ALASKA LEGISLATURE COMMITTEE FILES 1987-1988 8672
5479 SRES SB 482 (file 1)

1051

siting of mariculture may be more difficult on tidelands designated for log transfer or storage, mineral transfer or access, commercial activities, crucial fish and wildlife habitat, or recreation. However, these areas will be available for mariculture if it is possible to site, design, and operate mariculture in a manner compatible with the designated use, or if there is no feasible and prudent alternative for mariculture while one exists for the competing use.

In this way, mariculture may be allowed in most of Prince William Sound, though it must sometimes meet strict guidelines. The most restrictive guidelines apply to state tidelands adjacent to the USFS proposed wilderness areas. In these areas, mariculture or other tideland facilities may be allowed "if they are mostly underwater and cause only limited impact on the fish and wildlife, recreation, tourism and wilderness values" and if they do not create "long-term visual impacts." Other guidelines exist for the most important and frequently used recreation areas, anchorages, and sport fishing sites.

The state also encourages mariculture operations in cooperation with private upland owners adjacent to private lands in the Sound including lands in the Chenega and Fidalgo management units.

Because the industry is new and the impacts and incompatibilities are not yet clear, public notice of a proposed permit or lease for mariculture facilities will be sent to adjacent upland owners, user groups, and communities that may be affected by the activity. (This notice is in addition to the department's existing public notice procedures.)

ALASKA STATE LEGISLATURE - SENATE
SENATOR RICHARD I. ELIASON

RULES COMMITTEE, CHAIRMAN
LABOR & COMMERCE COMMITTEE, VICE-CHAIRMAN
LEGISLATIVE COUNCIL
RESOURCES COMMITTEE
FISHERIES SUBCOMMITTEE, CHAIRMAN

P.O. BOX 143
SITKA, ALASKA 99835
P.O. BOX V
JUNEAU, ALASKA 99811
(907) 465-4916

M E M O R A N D U M

TO: Senator Jack Coghill, Chair
Senate Resources Committee

FROM: Senator Dick Eliason, Chair
Fisheries Subcommittee

DEliason

DATE: February 23, 1988

RE: Proposed Mariculture Legislation

Last spring, the Fisheries Subcommittee of the Senate Resources Committee held several statewide hearings on S.B. 106, "An Act relating to aquatic farming". These well attended hearings were held in Dillingham, Kodiak, Anchorage, Sitka, and Ketchikan with residents from Petersburg and Wrangell connected by the teleconference system.

An overwhelming majority of those testifying were in opposition to the pen rearing of salmon. Concerns regarding possible water quality problems, increased conflict between users, competing markets, and potential disease contamination of the wild stock were voiced by those testifying at these hearings. Since that time many communities and organizations statewide have submitted resolutions opposing salmon farming. Because of this strong, broad-base opposition to permitting farming of fish in saltwater, it seems unrealistic at this time for the legislature to continue to pursue this concept.

The attached draft legislation, instead, encourages the growers of shellfish and aquatic plants as well as the farming of finfish in fresh water. This legislation sets the criteria for these economic ventures and provides for an orderly development of the industry. Under this proposal farming of finfish in saltwater would not be allowed. Possibly at a later date when this concept gains more support, the legislature may wish to pursue this matter once again. However, until that happens, it appears most prudent to consider legislation involving the farming of shellfish, aquatic plants, and fresh water fish.

I respectfully request that this draft be introduced as a Senate Resources Committee bill and that hearings be scheduled as soon as possible to allow interested Alaskans an opportunity to respond to this proposal. Thank you very much for your thoughtful consideration of this request.

ALASKA STATE LEGISLATURE - SENATE
SENATOR RICHARD I. ELIASON

RULES COMMITTEE, CHAIRMAN
LABOR & COMMERCE COMMITTEE, VICE-CHAIRMAN
LEGISLATIVE COUNCIL
RESOURCES COMMITTEE
FISHERIES SUBCOMMITTEE, CHAIRMAN

P.O. BOX 143
SITKA, ALASKA 99835

P.O. BOX V
JUNEAU, ALASKA 99811
(907) 465-4916

MEMORANDUM

TO: Senator Dick Eliason

FROM: Sheila Peterson, staff
Senator Eliason's Office Sheila

DATE: March 7, 1988

RE: Opposition to the pen rearing of salmon

The following communities and organizations have submitted resolutions in opposition to the pen rearing of salmon:

<u>Communities</u>:

Kenai Peninsula Borough
Edna Bay Community, Inc.
City of Port Alexander
City and Borough of Sitka
City of Craig
City of Wrangell
Ketchikan Gateway Borough

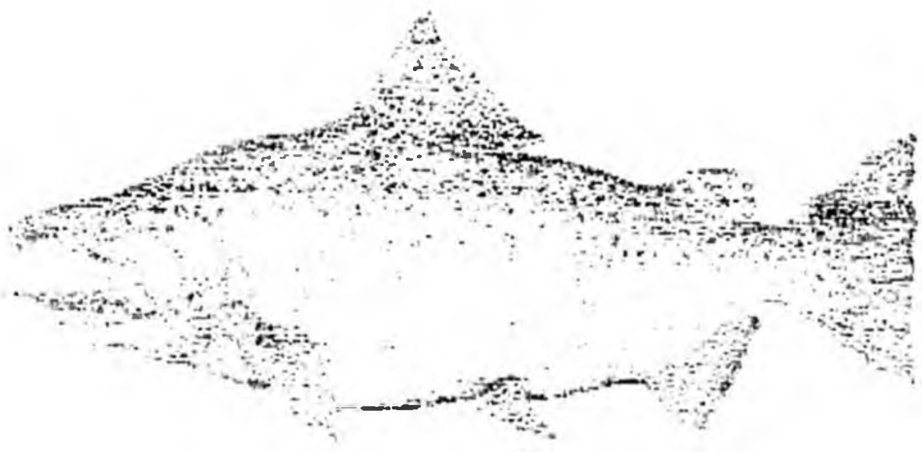
<u>Organizations</u>:

Craig Fish and Game Advisory
SW Regional Fish and Game Council
United Fisherman of Alaska
Northern Southeast Regional Aquaculture Association
Alaska Trollers' Association
Southeast Alaska Conservation Council
Alaska Environmental Lobby
Seafood Producers Cooperative
Southeast Regional Fish and Game Council
North Pacific Fisheries Assn.
Cook Inlet Fisheries Coalition
Cordova District Fishermen United

We have also received many, many letters and public opinion messages statewide in opposition to the pen rearing of salmon.

Baranof Warm Springs

Chinook Hatchery



Hawken Northwest, Inc.

Baranof Warm Springs Chinook Hatchery Development Proposal

Submitted by
Hawken Northwest, Inc.

Introduction

In 1976 ADFG FRED Division identified Baranof Lake in Warm Springs Bay as one of the 10 best hatchery sites in Alaska. It was given the highest rating of all the sites considered by the U.S./Canada Chinook Investigation Team. Today some 12 years later, there still is no hatchery at this location.

The economic potential at this site is worth over $43,000,000 annually to the Alaskan economy! The Alaska Department of Fish and Game estimates the average adult chinook salmon harvested in S.E. Alaska weighs 15.9 pounds and sells for an average of $2.37 per pound giving an ex-vessel value of $37.68 per fish. Using an economic multiplier of 2.1 to project this value to the overall economy, raises this to $80 per fish. Applying the standard operating assumptions developed by ADF&G and NMFS for chinook hatchery design, production, survival, and harvest, the Baranof Warm Springs site has an ultimate capacity to produce over 21,000,000 smolts resulting in almost 650,000 harvestable adults. Under current conditions this would produce over $20,000,000 annually at the current 40% harvest level. If the harvest rate could be increased through management to 85% this annual value would attain the $43,000,000 dollar level.

History

Alaska Department of Fish and Game by-passed this site soon after its evaluation in 1976, because of high construction costs, water rights conflicts, private land ownership problems and lack of department long range planning and political support. NSRAA exercised a preference right on the site, but soon abandoned the right in favor of pursuing other projects with their coho lake stocking program. In September of 1981, Jerry McCutcheon filed a PNP application which was denied on the basis that ADF&G maintained its intent to build a hatchery. FRED Division still lacking an organized chinook rehabilitation program and facing reduced funding, abandoned this project and allow their water rights application to lapse. Wilderness Acquisitions, Inc. purchased their site in early October, 1985. On October 26, 1985. Dale and Greg Young initiated a harvest management study by applying for a PNP hatchery permit at this site and filed for appropriate water rights. NSRAA filed for a second preference right at this site without even having a project or program under development. The ADF&G requested an opinion from the Attorney General's office that stated that the state had first preference right. Wilderness

Acquisitions, Inc. approached both NSRAA and ADF&G proposing a joint venture hatchery to allow development to proceed immediately. Both parties chose not to cooperate. DNR denied Wilderness Acquisitions' water right applications. Wilderness Acquisitions appealed this decision and ultimately filed suit to force DNR to comply with state statutes.

During this period ADF&G and NSRAA made an illegal chum salmon release in Warm Springs Bay. In an attempt to create the basis of a project at the site. At the same time the mariculture issue surfaced and the Wilderness Acquisitions case became a test case for private aquaculture. The legislature imposed a moratorium on aquaculture further delaying resolution of this issue. Hawken Northwest again proposed a cooperative brood stock development program to ADF&G, who again elected to do nothing. Another proposal was submitted to the Chinook Mitigation committee. This proposal was not even considered. Following the appointment of a new FRED Division Director a smaller project of a similar scale to those funded for mitigation was submitted and again brought a response of indecision. **Some 12 years later there still is no hatchery at Baranof Warm Springs.**

Problem Statement

After 12 years of no substantive action by ADF&G or NSRAA the $43,000,000 annual economic impact of this facility is yet to be realized. Neither entity has put forth a project proposal that addresses the potential at the site and the concerns of local businesses and land owners. Due to a lack of coordination and prioritization of many different working groups and lack of the ability to make use of large volumes of production data, catch statistics, and market economics, chinook production has lagged far behind other enhancement efforts. **Private sector investors have nearly a million dollars and three years of extensive research and planning stalled by indecisiveness on the part of the state.** This proposal presents a pathway to correct this situation.

