented on the Project Review Team (see analysis under recommendation 1).
- The government encourages the salmon farming industry and support industries to employ local people, including First Nations. Operators are required to submit a staffing and hiring plan with their applications.
- Several government agencies are providing financial assistance to a First Nations environmental monitoring program that is currently being developed. In 2001, the Ministry of Agriculture, Food and Fisheries helped to secure funding for First Nations stream surveying work through the Atlantic Salmon Watch Program.
- The Fish health database is available at [www.agf.gov.bc.ca/fisheries/health/](http://www.agf.gov.bc.ca/fisheries/health/).
- There are no provincial First Nations training programs for fish health, fish disease identification or disease management.
- There is First Nations representation on the provincial BC Aquaculture Research and Development Committee, which approves funding for research on the potential environmental impacts of salmon farming.
- First Nations were partners in 2 alternative technology pilot projects (one of these has since been terminated).
- Government is assisting First Nations to participate directly in the salmon farming industry. For example, government agencies are providing financial support for a First Nations environmental monitoring program spearheaded by the BC Aboriginal Fisheries Commission.

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## **7) RISK MANAGEMENT**

### **RECOMMENDATION 40: Undertake coordinated scientific research, technological trials and inventory investigations, based on the prioritization of initiatives.**

- *The government should implement the research-related initiatives in the time frame shown in Table 17 as a means of addressing uncertainty and applying adaptive management principles.*
- *Government should ensure equitable sharing of costs by industry (also refer to Recommendation 44).*

#### **ASSESSMENT:**

- The research identified by EAO has not been completed. For example, to our knowledge the government is not researching the interactions between wild and

escaped farm salmon or the potential impacts of night lighting on marine life. Also, the province has not conducted further research on sensitive fish habitat, including juvenile and adult salmon migration routes.

- Legislation is currently being developed which will apply a levy to industry for research and development initiatives.

**RECOMMENDATION 41: Reduce risk through performance based program implementation supported by comprehensive monitoring.**

**ASSESSMENT:**

- The provincial government's new escape and waste programs use performance-based standards. There are monitoring programs for escapes, fish health, site allocation, waste management and pilot projects.

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## 8. ALTERNATIVE TECHNOLOGY

**RECOMMENDATION 42: Undertake further analysis and development of the policy framework necessary for exposed offshore open marine systems.**

- *Federal and provincial governments should clarify jurisdiction and the policy and management regime for potential exposed offshore open marine salmon aquaculture facilities.*
- *The social and economic considerations, especially with respect to worker safety, navigational safety, and the potential for jobs relating to the handling and processing of the product moving away from smaller communities, should be assessed, following which government should establish a clear policy on whether or not it will support such facilities off the coast of BC.*

**ASSESSMENT:**

- A proposal for offshore open marine salmon aquaculture was developed but not approved.
- No policy has been established with respect to worker safety, navigational safety and the potential for job loss in smaller communities. The government has not established a policy concerning its decision to support or oppose offshore facilities.

**RECOMMENDATION 43: Initiate pilot projects to assess the development of closed circulating marine systems in B.C.**

- *Pilot projects should be initiated to allow for direct assessment and encouragement of closed marine systems in BC. Both the "Future Sea Farms" and "Mariculture" systems should be tested in a variety of habitat types and siting conditions on the west coast of Vancouver Island and in the Broughton Archipelago. Monitoring data from the Future Sea Farms test site near Nanaimo should be considered in this assessment.*
- *MAFF and MELP [MWLAP] should cooperate to establish a task force of industry, provincial and federal governments, First Nations, and interested local governments to select sites and develop strategies to implement pilot projects*



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*through cooperative arrangements with these groups.*

- *Costs for the pilot projects should be covered through harvesting of the product, and direct investments from government and industry.*
- *The strategies developed should provide opportunities for First Nations and local community members with appropriate technical expertise to direct or participate in operating, monitoring and evaluating the technologies.*
- *Reports on evaluations should be documented and accessible to the public.*

### **ASSESSMENT:**

- The government has approved three marine-based and one land-based closed-containment system. The Future Sea system has been tested through this program, but the Mariculture system has not. The pilot project policy did not allow for trials in a variety of habitat types and siting conditions. Monitoring data from the Future Sea Farms test site in Nanaimo has been used to assess the development of closed circulating systems. The pilot program was never completed and is currently at a stand still.
- A task force was never implemented.
- Neither level of government provided funding to the pilot projects.
- To our knowledge, the pilot project program does not include the objective of providing opportunities for First Nations and local community members to participate in monitoring, operating or evaluating the technologies.
- Reports on the pilot projects are accessible through the Internet at [www.agf.gov.bc.ca/fisheries/technology/new\\_tech.htm](http://www.agf.gov.bc.ca/fisheries/technology/new_tech.htm).

### **RECOMMENDATION 44: Establish a funding commitment to salmon aquaculture research and development.**

- *The Ministry of Agriculture, Fisheries and Food should work with the industry to establish an industry-sourced research and development fund, whether through the industry association or under the Farming and Fishing Industries Development Act, or through some other mechanism, to make funding available for research and technological development (also see recommendation 40).*

### **ASSESSMENT:**

- An entirely industry-sourced research and development fund was never set up. Instead two funds were established: the BC Aquaculture Research and Development Committee (BCARDC) for provincial funds (focussed on researching environmental impacts) and the DFO program which includes federal funds and cost sharing from the fish farming industry (focused predominantly on increasing farmed fish production). Legislation is currently being developed that will allow government to collect levies for a research fund.

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## **9) CONFLICT RESOLUTION**

### **RECOMMENDATION 45: Establish improved mechanisms for addressing disputes that arise over salmon aquaculture.**

- Government agencies should establish and implement a comprehensive approach to preventing and responding to disputes that arise in connection with salmon farm tenuring, operational licensing decisions, and operational practices at farm sites. The dispute resolution “system” for salmon aquaculture should consist of the following features:

#### **Dispute Prevention**

- Emphasis should be on dispute prevention through a range of proactive means, including improved inter-agency coordination, integrated coastal zone planning, adoption of refined siting criteria, strengthened public and First Nations participation in siting decision-making, and improvements to resource inventories and mapping as the technical basis for siting and management decisions (see siting-related recommendations in Chapter 4). Involvement of all levels of government and interested agencies in a policy advisory capacity will, at a broader level, serve to address issues, which are the basis for many disputes.

#### **Public Notice**

- Licensing agencies should establish procedures and mechanisms that consistently inform the public of the status of site tenuring and operations-related licensing/permitting applications, and allow an appropriate period for public comment, as a further basis for dispute prevention.
- With respect to site tenure, there should be a policy requirement for salmon farming proponents to sponsor one or more local open houses to explain their proposals and receive comment, and/or to meet with local advisory working committees to discuss their proposals. To facilitate the public notice objective, MAFF should develop and maintain an Internet web site that lists all salmon farming-related regulatory applications and describes the current status of those applications.
- The procedural right of any party to register a formal objection to a site application with the Minister of Environment, Lands and Parks should be made known through all feasible means (e.g., on the proposed internet website and, in newspaper notices of pending applications).

#### **Internal Review Procedures**

- All licensing agencies (MAFF, MELP [MWLAP], DFO) should develop and implement written administrative procedures to be followed in providing written reasons for decisions, addressing queries, complaints and concerns from applicants and the public about licensing decisions that are made by those agencies. The procedures should stress timeliness in responding to queries.

#### **Opportunity to File Complaints about Salmon Farming Practices**

- Complaints about operational practices at individual farm sites should be handled under the procedures recently set up under the provincial Farm Practices Protection (Right to Farm) Act, where complaints may be addressed informally by regional MAFF staff and “peer advisors”, or referred to the provincial Farm Practices Board for review and decision.
- **Policy Context and Advice**

#### **ASSESSMENT:**

##### **Dispute Prevention**

- The provincial government has attempted to prevent disputes through improving inter-agency coordination, integrated coastal zone planning, refining the siting

criteria and making improvements to resource inventories and mapping. However, many environmental groups, First Nations and local communities do not believe that adequate dispute resolution mechanisms have been established. Also, public and First Nation participation in siting decisions have not been strengthened. While there has been on-going discussion about re-establishing a new forum to help address dispute prevention, at the current time this forum has not been established.