Proposal

Hawken Northwest proposes a phased approach to develop the site thus overcoming the problems that have stopped it to date.

This concept evolved during two years of extensive research and evaluation of the various U.S./Canada treaty mitigation needs and proposals and problems at this site. Although Baranof Warm Springs rated highest of all sites in the evaluation process it was not funded because of the large scale of the proposed projects, the concerns of local residents and water rights issues. This phased approach allows the project to start at a more modest level, then grow to the largest size that meets the reasonable concerns of the local people while providing the highest economic benefit from the mix of opportunities available at the site....

Phase I

On site production could start immediately with eggs and fry transported from Hidden Falls. A production level of 33,000 adults available for harvest would be achieved while developing a stock that performed well under the Baranof site conditions and also exhibited high exploitation rates on inside fisheries.

Phase II

A production level of 100,000 adults available for harvest using the stock developed during phase I. Concurrent with this production would be the development of management procedures to increase the exploitation rates of this targeted stock.

Phase III

A level approaching 650,000 adult chinook could be produced at this site if the resulting fish and related production and harvesting activities could be accommodated in a satisfactory management scheme. By pushing current technology the upper limit could be as high as 1,000,000 chinook annually.

Capital Request		Source
Phase I	$1,500,000	U.S. /Canada Mitigation Funds
Phase II	$3,000,000	
Phase III	To be determined	

Operational Request

Phase I	$225,000	PNP
Phase II	$750,000	PNP
Phase III	?	

Options for Funding and Operations

The three most obvious options to develop start-up operational funding for this project are: 1. Smolt production contracts funded by mitigation monies, 2. The PNP revolving loan fund, and 3. Assessment monies. Once returns come back to the facility, cost recovery funding would be available to the extent that returns exceeded brood needs. There are various ways that these sources can be developed.

Hawken Northwest could contract directly with the state, an association, or a gear group receiving money from the state for production of a given number of fish for a lump sum. This would probably be done on a multi-year basis.

A PNP permit could be applied for by NSRAA or Hawken Northwest and operational funds could be obtained through the revolving loan fund. These monies would be contingent upon appropriation by the legislature.

Assessment funds could be distributed through one or both of the Associations until on site cost recovery options were developed.

An option that would provide more direct involvement by the target gear, would involve issuing a PNP permit to ATA with the funding coming from assessment dollars from NSRAA.

cc

ADF&G
ATA
DNR
Eliason
Grussendorf
NSRAA

Baranof Warm Springs

	A	B	C	D	E	F
1	[illegible]en Northwest Construction Budget -					
2						
3	[illegible]of Warm Springs Chinook Hatchery			Phase I		
4						
5			33,000 Adult Chinook Capacity			
6						
7						
8	[illegible]es					$177,606
9						$0
10	[illegible]ing Tanks					$455,400
11	[illegible] ladder					
12	[illegible] Holding					
13				Area		
14	[illegible]ess Buildings			0		
15	[illegible]upation			250		$22,770
16	[illegible] Storage			160		$21,859
17	[illegible]op			1000		$109,296
18	[illegible]arehouse			1000		$63,756
19	[illegible]earing Cover			2500		$227,700
20	[illegible]awning			200		$18,216
21						$0
22	[illegible]using			2000		$327,888
23						$0
24	[illegible]ock & Landing					$72,864
25						
26						
27						
28	[illegible]tal Cost - Design, Construction					$1,497,355
29	[illegible]verhead and Profit					

Science Council of Canada
Conseil des sciences du Canada

Council Statement

Aquaculture: An Opportunity for Canadians

A Statement by the Science Council of Canada on the Role of Aquaculture in Canadian Fisheries

March 1985

Contents

Preface	7
Chapter 1. The Significance of Aquaculture	9
International Involvement in Aquaculture	9
The Market for Canadian Aquaculture	10
Aquaculture and Fishery Management	10
Aquaculture and the Sport Fisheries	13
Canadian Commitment to Aquaculture	13
Chapter 2. The Viability of Canadian Aquaculture	14
Sites and Leasing Policy	14
Commercial Fishing Interests	14
Special Native Interests	15
Salmonid Enhancement and Private-Sector Ranching	15
Seed Stocks	16
Feed	17
Technology	17
Capital	18
Markets and Quality Assurance	20
The Role of Producer Organizations	20
Infrastructural Needs	21
Chapter 3. Agenda for Action	23
Glossary	25
Bibliography	27

Preface

In many countries commercial aquaculture* is creating profits, new wealth, and new employment opportunities. Yet in Canada it is still an undeveloped industry. Canada has been slow to apply the scientific knowledge available and to use new technologies of cultivation for this renewable resource.

The Science Council of Canada has identified aquaculture as an emerging area of science and technology offering new opportunities to Canadians to maximize the economic and social benefits of the natural resource industry. In July 1983 the Science Council, with the Department of Fisheries and Oceans, co-sponsored the first National Aquaculture Conference. The private sector, the research community, and different levels of government were asked to assess the potential of aquaculture in Canada. The final report from the conference participants concluded that:

> For Canada [commercial aquaculture] means an opportunity to substantially increase exports, create new jobs, provide supplemental employment and income opportunities within the traditional commercial fishery, and to expand support industries that provide equipment, supplies and services. Furthermore, aquaculture has an important role to play in enhancing stocks of fish for the recreational and commercial fisheries. Canada's abundant resource base, both fresh and salt water, is more than adequate to support an aquaculture industry of major dimensions.

The conference strongly urged the government of Canada to designate aquaculture as a high-priority opportunity for development and, in consultation with provincial governments and the private sector, to prepare a National Aquaculture Policy and Development Plan.

In response, the Science Council created an Industry Task Force on Aquaculture. In receiving their final report, Aquaculture: A Development Plan for Canada, the members of the Science Council recognized the significance of this rapidly developing, science- and technology-intensive industry to the need to restructure Canadian fisheries. This statement is based on the final report of the Industry Task Force, research contributions from private sector consultants, and consultations with representatives of the commercial fishing industry, the aquaculture industry, Native groups, and government and university departments. The Science Council believes that Canada's aquatic natural resources can benefit from the development of new technologies and methods that will increase production of commercially attractive marine and freshwater plants and animals by aquacultural methods without exerting further pressures on wild stocks.

---

* This and other specialized terms are defined in the glossary on pages 25 and 26.

Chapter 1

The Significance of Aquaculture

Aquaculture is expected to be one of the agri-business growth industries of the 1980s. This knowledge-intensive industry can be defined as the cultivation of aquatic organisms. It may involve careful control (intensive aquaculture) or minimal management (extensive aquaculture) of the organism's environment to increase survival and improve production. In the past, because of the abundance of wild fish, hunting and gathering met the needs of the market. Only in this century, when increases in population placed greater demands on wild stocks, has scientific understanding of aquatic species permitted the artificial cultivation of fish, shellfish, crustaceans, and seaweeds on a commercial basis. In the last two decades, the gap between demand and supply has prompted the application of farming techniques and new technologies to the cultivation of a wide range of aquatic species.

The application of science and technology to our natural resources can create new wealth and employment, especially in remote communities. Commercial aquaculture draws on a variety of technologies ranging from the development of pelletized feeds and new vaccines to the use of offshore technology in the design of marine enclosures and sea pens and automated feeding, harvesting, and processing techniques. Its advantages over conventional fish-catching methods include

- control of the environment for the organism;
- management of production and quality;
- efficient utilization of water for production;
- low energy costs;
- commercial profitability.

<u>International Involvement in Aquaculture</u>

Aquaculture is already established as a profitable industry in many countries. In the last decade, aquaculture production increased so rapidly that it already accounts for more than 10 per cent of the world's total harvest of fishery products. Leading aquaculture producers are China (more than 2 million tonnes or 25 per cent of its seafood production) and Japan (1 million tonnes or 10 per cent of its seafood production). In the developing countries, warm-water species such as tilapia show great promise as a source of inexpensively produced protein.

Aquaculture production has also been increasing rapidly in cool-water areas. Today, in European fish markets, all freshwater trout, most fresh salmon, mussels, oysters, and some turbot, eels, and freshwater crayfish are products of aquaculture. In North America most catfish, freshwater trout, crayfish, mussels, and oysters are produced by aquaculture. Increasing quantities of farmed shrimp, steelhead trout, abalone, clams, and salmon are also entering fresh fish markets.

The most dramatic example of recent aquacultural expansion of immediate significance to Canada is Atlantic salmon farming in Norway. In the late 1960s declining returns of wild salmon stocks were noted. At that time, Canadians and Europeans were experimenting with new techniques for artificially propagating salmon. In Norway, the application of scientific knowledge, some of it generated by Canadian scientists, allowed private-sector attempts at farming fish in the sea to succeed on a large scale. This led to the first commercial production of salmon. In 1973 Norwegian farmers produced only 171 tonnes for sale. By 1983 Norway produced 22 703 metric tonnes of salmon and trout. Production in 1984 is projected to reach 25 000 tonnes with a first-hand sales value of more than U.S. $100 million. The Norwegian salmon-farming industry now provides direct employment for more than 2000 people on more than 400 licensed and operating farms. When the employment from supporting trades such as feed supply, transport, and processing are added, the employment figure is at least 4000. The Norwegian government information service anticipates that by the year 2000 their aquaculture industry will generate goods worth U.S. $3 billion and will employ some 50 000 people.

Smaller but similar salmon-farming industries are expanding with equal rapidity along the coasts of other North Atlantic nations such as Scotland, Ireland, Iceland, and the Faroe Islands. The prospects for the Atlantic salmon-farming industry are such that by the early 1990s, European production is expected to exceed 50 000 tonnes. This is about equal to the present total Canadian catch of Pacific salmon (see Table 1). In New Zealand and along the coast of Chile, farming and ranching of coho and chinook salmon are also developing. All these enterprises are independent, private-sector investments that reflect an entrepreneurial confidence in aquaculture.

Production from European salmon-farming industries has already had an impact on the traditional market outlets for frozen and processed Canadian salmon in Europe. What is more disturbing is the recent penetration of air-freighted fresh-farmed salmon from Europe into North American and Japanese markets. Norwegian air freight exports to North America started in 1981; by 1983 they exceeded 4000 tonnes. Totals for 1984, although unavailable at the time of going to press, are expected to have increased considerably. Indeed, Norwegian exports are limited only by the present constraints on air freight capacity between Northern Europe and the United States. This level of imports into North American markets is already more than three times the current wild harvest of Atlantic salmon in Canada (see Table 1).

<u>The Market for Canadian Aquaculture</u>

Developing a domestic Canadian aquaculture industry aimed at important export markets such as the United States, Europe, and Pacific Rim nations will help Canada maintain her position as the leading fish exporting nation. Whenever a species is brought into cultivation, the year-round availability of superior-quality fresh produce creates new market opportunities for both the farmed and wild products. This phenomenon is analogous to what happened in the poultry industry when reliable mass-production techniques for chickens, turkeys, and ducks were developed in the 1940s and 1950s. Techniques that allowed cost-effective mass production, continuity of supply, and the application of quality-control procedures led to a rapid expansion of markets. Today, aquaculture is becoming a similar sort of agri-business.

Those species of most importance to Canada and for which commercial aquacultural technology already exists include salmon, mussels, trout, and several species of oyster. Clams, scallops, other shellfish, turbot, and arctic char also have some potential.

<u>Aquaculture and Fishery Management</u>

At a time when the wild fisheries are experiencing difficulties, aquaculture is supplying an increasingly significant proportion of fish protein. Around the world, aquaculture is seen as a means of producing badly needed high-quality protein while employing the under-used skills and capacity of the traditional

Table 1: Nominal Catch and Landed Value of Main Categories of Fish in Canada and Those of Interest to Aquaculture Production (Quantity (Q) in tonnes live weight and Value (V) in $000)

Species	Atlantic Coast		Pacific Coast		Canada	
	Q	V	Q	V	Q	V
1 9 8 2						
Total Groundfish	820 327	291 139	54 353	27 999	874 680	319 138
Total Pelagic and Other Finfish	270 150	52 714	98 857	198 091	306 007	250 805
Salmon	1 536	6 068	65 715	165 088	67 251	171 156
Total Shellfish	170 155	237 755	7 575	9 986	177 730	247 741
Oysters	1 321	1 323	1 579	981	2 900	2 304
Total Sea Fisheries	1 197 632	589 174	160 785	240 081	1 358 417	829 255
Inland Fisheries					57 743	58 847
Grand Total Canada					1 416 160	888 102
1 9 8 3						
Total Groundfish	764 248	275 115	62 710	36 453	826 958	311 568
Total Pelagic and Other Finfish	201 785	46 757	112 293	149 228	314 078	195 985
Salmon	1 210	4 797	70 630	104 000	71 842	108 797
Total Shellfish	141 991	294 662	7 797	12 206	149 788	306 868
Oysters	1 486	1 373	1 600	1 040	3 086	2 413
Total Sea Fisheries	1 108 024	621 248	182 800	202 190	1 290 824	823 438
Inland Fisheries					50 000	50 800
Grand Total Canada					1 340 824	874 238

Source: Canadian Fisheries Highlights 1983, Statistics and Analysis Division, Fisheries and Oceans Canada, 1984.

fishing industry. The profitability of aquaculture and its ability to contribute new employment and wealth to local economies is no longer questioned. There are many large-scale aquaculture development programs for coastal areas, most of them supported by international aid financing, that retrain fishing employees in aquaculture techniques for the production of tilapia, milkfish, sea bream, prawns, and many other species.

In the European Economic Community, for example, aquacultural initiatives are an integral part of fishery management policy and a mechanism for economic development in rural communities. In Norway aquaculture and the traditional fisheries are closely allied. Almost 50 per cent of the salmon farmers are former fishermen or traditional fishing industry employees. Extensive use is made by the salmon-farming industry of the technologies developed in support of the traditional fisheries. Recent Norwegian projections indicate that by 1985 sales of farmed salmon and sea-reared trout will exceed their sales of cod, traditionally the main export species, with exports valued at about U.S. $135 million. Japanese aquacultural operations are now intertwined with those of the coastal fisheries and play an important economic role in their maintenance; the artificial harvest of several species now greatly exceeds the production of the natural stock.

The potential of aquaculture as a facet of fish production remains largely unrecognized in Canada. In maintaining its position as the number one fish-exporting nation in the world and in attempting to conserve wild stocks, Canada has established extensive programs of fishery management. These vary from catch quotas and other regulatory controls to quality-improvement and cost-reduction programs, stock enhancement, and related research programs. Such programs constitute a large part of the total costs of managing Canadian fisheries. The integration of resource management policies with commercial aquaculture development would cut down on the use of public funds and may lead to beneficial technical spin-offs.

The classic problem confronting the traditional fisheries is the common property of the resource. As long as individuals do not own the rights to harvest a specific share of the wild fisheries, they will have no individual incentive to conserve it properly or harvest it efficiently. There is a well-documented and well-analyzed tendency toward excessive exploitation of the resource and excessive investment in the industry, as individuals attempt to increase their own share at the expense of others.

Fishery management policies are intended to address this fundamental economic problem. Harvesting quotas, the establishment of privately managed terminal or "pocket" fisheries, the authorization of privately financed enhancement "ranching" operations are all methods of overcoming the problems associated with common property ownership. Commercial aquaculture is a logical extension of these measures. With fixed-enclosure aquaculture, the common property problem in harvesting is eliminated, providing the institutional framework for the efficient production of fish products from privately owned or leased farms.

This is not to suggest that aquaculture can resolve all current fishery management problems, or substitute for commercial wild production. Properly managed wild fisheries can yield considerably lower-cost fish than intensive aquaculture. However, wild resources are harvested seasonally and cannot provide sufficient quantities of top-quality fresh produce to year-round markets. Reducing the wild catch in order to increase escapements is probably the most cost-effective short-term means of increasing wild production -- certainly more so than constructing new public hatcheries. However, aquaculture can provide an efficient source of incremental fish production to meet the growing demand for fish products and to relieve increasing pressures on the wild resource.

Aquaculture and the Sport Fisheries

Some of the pioneering efforts in Canadian aquaculture involved the construction and operation of hatcheries for sport fisheries. At present some of the private trout hatcheries across Canada stock lakes for the inland sport fisheries; the salmon and steelhead trout sport fisheries are enhanced through the work of the Department of Fisheries and Oceans. These sport fisheries are extremely important to Canada. On the west coast alone, the direct income impact of resident tidal and nontidal angling in 1980 was estimated at between $38 million and $40 million, with direct employment in the range of 3500 to 4000 person-years.

An emerging aquaculture industry with efficient methods of producing juvenile fish has a role to play in supplying the needs of sport fisheries. Reducing commercial pressure on salmon stocks by farming these species would help to meet growing sport and Native food requirements without further depleting the wild resource.

There is no reason why the aquaculture industry should not develop alongside a flourishing sport fishery. As the sport fisheries develop, so will their need for suitable stocks of juvenile fish for stocking rivers and lakes. Commercial aquaculture can supply these future needs at lower cost than current government-run hatcheries can.

Canadian Commitment to Aquaculture

Aquaculture has an important part to play in the Canadian fisheries. However, to realize its benefits, a firm commitment from both federal and provincial governments is needed. Therefore,

1. The Science Council of Canada recommends that federal and provincial governments state clearly their intention to develop a commercial aquaculture industry in Canada. In consultation with industry, specified production targets for identified species should be set. Governments should take concerted action to ensure that aquaculture is made an attractive area for investment and create lead agencies, as outlined in the final report of the Industry Task Force, to coordinate the development strategy for this emerging science-based industry.

Chapter 2

The Viability of Canadian Aquaculture

Other countries, when faced with declines in their traditional fisheries caused by environmental problems or jurisdictional limitations, have turned to large-scale aquaculture development. A recent survey of salmon farms in Norway showed that they produce an average annual operating surplus equivalent to about Cdn $30 000 per employee. A study by the Department of Fisheries and Oceans recently determined that the gross profit of Norwegian salmon farms was approximately 27 per cent of gross sales. There is every reason to believe that if an integrated industry is launched in Canada, similar profit levels could be achieved in less than a decade. Marketing studies done for salmon farming on both Canadian coasts conclude that even with the expanding production of farmed fish from other countries, Canada has sufficient market potential to support an aquaculture industry.

In order to establish a commercially viable aquaculture industry in this country, several essential components must be developed in concert.

<u>Sites and Leasing Policy</u>

The extensive coastline and abundant freshwater resources of Canada offer many possible sites for aquaculture, well within the acceptable temperature limits for the growth of commercially significant species. Indeed, the coasts of Canada could ultimately sustain a very large scale of production. Across Canada good sites for the cage, pond, and raceway cultivation of trout and other species abound. However, only a few have been developed even on an experimental scale.

Site availability will not limit the development of an aquaculture industry in Canada. However, the sites identified by the private sector must be opened up to commercial aquaculture development without adversely affecting other users of coastal and shoreline areas. This requires the creation of appropriate leasing policies. Various ways of influencing the development of the industry through leasing policies might include:

(a) the attachment of specific terms and conditions to aquaculture permits to limit ownership of the resource to resident individuals or companies;
(b) the provision of special incentives, such as grants, access to low-interest loans, and technical services, to locally-owned operations;
(c) the provision of similar special incentives to scattered small producers to enable them to organize into more efficient integrated cooperatives or large firms.

Clearly, aquaculture developments in rural areas can provide employment and income for the local residents. If leases can be reserved for these people (or for applicants who will ensure significant local participation) without compromising the economic performance of the operations, the developments would be doubly beneficial -- they would provide a return on investment as well as badly needed income and employment.

<u>Commercial Fishing Interests</u>

The negative effects of reducing the commercial fishing fleet capacity can be mitigated if new employment in aquaculture is created at the same time. Preferential access to aquaculture leases or special opportunities offered to those displaced from the wild fisheries through the buy-back programs could achieve this goal. Governments may wish to promote entry into aquaculture for anyone participating in the -licence (salmon fishing) buy-back program. This would also offer the side-benefit of new productive uses for existing excess fishing vessels. Since moving into aquaculture production requires new skills, training and extension courses must be organized.

Special Native Interests
For Native people, the issue of certain leasing policies affects not only economic development opportunities but also aboriginal land claims. Confrontation between Native people and private-sector entrepreneurial interests over aquaculture development must be avoided.