#### **Public Notice**

- The LWBC website provides information to the public about the status of site tenure and licensing/permitting applications. The interactive web site provides an opportunity for public input. The public can write letters or send emails to LWBC to register a formal objection to a site application.
- There is a policy requirement for salmon farming proponents to sponsor open houses to explain their proposals and receive public input. However, it is important to note that many stakeholders do not consider these open houses to be forums for public consultation. There is a MAFF web site that lists salmon farming regulations. The LWBC website provides information about the status of salmon farming applications.
- The right for any party to object to a site application is not made known through all feasible means, but application files are accessible to all parties.

#### **Internal Review Procedure**

- The licensing agencies have developed and implemented written administrative procedures to provide written reasons for decisions.

#### **Opportunity to File Complaints about Salmon Farming Practices**

- Complaints about the operation of farm sites can be handled under the Right to Farm Act, but are usually handled instead by the MSRM or MWLAP if the complaint concerns an enforcement issue.

#### **RECOMMENDATION 46: Develop and adopt a set of integrated, strategic policy objectives for salmon aquaculture in BC.**

- *The provincial government should implement its plan to prepare a statement of its corporate policy direction for salmon aquaculture in BC, identifying specific environmental, economic and social policy objectives for this sector.*
- *The strategic policy objectives should serve as a basis for the development and implementation of more specific salmon aquaculture regulations, programs, policies and guidelines; and provide essential strategic direction for coastal zone planning processes.*
- *The strategic policy objectives should be developed through inter-agency and inter-governmental cooperation, and with the participation of all key governments and groups with an interest in salmon aquaculture in BC.*
- *The objectives of the fisheries renewal program should be a consideration in this policy development.*

#### **ASSESSMENT:**

- The government has developed and implemented a Provincial Salmon Aquaculture Policy Framework, which includes environmental, economic and social policy objectives for aquaculture.
- The policy framework serves as a basis for specific aquaculture regulations.

Strategic direction for coastal zone planning comes from the provincial government's general policy directing new era planning.

- The government did not prepare this document with participation from First Nations, environmental groups, and commercial and recreational fishing groups with an interest in salmon aquaculture in BC. In October 2001, an inter-agency Directors' Aquaculture Committee was formed to coordinate policy and program development, comprised of government agencies alone (MAFF, MSRM, LWBC, MWLAP and DFO).
- According to government officials, the objectives of the now defunct Fisheries Renewal program were considered in developing the province's salmon aquaculture policy.

**RECOMMENDATION 47: Re-establish a broadly based advisory group to provide counsel to government on the management of salmon aquaculture in B.C.**

- *An advisory group comprising representatives of all key interests should be re-established to provide advice to the provincial government on development and implementation of the provincial salmon aquaculture management system, monitor policy implementation, advise on research priorities, and serve as a forum for dialogue and information exchange among the interests.*
- *The advisory group should regularly report to both the Minister of Environment, Lands and Parks [now MWLAP] and the Minister of Agriculture, Fisheries and Food as the two Ministers with mandates that relate most directly to salmon aquaculture management, and report annually on the progress of implementation of these recommendations. The group should interact with representatives of all key agencies to ensure that the advice that the group provides to the Ministers integrates the range of policy positions and priorities of the agencies.*
- *The advisory group should also report to the Ministers of Health, Small Business, Tourism and Culture, Aboriginal Affairs, and Employment and Investment as appropriate on issues of direct concern to their mandate.*
- *The government should consider using the Fisheries Renewal Board or a related committee as the policy advisory group.*

**ASSESSMENT:**

- The Salmon Aquaculture Implementation Advisory Committee (SAIAC), which included stakeholders from some but not all of the key interests, was established in February 2000. Significant policy areas were never discussed by SAIAC and much of the information on the current status of the industry was withheld from SAIAC members. Conservation groups and First Nations resigned from SAIAC when it became clear that major decisions were being made behind closed doors. The SAIAC is no longer in operation.
- In April 2003, the governments of Canada and BC accepted the Pacific Fisheries Resource Conservation Council (PFRCC) proposal to develop a new advisory process, now referred to as the Salmon Aquaculture Forum. The PFRCC released their recommendations to the federal and provincial ministers on December 16, 2003. At the time of printing, the governments of Canada and BC were refusing to fund the forum proposed by the PFRCC and its fate is clearly in question.