If leases are not allocated in an equitable way, Native people will undoubtedly argue that future land claims settlements may be compromised. This would not only be perceived as an injustice to Native groups, but might also result in the obstruction of aquaculture development with legal and political actions challenging the issuance of leases to non-Natives. Thus, in developing leasing policy, all levels of government should consult with Native groups prepared to enter into this new industry. The federal Department of Indian and Northern Affairs should ensure that Native interests are represented in all aspects of aquaculture policy and planning. Federal/provincial coordination in the development of leasing policies is also needed to ensure that matters of aboriginal and usufructuary rights within federal jurisdiction are not ignored by provincial leasing initiatives.

2. The Science Council of Canada recommends that both federal and provincial levels of governments work with the private sector and with representatives of Native groups to prepare enabling legislation to establish a legal framework for the conduct of commercial aquaculture, to clarify or create the necessary rights, supply financial incentives, and regulate the industry as appropriate.

Salmonid Enhancement and Private-Sector Ranching
Salmonid enhancement programs for Pacific salmon evolved from efforts to conserve salmon stocks, increase returns to the west-coast fishery, and improve incomes, regional employment, and economic development. Enhancement of wild salmon stocks employs extensive aquaculture techniques to artificially propagate salmon eggs in hatcheries and release juvenile salmon (smolts) into the wild. Salmonid enhancement programs (SEPs) have considerable facilities, personnel skills, research capabilities, and some brood stocks. The aquaculture industry should have access to these resources from which they could draw assistance to accelerate the growth of commercial aquaculture. Research on pathological, nutritional, genetic, and physiological problems of salmonids relate to the needs of the aquaculture industry. The aquaculture of salmonids in sea pens offers many opportunities for research investigations that could assist the enhancement of wild stocks.

Commercial salmon ranching involves technology transfer of government hatchery research and practices into the private sector as a business. Elsewhere, economic incentives for salmon enhancement that are directly linked to harvest opportunities have encouraged the private sector to share more of the responsibilities and costs for enhancement, habitat protection, and harvest management. Although biological and social concerns must be considered, there are also strong arguments in support of Canada increasing the extent of private-sector involvement in both enhancement and private-sector ranching as an adjunct to commercial aquaculture. Proponents of commercial salmon ranching argue that it would lead to more efficient management of the fishery and to greater economic benefits for those employed in it.

A key element in the cost of salmonid enhancement is the cost of rearing juvenile salmon. The improved, more efficient techniques used in the fish-farming industry, if applied to salmonid enhancement, could help reduce rearing costs. Contracting out more of this work to the private sector could also improve the efficiency of salmonid enhancement. This might include placing some existing SEP hatcheries under private-sector management and allowing them to reduce costs by the sale of surplus eggs, fry, and smolts to salmon farmers. SEPs could also contract out new commercial hatcheries to rear fry specifically for enhancement purposes.

Tests of commercial ocean-ranching ventures, involving both Pacific and Atlantic salmon and other species, are being carried out in other countries such as the United States, Iceland, Chile, and Scotland. To enhance the public fisheries, Alaska has encouraged the development of non-profit salmon hatcheries operated by fishing cooperatives and interested individuals. Along the Pacific coast (in California, Oregon, Washington State, and Alaska), both public and private sectors are involved in enhancement, but only in Oregon and California has this been permitted on a profit-making basis. It is still premature to evaluate the success of such ventures. However, Canada should not preclude private-sector experimentation and involvement in this interesting field. In particular, using surplus fry and smolt production for ranching operations alongside farming operations may work well in Canada.

3. The Science Council of Canada recommends that the Department of Fisheries and Oceans develop policies integrating the needs of fish population enhancement with the needs of a commercial aquaculture industry. Private-sector management of enhancement programs should be permitted.

Seed Stocks

Supplies of hatchery-reared seed stock are an essential component of the industry. Mussel farmers and oyster farmers in Canada currently depend largely on the collection of wild seed. These seed collection areas must be protected from environmental degradation, commercial exploitation, and depletion of the brood stock to allow expansion of mussel and oyster production. As the oyster industry moves toward more intensive forms of cultivation and the volume of production increases, wild sources of seed (spat) will become inadequate to supply the industry. On the Pacific coast the oyster industry is already beginning to use hatchery-reared spat, and in Nova Scotia the developing industry of rearing European oysters depends exclusively on supplies of hatchery-reared seed.

Allied to seed stock availability is the need for genetic selection of suitable genotypes and for selective breeding programs. Their importance to aquaculture parallels the importance of selecting suitable strains in the poultry, pig, and cattle industries.

The supply of juvenile salmon (smolts) that have suitable genetic strains for rearing under farm conditions is an important limiting factor in the production of farmed salmon in Europe. Farmed salmon production in Canada cannot expand significantly until appropriate supplies of smolts are available from government hatcheries and a sufficient number of commercial smolt production facilities are established by the industry.

4. The Science Council of Canada recommends that Canadian governments at all levels cooperate closely with the industry to support the creation of private-sector hatcheries sufficient to supply the needs of a rapidly growing industry with superior strains of seed stock.

Feed

Shellfish cultivation usually uses the natural planktonic food in the water. Thus feed costs contribute little to the cost of production, except in the intensive hatchery production of oysters and other shellfish. However, finfish aquaculture requires the feeding of artificially formulated diets to fish enclosed in cages, tanks, ponds, or raceways. The cost of fish feed is critically important to the viability of the industry.

As in the production of feeds for poultry and other agricultural industries, feed production in fish farming involves the formulation of relatively low-cost protein, fat, and carbohydrate sources into nutritionally adequate packages. Canada is well endowed with supplies of the raw fish wastes that are used for such feed. At the moment, much of this raw product is exported rather than being upgraded by producing pellets in Canada.

Feed technology also requires scientific knowledge of the nutritional needs of fish species. Several groups of Canadian researchers already have substantial expertise in this area. To date, much of their research has been applied by feed-stock producers in other countries. Tapping these resources would lead to the development of a domestic fish-feed industry, replacing imported feed stocks. The fish-farming industry that can be supported on the west coast alone is expected to be at least as large as that of Norway where there are several fish-feed producers.

5. The Science Council of Canada recommends that the aquaculture industry develop commercial applications for Canadian raw fish wastes and sponsor research, particularly in fields such as fish nutrition and feed technology.

Technology

In order to establish an efficient, profitable industry, it is essential to reduce the costs of production. This can be done by introducing automated techniques and expanding commercial production using the most modern methods and technologies available. A great deal of the necessary commercial-scale production technology and know-how is already available. The techniques of commercial production and sea-farm management must be transferred to Canadian industry as rapidly as possible, to adapt them to Canadian conditions and to deploy them in expanding commercial ventures.

There are many ways of obtaining foreign technology and know-how. In the present context, the most relevant mechanisms are the negotiation of technology transfer agreements, attracting direct investment by companies with this know-how to Canada by joint ventures, special licensing arrangements, and technical exchange training programs.

Arrangements like these are essential to accelerate the development of Canadian aquaculture. First, they will inspire greater confidence in the growth of the industry and will attract sources of risk capital. Second, these arrangements will help Canadian companies to earn profits more rapidly. Third, they will accelerate the rate at which production increases, thereby enabling Canadian production to become known and established in world markets in the next decade. Therefore, Canadians must acquaint themselves with overseas firms from which they could buy technology, or to which they could sell their produce.

6. The Science Council of Canada recommends that industry, with the support of the relevant government agencies and centres of aquaculture research and development, seize opportunities for technology transfer and develop new markets for species under commercial production in Canada.

This process of adapting foreign technology to the Canadian situation can draw on existing scientific capability in Canada. If some of the substantial research capability in Canada were applied to the problems inherent in commercial aquaculture, considerable advances in commercial production could be achieved in a relatively short time. The research community has an important role to play together with industry in the three distinct facets of technology development and transfer through:

a) the transfer of already-established commercial technologies and know-how to Canada;
b) research and development programs to create the indigenous technologies that will allow commercial-scale aquaculture in Canada;
c) the export of improved aquacultural technologies from Canada.

7. The Science Council of Canada recommends that governments direct their lead agencies for aquaculture to coordinate funding from all sources and, with the advice of the Regional Aquaculture Coordinating Committees recommended by the Industry Task Force, channel funds into development of the species identified as having the greatest commercial potential in each region.

Although it may be premature to discuss the export of aquacultural technologies from Canada before a commercial aquaculture industry has been established, the long term could bring significant spin-off benefits to other Canadian industries as well as constituting a component of Canadian aid to less developed nations. The International Development Research Centre and the Canadian International Development Agency are already involved in aquaculture assistance to less developed nations. The creation of an indigenous aquaculture industry in Canada could only strengthen these initiatives.

Capital

The success stories of aquaculture in other developed countries should encourage Canadian sources of capital to invest in this new area of opportunity. As the federal government's report, A New Direction for Canada: An Agenda for Economic Renewal, states:

> If we are to be competitive, we must become effective in applying leading-edge technologies in producing goods and services. Economic success will stem not only from producing technology, but from using new technology in established industries.

The basis of a successful aquaculture industry will be a core of integrated, self-sufficient companies and cooperatives that use the most advanced technologies available. Operations like this are the mainstay of the industries established in Europe. These operations need several million dollars in investment and equivalent sums of working capital. When such enterprises are fully established, smaller grow-out operations can prosper. However, the front-end costs are high, there are inherent risks in cultivating living organisms, and a relatively long-term investment is needed (a minimum of three years before there is a return on capital), therefore it may prove difficult to attract domestic capital.

To make the transition from pioneering efforts in aquaculture to a highly capitalized industry employing sophisticated technology, four likely sources of capital could be tapped:

1. Existing Canadian aquaculture enterprises could achieve the necessary rapid growth by entering into joint ventures with large firms that have capital to invest. These might include, for example, Canadian firms with an interest in fisheries, related resource-based firms, or the food industry. They could also include foreign firms that already have expertise in aquaculture. Entering into such joint ventures may turn current owner/managers of aquaculture enterprises into minor shareholders, or even managers of their firms.

2. Existing Canadian firms already involved in fisheries or in the resources sector may invest in aquaculture on their own. They will then need to buy the necessary expertise either from domestic or from foreign sources.

3. Governments could take minority-share status in aquaculture firms. This route has been successful in remote areas of the Highlands and Islands of Scotland as a way of enabling small producers to establish new enterprises.

4. Foreign firms with capital or expertise could be encouraged to establish "greenfield operations," i.e., new businesses involving specially constructed facilities.

Canada may ultimately have to depend on a judicious blend of foreign and domestic capital to develop this sector, despite the tradition of giving preference to Canadian capital. In any case, Canadian firms must improve their operations, especially to attract capital and enhance their reputation as business partners. Before new investors will support this area of new technology, entrepreneurs must strengthen their managerial capabilities and incorporate the most modern techniques and technologies currently available.

8. The Science Council of Canada recommends that entrepreneurs in the aquaculture industry create the appropriate conditions to attract investment capital by:
a) participating in technical exchange agreements and adapting foreign and domestic best-practice technology;
b) examining ways of reducing risk to meet the standards set for aquaculture insurance;
c) raising the quality of their business planning.

Although investment money is available in Canada, most of it is put into more secure, better-understood areas of investment. Government policies are needed that will create a climate of certainty to elicit the necessary investment. At the moment, jurisdictional competition between levels of government and among different departments only adds to confusion and uncertainty. A clear signal would be sent to the investment community if the government announced the development of a commercial aquaculture industry with specified production targets for particular species as a provincial or even a national goal and launched a concerted effort to achieve this goal within the decade.

9. The Science Council of Canada recommends that federal and provincial ministries clarify their departmental mandates regarding

aquaculture and evaluate their programs with a view to enhancing their support for commercial aquaculture.

Governments must reorder their investment incentives to attract Canadian capital into promising new areas of knowledge-intensive development, such as aquaculture. Tax measures that ensure the eligibility of new capital for these emerging opportunities should be instituted. There are also sound economic reasons for direct government support to sectors such as aquaculture, that are relatively risky and require "patient" capital. The federal and provincial governments could identify the most appropriate mechanisms to enhance the development of these sectors. Given its proposed new proactive mandate, Investment Canada might help by attracting new foreign investment. Similarly, governments could provide the appropriate communication, transportation, and veterinary infrastructure to signal their support for the industry and the investment community.

10. The Science Council of Canada recommends that Investment Canada use its new proactive mandate to seek out sources of both domestic and foreign capital with a view to facilitating investments that will stimulate the development of Canadian aquaculture capabilities. It further recommends that External Affairs, through its science counsellor network, assist entrepreneurs to identify opportunities for international technical exchange agreements.

Markets and Quality Assurance

Marketing is a crucial part of a successful industry. Aquaculture in other countries expanded on the basis of developing new markets and providing fresh produce to these markets "in the right place, at the right time, and at the right price." Good market potential in the United States, Europe, and the Pacific Rim countries exists for all the prime candidate species of Canadian aquaculture. To penetrate these markets, marketing strategies must be based on consistent supply and quality assurance. This requires an informed and disciplined approach to marketing and close cooperation among individual producers through their organizations and interaction with government regulatory agencies.

Indeed, it would greatly benefit the entire fishing industry if quality-assurance standards and marketing strategies developed in the context of aquacultural production were integrated with the standards and strategies that apply to the harvesting of wild stocks.

11. The Science Council of Canada recommends that the aquaculture industry create effective producer organizations to provide a forum for continuing consultations with government, to cooperate and share knowledge within the industry and enable producers to develop self-discipline concerning quality-assurance standards and market promotion.

The Role of Producer Organizations

Producer organizations are perhaps the most powerful force to influence the course of development of aquaculture. In the wild fisheries, fishing cooperatives and other industrial organizations have exerted powerful political and economic influence on the shape of the industry in the production, processing, and marketing sectors. Farmers' organizations have had a similar influence on the development of government policies and programs for agriculture.

In countries in which commercial aquaculture flourishes, producers' organizations with strong marketing interests are supported by a levy on farmers' sales or production totals. The European Economic Community offers incentives to newly created producers' associations, such as 80 per cent of their operating costs in their first year, declining gradually over five years.

Canadian aquaculture producers must work toward the development of a disciplined industry that uniformly upholds high standards of quality assurance and that can agree on the seasonal distribution of production to available markets. Strong producers' organizations can provide a coherent voice for the industry to all levels of government on the development of policy and can assist in communications and technology transfer within the industry. They must work to ensure the orderly development of the industry and to prevent destructive local competition among producers when they pool their resources to compete effectively on international markets.

However, at present, the embryonic industry does not have the resources or personnel to establish an effective organization to represent the national interests of aquaculture producers. The creation of national producer groups under the umbrella of the Aquaculture Association of Canada (formed in 1983 at the first National Aquaculture Conference) should be assisted at these early stages with government support. As the industry takes shape, such assistance should be phased out in favour of self-supporting industrial associations.

12. The Science Council of Canada recommends that governments extend assistance to the aquaculture industry for an initial five-year period to help create effective producer organizations.

Infrastructural Needs

The range of programs already in place to manage the wild fisheries is impressive. Many of the skills and resources in these programs could be applied to the development of commercial aquaculture. For example, expansion of the existing fish pathology capabilities in universities and in the federal Department of Fisheries and Oceans would provide an efficient veterinary and diagnostic service for fish farmers. Applying existing fisheries research capabilities could bring promising candidate species into commercial cultivation and initiate research on relevant diseases, nutritional problems, breeding programs, and other topics of economic significance to the industry.

An aquaculture industry will require a range of supporting services, including veterinary and diagnostic services, research and development work, quality-assurance requirements, and an advisory extension service to fish farmers (comparable to that in place for agriculture). These were outlined in more detail in the Industry Task Force report, Aquaculture: A Development Plan for Canada.

13. The Science Council of Canada recommends that the federal government work with provincial governments, in consultation with the industry, to establish appropriate services, particularly aquacultural veterinary and pathology services.

Furthermore, federal and provincial governments should cooperate to develop centres of excellence that would serve the needs of the aquaculture industry. Research and education facilities already exist in Nanaimo, Guelph, and Halifax, which could serve as the nuclei for such centres. Cooperative education programs, such as those developed at the University of Waterloo (involving several months of practical on-site experience), and the curriculum of the University of Stirling's Institute of Aquaculture in Scotland should be considered as models for curriculum development.

14. The Science Council of Canada recommends that federal and provincial governments cooperate to develop centres of excellence to serve the needs of the aquaculture industry.

Local Community Economic Development, Job Creation, and the Public Involvement and Small Projects components of the Department of Fisheries and Oceans' Salmonid Enhancement Program has done much to interest Native people, young people, and local residents in the "hands-on" management of fish. However, technicians must be trained in the basics of commercial aquaculture and business management techniques. This can best be accomplished at the level of community colleges and technical schools in short basic learning programs augmented by extension courses (such as seminars on specific species or problems). Again, these training programs should be integrated with practical on-site experience; Scottish extension programs should be examined. Video-taped learning modules should also be prepared by Canadian colleges and universities in cooperation with universities and agencies abroad and distributed to fish farmers to show specific fish diseases or new technologies that could be adapted to Canadian fish farms. (This is already being done on a commercial basis in Norway.)

15. The Science Council of Canada recommends that federal and provincial governments support the development of commercial aquaculture with retraining programs, local employment programs, and community development projects.

Chapter 3

Agenda for Action

Canadian aquaculture is o... threshold of commercial development. Although Canada is currently lagging behind other nations in developing this technology, it now has an opportunity to develop this industry very rapidly. During the next decade, it could create an indigenous Canadian aquaculture industry of at least the same capacity as Norwegian aquaculture. Canadians must quickly adopt, adapt, and develop the necessary techniques for a viable aquaculture industry before the window on market opportunities closes. One thing is clear. At both the level of governmental policy and industrial application, a great deal can be learned from other countries.

The recommendations for aquaculture are summarized below. They are grouped according to sector and listed in order of priority.

The Science Council of Canada recommends that federal and provincial governments:

- recognize commercial aquaculture as a high-priority opportunity for development (see recommendation 1);
- establish lead agencies to coordinate and encourage the development of this emerging science-based industry (recommendation 1);
- direct these lead agencies for aquaculture to coordinate funding from all sources and, with the advice of Regional Aquaculture Coordinating Committees, channel funds into development of the species identified as having the greatest commercial potential in each region (recommendation 7);
- cooperate closely with the industry to support the creation of private-sector hatcheries sufficient to supply the needs of a rapidly growing industry with superior strains of seed stock (recommendation 4);
- extend assistance to the industry for an initial five-year period to assist in the creation of effective producer organizations to provide a forum for continuing consultations with government, to cooperate and share knowledge within the industry and to enable producers to develop self-discipline concerning quality assurance standards and market promotion (recommendation 12);
- work with the private sector and with representatives of Native groups to prepare enabling legislation to establish a legal framework for the conduct of commercial aquaculture, to clarify or create the necessary rights, supply financial incentives, and regulate the industry as appropriate (recommendation 2);
- support the development of commercial aquaculture with retraining programs, local employment programs, and community development projects (recommendation 15);
- cooperate to develop centres of excellence to serve the needs of the aquaculture industry (recommendation 14);
- clarify departmental mandates regarding aquaculture and evaluate programs with a view to enhancing support for aquaculture; in particular, Investment Canada should use its new proactive mandate to seek out sources of domestic and foreign capital with a view to facilitating investments that will stimulate the development of Canadian aquaculture capabilities; and External Affairs, through its science counsellor network, should assist entrepreneurs to identify opportunities for international technical exchange agreements (recommendations 9 and 10);

- develop policies integrating the needs of fish population enhancement with the needs of a commercial aquaculture industry (recommendation 3);
- establish appropriate services for the industry, particularly veterinary and pathology services, in consultation with the industry (recommendation 13).

The industry should:

- create effective producer organizations to provide a forum for continuing consultations with government, to cooperate and share knowledge within the industry and enable producers to develop self-discipline concerning quality assurance standards and market promotion (see recommendation 11);
- seize opportunities for technology transfer and develop new markets for species under commercial production in Canada (recommendation 6);
- create the appropriate conditions to attract investment capital by:
  - a) participating in technical exchange agreements and adapting foreign and domestic best-practice technology;
  - b) examining ways of reducing risk to meet the standards set for aquaculture insurance;
  - c) raising the quality of their business planning (recommendation 8);
- develop commercial applications for Canadian raw fish wastes and promote scientific research, particularly in fields such as fish nutrition and feed technology (recommendation 5).