**10) IMPLEMENTATION****RECOMMENDATION 48: On a priority basis, develop a comprehensive code of salmon aquaculture practice.**

- *Develop a comprehensive code of salmon aquaculture practices that would, in a single reference document:*
  - *identify all the requirements associated with the development and operation of salmon farms in BC,*
  - *provide guidance about optimum husbandry practices and procedures to maintain the best salmon farming practices, and*
  - *set monitoring requirements and protocols.*
- *The document should be developed cooperatively by government, industry and other key interests, but maintained by government, and structured to include separate sections on:*
  - *escape and prevention management,*
  - *fish health management,*
  - *waste management including remedial action plans,*
  - *predation management,*
  - *noise and visual impact management,*
- *Salmon farmers should use this document as a source in the development of their farm-specific salmon aquaculture management plans, which would identify the measures to be used at the farm to prevent or mitigate escape, fish health, waste, predation, and other issues.*
- *The code should:*
  - *describe the processes for applying for tenures, operating licences and other necessary approvals, and*
  - *outline methods for addressing complaints and solving disputes related to salmon farm practices.*

**ASSESSMENT:**

- Government, industry and other key interests have not worked cooperatively to develop a comprehensive code of salmon aquaculture. The BC Salmon Farmers Association has developed its own industry-approved “code of practice” without input from the government and key stakeholders.
- The provincial government’s application guide for industry includes information to assist operators in developing farm management plans and applying for tenures/ licences.

**RECOMMENDATION 49: Government should implement changes to the legislative, regulatory and policy framework for provincial approval processes.**

- *Amend the Fisheries Act (BC), or develop new legislation to reflect broadened policy base for salmon aquaculture.*
- *Enact orders under the Animal Disease Control Act to make it applicable to fish diseases.*
- *Amend Animal Disease Control Act as necessary to expand capability to cost recovery for government implemented disease control measures.*
- *Consider the future development of legislation for coastal zone planning.*

**Code of Practice**

- *Develop in accordance with Recommendation 48.*

**Regulations**

- *Amend Aquaculture Regulation to establish expanded standardized operational requirements.*
- *Consider amending the Aquaculture Waste Control Regulation to eliminate need for permits for some farms and impose requirement of waste management plan on all farms.*
- *Develop new waste management regulation by April 1999.*
- *Amend Animal Disease Control Regulation as necessary, to respond to recommendations of the Fish Farm Review Committee*

**Licences**

- *Develop new format for aquaculture licence based on amended Aquaculture Regulation.*
- *For new aquaculture licences, impose the detailed operational standards as terms and conditions*
- *Impose restrictions on the medicated feed dispensers/vendors through the licence to ensure policy of providing medicated feed only under veterinarian prescription.*

**Policies and Agreements**

- *Develop operational policies to implement recommendations, in particular:*
  - *adopt the tenure review process outlined in Figure 11 and develop assessment criteria for tenure applications that provide an approach to considering relevant environmental and social factors associated with the tenure application, and*
  - *adopt the licence review process outlined in Figure 15*
  - *develop an enforcement and compliance policy and manual, and*
  - *provide policy guidelines to establish the Fish Farm Review Committee.*
- *Review and amend federal/provincial MOUs as necessary.*

**ASSESSMENT:**

- *Over the past 3 years the provincial government has made amendments to the Aquaculture Regulation (relevant to fish escapes) under the provincial Fisheries Act; and the Finfish Aquaculture Waste Control Regulation under the provincial Waste Management Act (now called the Environmental Management Act). Both of these acts require salmon farmers to develop a Best Management Practices Plan.*
- *The Animal Disease Control Act is not applicable to fish diseases.*
- *To our knowledge, the provincial government has not considered developing legislation for coastal planning.*

**Code of Practice**

- *A code of practice as described in Recommendation 48 has not been developed. The BC Salmon Farmers Association developed their code of practice without input from key stakeholders.*
- *The Aquaculture regulation has been amended.*
- *The Aquaculture Waste Control Regulation allows all finfish farms to discharge waste without permits, not just some farms as specified in this recommendation. Under this regulation all fish farms are required to implement a Best Management Practices Plan (which includes the objective to reduce the amount of waste and*

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pollutants discharged into the environment).

- The waste control regulation was introduced on September 12, 2002, over three years later than the time line recommended by EAO.
- The Animal Disease Control Act is not applicable to fish diseases

**Licenses**

- Government has developed a new format for aquaculture licences, which reflects the changes to the Aquaculture Regulation.
- Detailed operational standards are spelled out in the Aquaculture Regulation under the Best Management Practices, not in the licence agreement.
- Medicated feed is only allowed under veterinarian prescription.

**Policies and Agreements**

- The tenure review process outlined in Figure 11 was not completely adopted (e.g. the Fish Farm Review Committee does not include First Nations or local government representation and the local advisory process has been replaced with open houses).
- Under the tenure review process, there are assessment criteria for tenure applications that consider social and environmental factors.
- The licence review process outlined in Figure 15 was not completely adopted (e.g. the Fish Farm Review Committee does not include First Nations or local government representatives).
- The LWBC web page has an enforcement and compliance policy and manual.
- Policy guidelines for the Fish Farm Review Committee (now called the Project Review Team) have been developed. They can be found at [www.lwbc.bc.ca/applying\\_for\\_land/aqua\\_append.htm](http://www.lwbc.bc.ca/applying_for_land/aqua_append.htm).
- We expect that federal/provincial MOUs have been amended as necessary. □

[END OF DETAILED ASSESSMENTS]

Tables — APPENDIX 2

<p><b>Siting</b> <b>Letter Grade: D</b></p>	<p><b>Progress according to Government</b></p>	<p><b>The Facts</b></p>
<p><b>Recommendation #1:</b> Establish permanent regional Fish Farm Review Committees to ensure coordinated salmon farm siting and management decisions</p>	<p>Partially Implemented</p>	<p>No regional or local committees established to provide input into salmon farm siting.</p> <p>Only one overriding fish farm review committee with no First Nations or local government representation.</p>
<p><b>Recommendation # 2:</b> Develop integrated coastal zone management plans</p>	<p>Partially Implemented</p>	<p>Coastal Zone Management Plans (CZMPs) have been developed, but they're not based on a thorough assessment of data.</p> <p>Decisions in the CZMPs not reached in a "consensus seeking setting."</p>
<p><b>Recommendation # 3:</b> Pending the development of coastal zone management plans, proactively identify and allocate suitable salmon aquaculture sites.</p>	<p>Partially Implemented</p>	<p>Some First Nations say that their input into Aquaculture Opportunity Studies was completely ignored.</p> <p>The public is not regularly consulted in the development of Aquaculture Opportunity Studies.</p>
<p><b>Recommendation 4:</b> Adopt revised salmon farm siting criteria.</p>	<p>Fully Implemented</p>	<p>Threatened species, sensitive habitats and salmon migration routes have not been thoroughly mapped and are not being incorporated into the decision-making process.</p> <p>Important issues like potential impacts from sea lice have not resulted in new siting criteria.</p>