SALMON CULTURE, FISH HEALTH AND THE ENVIRONMENT

By John Pitts, D.V.M.

Opponents of salmon farming in Washington State have claimed that wild populations of salmon will suffer from increased disease problems if salmon farming is allowed to proceed. Salmon aquaculture has prospered in Puget Sound for nearly 20 years in net-pens and for over a hundred years in state and federal hatchery programs. There has been no evidence of disease transmission to wild stocks because of these programs in Washington State. In addition, our neighbors to the north have been planting fish for over 100 years and there is no evidence that Canadian fish stocks have been adversely affected by diseases introduced from hatchery aquaculture (Hicks, pers.comm., 1988).

When fish biologists and pathologists have been asked to comment on this question, the answer has been consistent: Transmission of disease from farmed salmon to wild fish could happen, but it is very unlikely and has not been observed. More probable is the transmission of disease from wild fish to cultured fish (Kevin Amos, Washington State Department of Fisheries; Dr. Ralph Elston, Batelle NW; Dr. Lee Harrell, National Marine Fisheries Service; Dr. Brad Hicks, British Columbia Veterinary Service; Dr. Mike Kent, Batelle NW; Dr. Marsha Landbolt, University of Washington; Dr. Gary Wedemeyer, United States Fish and Wildlife Service; Dr. Jim Winton, United States Fish and Wildlife Service, pers.comm, 1938). The same response was given by scientists from Europe experienced in fish culture (Dr. Hans Achefors, University of Stockholm; Dr. Ron Roberts, Stirling University; Dr. Harald Rosenthal, Hamburg, West Germany). In no case has any evidence been presented to show that disease has moved from private sector aquaculture to the wild fishery (Needham, 1981; Neuman, 1986). As stated, the opposite is true, fish in private culture frequently become sick from communicable diseases when they are exposed to wild fish (Hicks & Ferguson, 1986; Hedick, et.al.,1986; Ostland, et.al., 1987). Although we must be aware of the interaction of disease in wild and cultured stocks it is much more likely that the private sector aquaculture will be adversely affected by diseases present in wild populations than vice versa.

The potential for any disease transmission, be it direct contact, air borne or water borne, is much greater when the organism is under stress. Experience has shown that a wide variety of bacterial, parasitic and other diseases become a problem only if fish are being held under environmental conditions unfavorable for that particular species or strain. Such unfavorable conditions include crowding, temperature fluctuations, inadequate dissolved oxygen, excessive a rough handling, sublethal levels of toxic materials, etc. (Wedemeyer, et. al., 1976). It is not in the best interests of the fish or fish farmer to crowd his farm or he may suffer crop losses. The farm itself must be located in an area of good oxygen supply and good flushing. Siting guidelines prepared by Washington State Department of Ecology require minimum depth and current requirements to ensure that the environment is protected while the fish prosper. The recent mortalities at two farm sites in Port Townsend caused by an unknown toxin in the water, points out the sensitivity of the farmed fish in a compromised environment. These fish are biological monitors, and along with our shellfish, are among the first to alert us to potential problems with water quality.

References

1. Hedrick, R.P., M.L. Kent and R.J. Toth, 1986. Myxosporeans Detected in Non-Salmonid Fishes from Water Enzootic for Proliferative Kidney Disease (PKD). American Fisheries Society/Fish Health Section, Newsletter 14(2): 4.

ks, b.D. and H.W. Ferguson, 1986. Proliferative Kidney ease in Arctic Char (Salvelinus alpinus) from ewfoundland. American Fisheries Society/Fish Health Section, Newsletter 14:6.

3. Needham, T., 1981. What sort of disease protection do we want? Fish Farmer 4: 19.

4. Neuman, S.G., 1986 - In Aquaculture Digest.

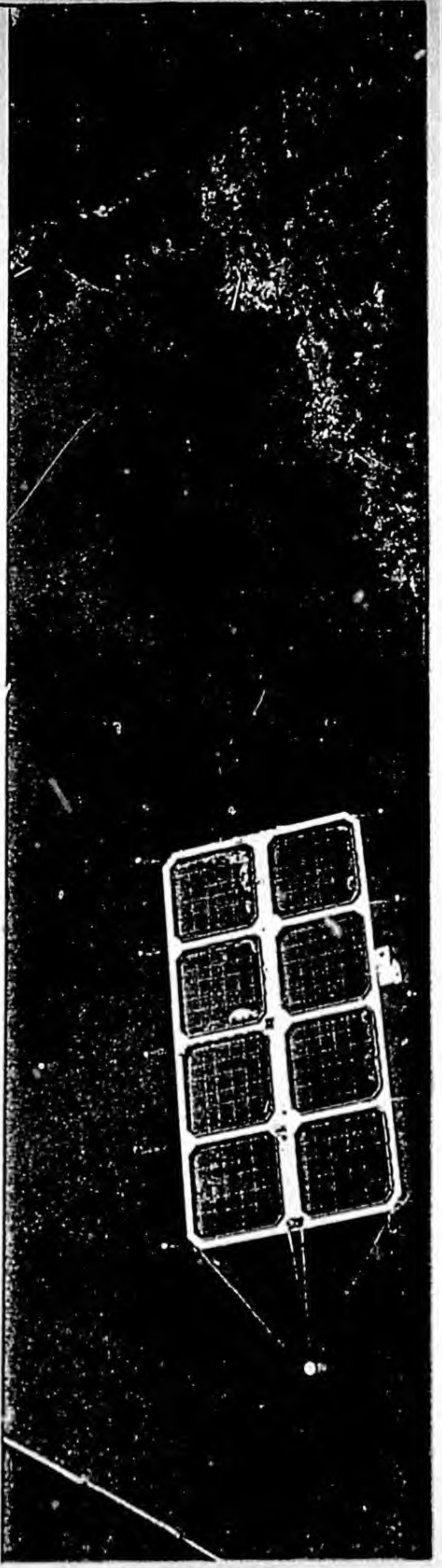
5. Ostland, V.O., B.D.Hicks and J.G. Daly, 1987. Furunculosis in Baitfish and its Transmission to Salmonids. J. Aquatic Anim. Dis. - in press.

6. Wedemeyer, G.A., F.P. Meyer, and L. Smith, 1976, Environmental Stress and Fish Disease, T.F.H. Publ.

Salmon Farming on the Sunshine Coast

By Peggy Parker

To Yvonne Kraft, the salmon she tends aren't just fish. "They're like your kids," she says. "You watch them every day, worry that they're eating enough and staying healthy. Let me show you the females we're raising for brood stock."

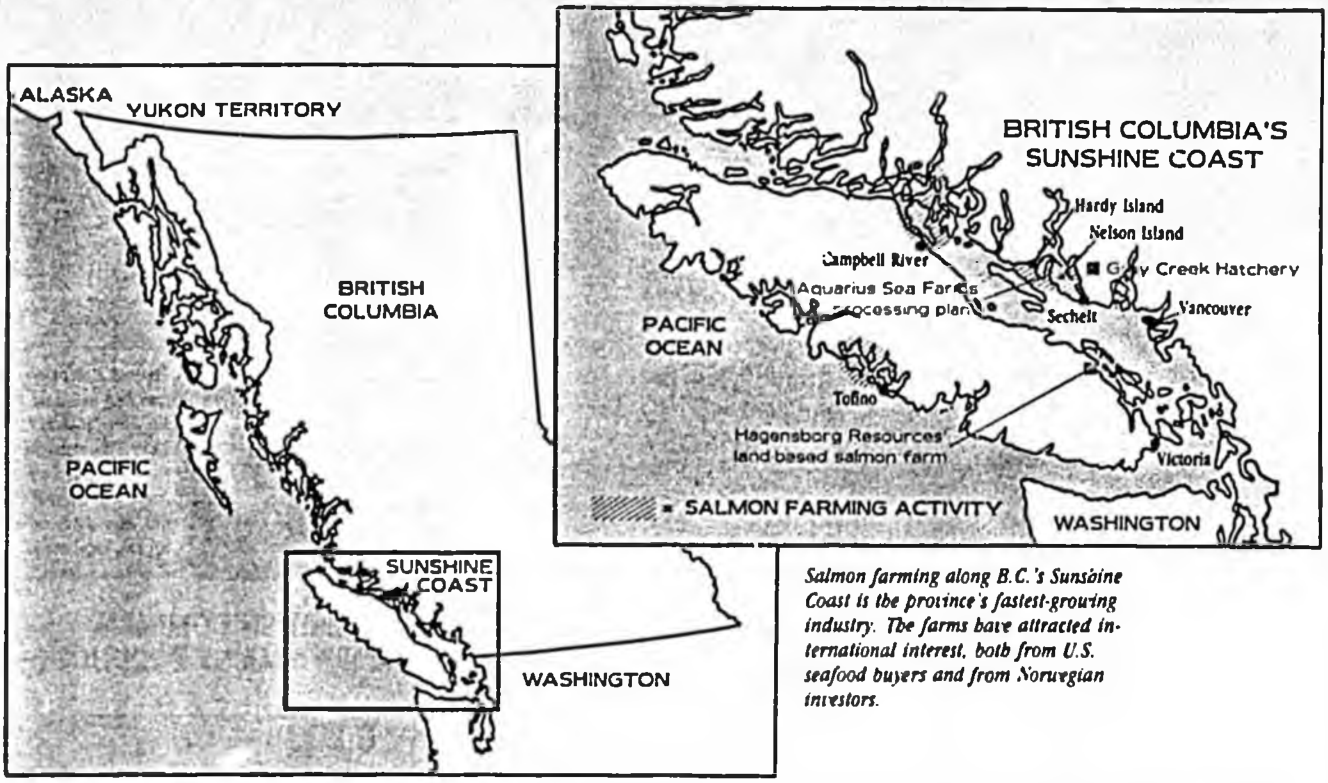


Kraft spent most of 1985 at this grow-out site in British Columbia, living in a plywood and tin shelter set on the floating farm — a series of underwater pens holding young chinook and coho salmon and connected by aluminum catwalks. The site is 40 miles from the nearest town.

"Last winter I'd be out here talking to these fish," she laughs, "talking to my girls."