<b>Siting Continued</b>	<b>Progress According to Government</b>	<b>The Facts</b>
<b>Recommendation 5:</b> Require salmon farm applicants to submit an assessment of proposed salmon farm sites and potential impacts on other resources and uses.	Fully Implemented	Environmental impacts and impacts on user groups are incomplete or non-existent.  Operators sponsor open houses, but this in no way implies that they are consulting with residents.
<b>Recommendation 6:</b> Continue to improve the quality of coastal resource inventory mapping.	Fully Implemented	Government has developed coastal resource inventory maps for all current salmon farm tenures, but the inventory mapping is spotty at best.
<b>Recommendation 7:</b> Ensure the opportunity for public participation in salmon farm siting and management decisions by establishing local advisory working committees.	Fully Implemented	No local advisory committees have been set up.  Input from the public is informal at best and is only obtained through open houses and through advertising and the referral processes.
<b>Recommendation 8:</b> Assess existing salmon farms to determine if the farms are causing significant negative impacts that need to be corrected.	Fully Implemented	Fully Implemented
<b>Recommendation 9:</b> Develop and implement consistent guidelines for assessing and approving salmon aquaculture facilities in freshwater.	Partially Implemented	No formal policy has been developed for approving freshwater aquaculture facilities.  MAFF approved a salmon aquaculture operation in Victoria Lake, which according to MWLAP files is the most naturally productive lake on Vancouver Island.

<b>Siting Continued</b>	<b>Progress according to government</b>	<b>The Facts</b>
<b>Recommendation 10:</b> Develop and enforce water quality standards for dissolved waste discharges from lake cage operations.	Partially Implemented	Water quality standards for waste discharge from lake operations have not been finalized.

Escapes Letter Grade: D	Progress according to government	The Facts
<b>Recommendation 11:</b> Continue to allow both Pacific and Atlantic culture, but restrict the species farmed to take into account local site conditions.	Fully Implemented	No restrictions have been placed on which species of salmon can be farmed based on local site conditions.
<b>Recommendation 12:</b> Advance the goal of eliminating escapes by focusing on escape prevention as the principal management strategy for eliminating and/or reducing ecological risks from salmon farm escapes.	Fully Implemented	Fully Implemented
<b>Recommendation 13:</b> Implement a mandatory standardized information collection and reporting program.	Fully Implemented	The industry maintains an inventory tracking system, but it does not measure chronic leakage and number of fish harvested. Also, some inventory data is not available to the public.
<b>Recommendation 14:</b> Reduce the risk of ecological effects from escaped farmed salmon.	Fully Implemented	<p>The geographic and funding limitations of the government's escape monitoring program ensures that escape and recovery numbers are underreported to an unknown degree.</p> <p>There is no requirement in the aquaculture licences to keep the level of escapes within a threshold of three per cent of total fish stocked.</p>

<b>Fish Health</b>  <b>Letter Grade: D</b>	<b>Progress According to Government</b>	<b>The Facts</b>
<b>Recommendation 15:</b> Establish a Fish Health Working Committee (FHWC) to promote integrated and corporate fish health policy development in B.C.	Fully Implemented	The terms of reference for the FHWC do not specify a requirement to solicit input from First Nations, community organizations or environmental organizations.
<b>Recommendation 16:</b> Strengthen disease surveillance and control programs.	Fully Implemented	<p>There is no legislation in place requiring salmon farm operators to report diseases on their farms to this committee. In fact, the operators have set up their own fish health database and the government does not have direct access to their data.</p> <p>Diseases have not been reportable under the provincial Animal Disease Control Act.</p> <p>The powers to quarantine, seize and dispose of farmed fish remain unclear and not established under legislation.</p>
<b>Recommendation 17:</b> Develop standards for managing farmed salmon health as part of a salmon aquaculture code of practice, and enforce the standards as a condition of the salmon aquaculture licence.	Fully Implemented	Fully Implemented
<b>Recommendation 18:</b> Improve the quality and accessibility of fish health information.	Fully Implemented	The province and the federal governments have not developed their own fish health database. Instead, the fish health database developed by salmon farm operators is not directly accessible and searchable by the public.