Kraft is a partner in Aquarius Sea Farms, the largest producer of cultured salmon in British Columbia. In 1985, she was not the only person who was interested in the fish swimming in her net pens. U.S. buyers who had come to rely on Norwegian farmed salmon were realizing that B.C. farms could augment supplies of farmed salmon — at reduced shipping costs — if they could produce reliable quantities.

B.C.'s salmon farmers geared up to meet these demands. Now, after three years of watching the progress of this budding industry, U.S. buyers no longer have to wait. The first harvest of salmon came in September, buyers liked what they saw, and wholesale prices jumped far higher than expected. This year marks the beginning of major production for the new generation of B.C. salmon farmers. In calendar year 1988, 5,000 tons of fresh salmon will be available to U.S. and European buyers, and projected production of 20,000 tons by 1990 is well within reach.



Salmon farming along B.C.'s Sunshine Coast is the province's fastest-growing industry. The farms have attracted international interest, both from U.S. seafood buyers and from Norwegian investors.

Unlike the Norwegians, residents of B.C.'s productive west coast, known as the Sunshine Coast, did not turn to fish farming on the rebound from a failing commercial fishing industry. Ironically, many of the province's leading fish farmers got into it as an alternative lifestyle.

Tom and Linda May operated a successful boatyard in Seattle during the 1970s. In 1980 they sold the business, bought a parcel of waterfront on B.C.'s Nelson Island, and began raising chum salmon.

"It was a disaster," says Tom May, now president of Royal Pacific Sea Farms, one of the dominant producers in British Columbia. "In 1981 we shifted to chinook and coho. We have a definite preference for chinook now, but we're putting a large effort into breeding coho, and our emphasis may shift in the future."

This oft-heard refrain is a response to the market. Restaurant buyers pay top dollar for fish that weigh five pounds or more. Chinook will grow to that size without becoming sexually mature. Coho are less likely to reach that size before they begin to show signs of spawning. (As salmon approach spawning, their meat becomes increasingly pale and watery.) In the case of Pacific salmon, spawning is a once-in-a-lifetime event that farmers would like to avoid altogether.

To this end, George Hunter directs a staff of bioengineering technologists at Royal Pacific in a two-pronged approach to sterilization. The most effective current technology is to feed very young coho miniscule amounts of steroids for a 12-week period. Ten days after the treatment, all trace of the steroids has disappeared.

"Hormonal sterilization is a short-term answer," says Hunter. "The long-range answer is to use other methods. We're doing work on inserting genes into salmon at very early stages of development. We're calling these 'transgenic' salmon." The gene is reproduced in a petrie dish and put into the salmon at the four-cell stage or earlier. Gene manipulation can increase growth rates and disease resistance as well as affect reproductive abilities.

After Royal Pacific's initial setback with chums, the company doubled production every year. In 1986, says Tom May, "We were showing a very, very large profit on a few-million investment. We sat down and decided what direction we wanted to go in terms of the scale of the operation — what kinds of fish to raise and where our profit centers would be. We came up with a needed investment of $10 million."

Early last year, the company went public. The offering on the Vancouver Stock Exchange was successful, due in large part to the company's solid operating record. In an industry where profits often elude balance sheets for five years after start-up, Royal Pacific made money after two years, and profits have grown each year.

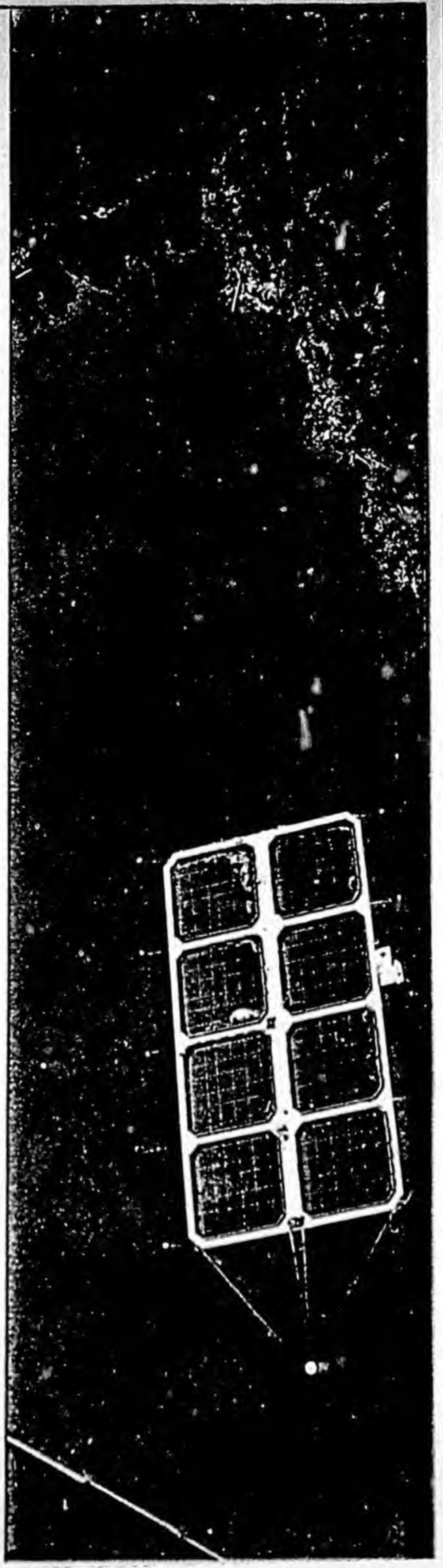
For many fish farming companies in B.C., offering shares on the Vancouver Stock Exchange is the best way to raise large amounts of money. Commercial banks in Canada have not recognized fish farms or their swimming

CORRECTION

THIS DOCUMENT
HAS BEEN REPHOTOGRAPHED
TO ASSURE LEGIBILITY

Salmon Farming on the Sunshine Coast

By Peggy Parker



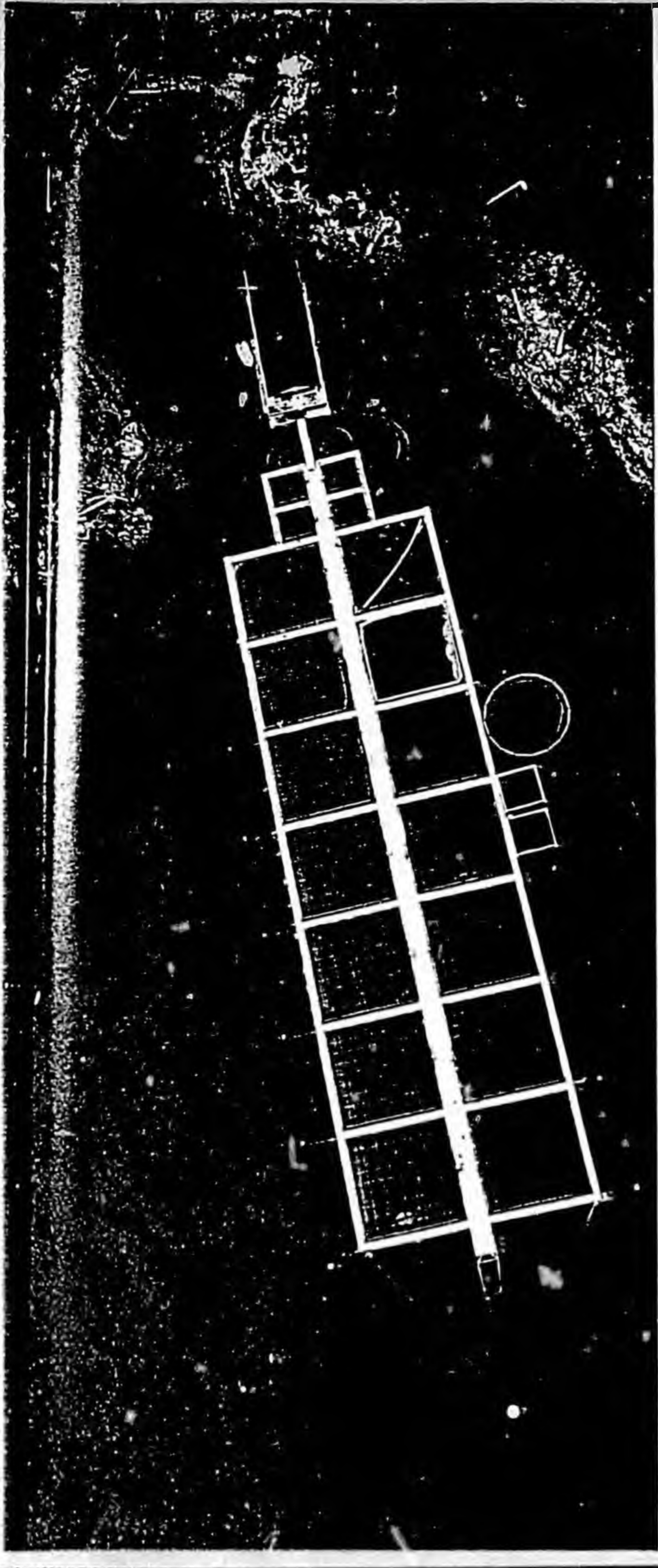
To Yvonne Kraft, the salmon she tends aren't just fish. "They're like your kids," she says. "You watch them every day, worry that they're eating enough and staying healthy. Let me show you the females we're raising for brood stock."

Kraft spent most of 1985 at this grow-out site in British Columbia, living in a plywood and tin shelter set on the floating farm — a series of underwater pens holding young chinook and coho salmon and connected by aluminum catwalks. The site is 40 miles from the nearest town.

"Last winter I'd be out here talking to these fish," she laughs, "talking to my girls."

Kraft is a partner in Aquarius Sea Farms, the largest producer of cultured salmon in British Columbia. In 1985, she was not the only person who was interested in the fish swimming in her net pens. U.S. buyers who had come to rely on Norwegian farmed salmon were realizing that B.C. farms could augment supplies of farmed salmon — at reduced shipping costs — if they could produce reliable quantities.

B.C.'s salmon farmers geared up to meet these demands. Now, after three years of watching the progress of this budding industry, U.S. buyers no longer have to wait. The first harvest of salmon came in September, buyers liked what they saw, and wholesale prices jumped far higher than expected. This year marks the beginning of major production for the new generation of B.C. salmon farmers. In calendar year 1988, 5,000 tons of fresh salmon will be available to U.S. and European buyers, and projected production of 20,000 tons by 1990 is well within reach.