<b>Fish Health Continued</b>	<b>Progress According to Government</b>	<b>The Facts</b>
<b>Recommendation 19:</b> Strengthen policies and programs respecting importation.	Fully Implemented	Diseases, pathogens or parasites that are foreign to BC or are only known to exist in distinct regions are not made reportable.
<b>Recommendation 20:</b> Strengthen the requirements for sampling and reporting of diseases in fish being transferred within B.C.	Fully Implemented	Diseases, pathogens or parasites that are foreign to BC or are only known to exist in distinct regions are not made reportable.
<b>Recommendation 21:</b> Enhance fish health inspection practices at fish processing facilities.	Not Applicable to the provincial government	Not applicable to the provincial government
<b>Recommendation 22:</b> Strengthen control of drug use on salmon farms.	Fully Implemented	<p>Flag indicators and written notice to signify drug use are not required. Flag indicators are required in Norway.</p> <p>Information pertaining to drug prescription and use on intensive fish culture operations is not integrated into the Fish Health Database.</p>
<b>Recommendation 23:</b> MoH and Health Canada should undertake further review of issues related to antibiotic and other drug use at salmon farms.	Fully Implemented	A joint Ministry of Health and Health Canada study into the risks of antibiotic use was undertaken, but was never published.

Waste <b>Letter Grade: C-</b>	<b>Progress According to Government</b>	<b>The Facts</b>
<b>Recommendation 24:</b> Develop a regulation under the Waste Management Act that implements a Performance Based Waste Management Model	Fully Implemented	Federal and provincial scientists consider this regulation inadequate.  This regulation establishes a high tolerance level for pollutants, allowing for a reduction of approximately 90% in species diversity.  The regulation does not include water quality and sediment standards for metals.
<b>Recommendation 25:</b> In order to set benthic sediment standards, government should test criteria for establishing the standards to ensure feasibility and consistency with government policy.	Fully Implemented	Fully Implemented
<b>Recommendation 26:</b> (Option to Recommendation 25)	Not applicable	The New Brunswick program was not adopted as an interim measure. The Waste Control Act was implemented in 2002, approximately 5 years after the SAR recommendations were released.
<b>Recommendation 27:</b> Apply existing regulatory scheme until performance based regulation enacted.	Fully Implemented	Before FAWCR was passed, there was no benthic monitoring program.

<b>Waste Continued</b>	<b>Progress According to Government</b>	<b>The Facts</b>
<b>Recommendation 28:</b> Establish registry of farms with prescribed fees under the new performance based regulation.	Fully Implemented	Fees are recovered for suspended solids, ammonia, nitrogen/nitrates, but not phosphates, metals or antibiotics (as suggested in this recommendation).  Companies are required to keep records of feed usage, but auditing is not done on a regular basis.
<b>Recommendation 29:</b> Develop regulatory provisions to ensure consistent enforcement and audit systems.	Fully Implemented	Fully Implemented
<b>Recommendation 30:</b> On a priority basis, examine measurements of existing benthic conditions below sites and remediate existing sites where conditions of degradation are visible.	Fully Implemented	Fully Implemented
<b>Recommendation 31:</b> Undertake focused research projects that assess the impacts of salmon farming on shellfish and other wild fishery resources on a priority basis.	Fully Implemented	The agencies named in this recommendation have not consulted with First Nations to develop a program to assess the potential impacts of salmon farming on shellfish and other fishery resources.  There has been no review of the siting standards regarding distance between shellfish resources beds and salmon farms based on a review of impacts.
<b>Recommendation 32:</b> Review existing policy prohibiting polyculture.	Fully Implemented	Fully Implemented

<b>Waste Continued</b>	<b>Progress According to Government</b>	<b>The Facts</b>
<b>Recommendation 33:</b> Incorporate results of monitoring and research into MAFF site assessment model	Fully Implemented	Fully Implemented



<b>Predator Control Letter Grade: D</b>	<b>Progress According to government</b>	<b>The Facts</b>
<b>Recommendation 34:</b> Implement enforceable predation prevention plans at all salmon farms.	Fully Implemented	Fully Implemented
<b>Recommendation 35:</b> Strictly control the killing of predators at farm sites.	Fully Implemented	<p>Government has no mechanism to monitor whether or not fish farm operators are only shooting predators that are inside pens</p> <p>The government requires that fish farmers record and report all predator kills, but there is no independent monitoring or auditing process.</p> <p>The government requires that predator carcasses be recovered, but this is not a regular practice.</p>
<b>Recommendation 36:</b> Discontinue the use of acoustic deterrent devices (ADDs) at B.C. salmon farms.	Fully Implemented	The government did not phase out all ADDs by 1999 as recommended by SAR.
<b>Recommendation 37:</b> Restrict the practice of "night lighting", pending the results of further research.	No Work to Date	<p>There is no policy requiring the industry to report their use of night-lights.</p> <p>According to the provincial government, further research is necessary on the potential impacts of night lighting on local marine life.</p>

<b>First Nations</b>  <b>Letter Grade: F</b>	<b>Progress According to Government</b>	<b>The Facts</b>
<b>Recommendation 38:</b> Develop strategies to address First Nations concerns about siting of salmon farms.	Fully Implemented	Consultation and decision-making with First Nations is not consistent with the principles outlined in the SAR report.
<b>Recommendation 39:</b> Develop strategies to involve First Nations in policy development, and research management.	Fully Implemented	First Nations are not represented on the government's Project Review Team.  There are no provincial First Nations training programs for fish health, fish disease identification or disease management.

<b>Risk Management</b> <b>Letter Grade: C-</b>	<b>Progress according to government</b>	<b>The Facts</b>
<b>Recommendation 40:</b> Undertake coordinated scientific research, technological trials and inventory investigations, based on the prioritization of initiatives.	Fully Implemented	The research identified by SAR has not been completed. For example, to our knowledge the government is not researching the interactions between wild and escaped farm salmon.
<b>Recommendation 41:</b> Reduce risk through performance based program implementation supported by comprehensive monitoring.	Fully Implemented	Fully Implemented

Alternative Technology Letter Grade: D	Progress According to government	The Facts
<b>Recommendation 42:</b> Undertake further analysis and development of the policy framework necessary for exposed offshore open marine systems.	No Work to Date	The government has not established a policy concerning its decision to support or oppose offshore facilities.
<b>Recommendation 43:</b> Initiate pilot projects to assess the development of closed circulating marine systems in B.C.	Fully Implemented	<p>The Mariculture closed contained system has not been tested.</p> <p>Pilot projects have not been conducted in a wide variety of habitat types and siting conditions.</p> <p>Neither level of government funds the pilot projects.</p> <p>A multi-sector task force was never established to provide input to this program.</p>
<b>Recommendation 44:</b> Establish a funding commitment to salmon aquaculture research and development.	Partially Implemented	<p>Two research and development funds have been set up.</p> <p>An entirely industry-sourced research and development fund has not been established. However, legislation is currently being developed that will allow government to collect levies for a research fund.</p>

<b>Conflict Resolution Letter Grade: F</b>	<b>Progress According to Government</b>	<b>The Facts</b>
<b>Recommendation 45:</b> Establish improved mechanisms for addressing disputes that arise over salmon aquaculture.	Fully Implemented	<p>Many environmental groups, First Nations and local communities do not believe that adequate dispute resolution mechanisms have been established.</p> <p>There has not been strengthened public and First Nation participation in siting decisions.</p>
<b>Recommendation 46:</b> Develop and adopt a set of integrated, strategic policy objectives for salmon aquaculture in B.C.	Fully Implemented	The government did not prepare its aquaculture policy framework with participation from First Nations, environmental groups, commercial and recreational fishing groups etc. who have an interest in salmon aquaculture in BC.
<b>Recommendation 47:</b> Re-establish a broadly based advisory group to provide counsel to government on the management of salmon aquaculture in B.C.	Fully Implemented	At the time of printing, the governments of Canada and British Columbia had not yet reached a final decision regarding the structure and mandate of a newly proposed advisory forum.

<b>Implementation</b> <b>Letter Grade: D</b>	<b>Progress</b> <b>According to</b> <b>Government</b>	<b>The Facts</b>
<b>Recommendation 48:</b> On a priority basis, develop a comprehensive code of salmon aquaculture practice.	Fully Implemented	Government, industry and other key interests have not worked cooperatively to develop a comprehensive code of salmon aquaculture.
<b>Recommendation 49:</b> Government should implement changes to the legislative, regulatory and policy framework for provincial approval processes.	Fully Implemented	The waste control regulation was introduced September 12, 2002, over three years later than the time line recommended by SAR.