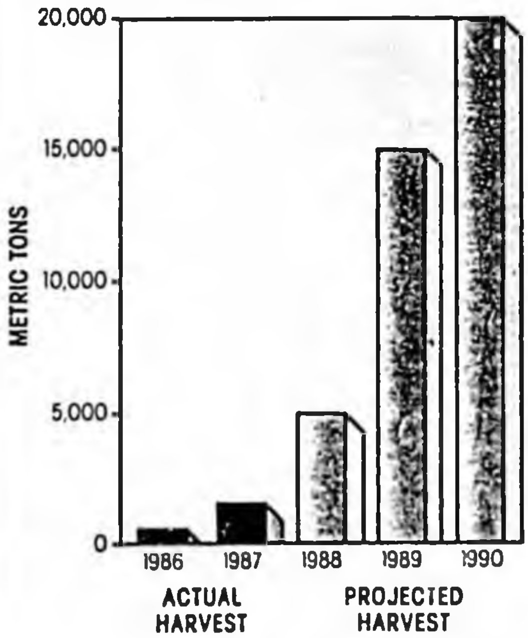


AQUARIUS SEA FARMS

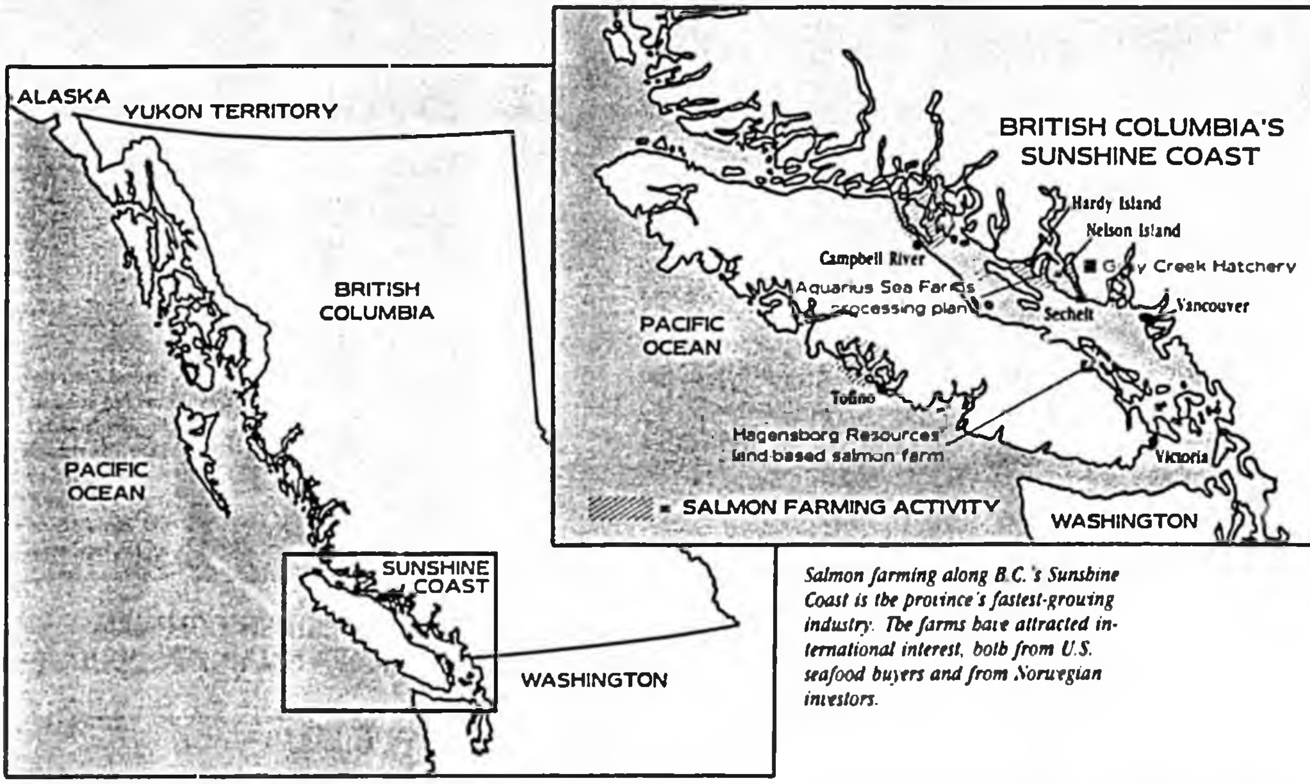
PEGGY PARKER

Yvonne Kraft (left) and her husband Norbert think big. Their Aquarius Sea Farms, owned with Norwegian investors, could produce up to 2,200 metric tons this season

BRITISH COLUMBIA FARMED SALMON PRODUCTION



British Columbia's salmon farmers will harvest 20,000 metric tons in 1990, according to projections. (For comparison, Norway was expected to produce about 48,000 mt of farmed salmon in 1987.)



Salmon farming along B.C.'s Sunshine Coast is the province's fastest-growing industry. The farms have attracted international interest, both from U.S. seafood buyers and from Norwegian investors.

Unlike the Norwegians, residents of B.C.'s productive west coast, known as the Sunshine Coast, did not turn to fish farming on the rebound from a failing commercial fishing industry. Ironically, many of the province's leading fish farmers got into it as an alternative lifestyle.

Tom and Linda May operated a successful boatyard in Seattle during the 1970s. In 1980 they sold the business, bought a parcel of waterfront on B.C.'s Nelson Island, and began raising chum salmon.

"It was a disaster," says Tom May, now president of Royal Pacific Sea Farms, one of the dominant producers in British Columbia. "In 1981 we shifted to chinook and coho. We have a definite preference for chinook now, but we're putting a large effort into breeding coho, and our emphasis may shift in the future."

This oft-heard refrain is a response to the market. Restaurant buyers pay top dollar for fish that weigh five pounds or more. Chinook will grow to that size without becoming sexually mature. Coho are less likely to reach that size before they begin to show signs of spawning. (As salmon approach spawning, their meat becomes increasingly pale and watery.) In the case of Pacific salmon, spawning is a once-in-a-lifetime event that farmers would like to avoid altogether.

To this end, George Hunter directs a staff of bioengineering technologists at Royal Pacific in a two-pronged approach to sterilization. The most effective current technology is to feed very young coho miniscule amounts of steroids for a 12-week period. Ten days after the treatment, all trace of the steroids has disappeared.

"Hormonal sterilization is a short-term answer," says Hunter. "The long-range answer is to use other methods. We're doing work on inserting genes into salmon at very early stages of development. We're calling these 'transgenic' salmon." The gene is reproduced in a petrie dish and put into the salmon at the four-cell stage or earlier. Gene manipulation can increase growth rates and disease resistance as well as affect reproductive abilities.

After Royal Pacific's initial setback with chums, the company doubled production every year. In 1986, says Tom May, "We were showing a very, very large profit on a few-million investment. We sat down and decided what direction we wanted to go in terms of the scale of the operation — what kinds of fish to raise and where our profit centers would be. We came up with a needed investment of $10 million."

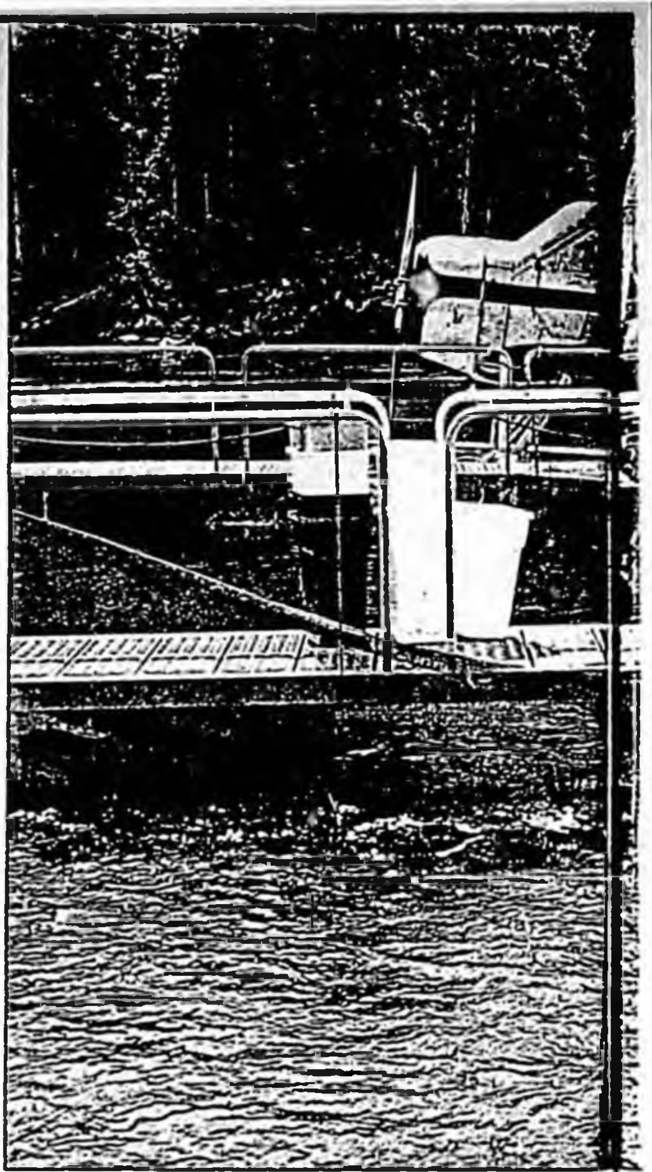
Early last year, the company went public. The offering on the Vancouver Stock Exchange was successful, due in large part to the company's solid operating record. In an industry where profits often elude balance sheets for five years after start-up, Royal Pacific made money after two years, and profits have grown each year.

For many fish farming companies in B.C., offering shares on the Vancouver Stock Exchange is the best way to raise large amounts of money. Commercial banks in Canada have not recognized fish farms or their swimming stock as collateral. Norwegian banks, however, familiar with the profits of salmon farms in their country, have invested heavily in British Columbia. Analysts say that of the estimated $100 million (Canadian) investment in the B.C. industry, about half is Norwegian.

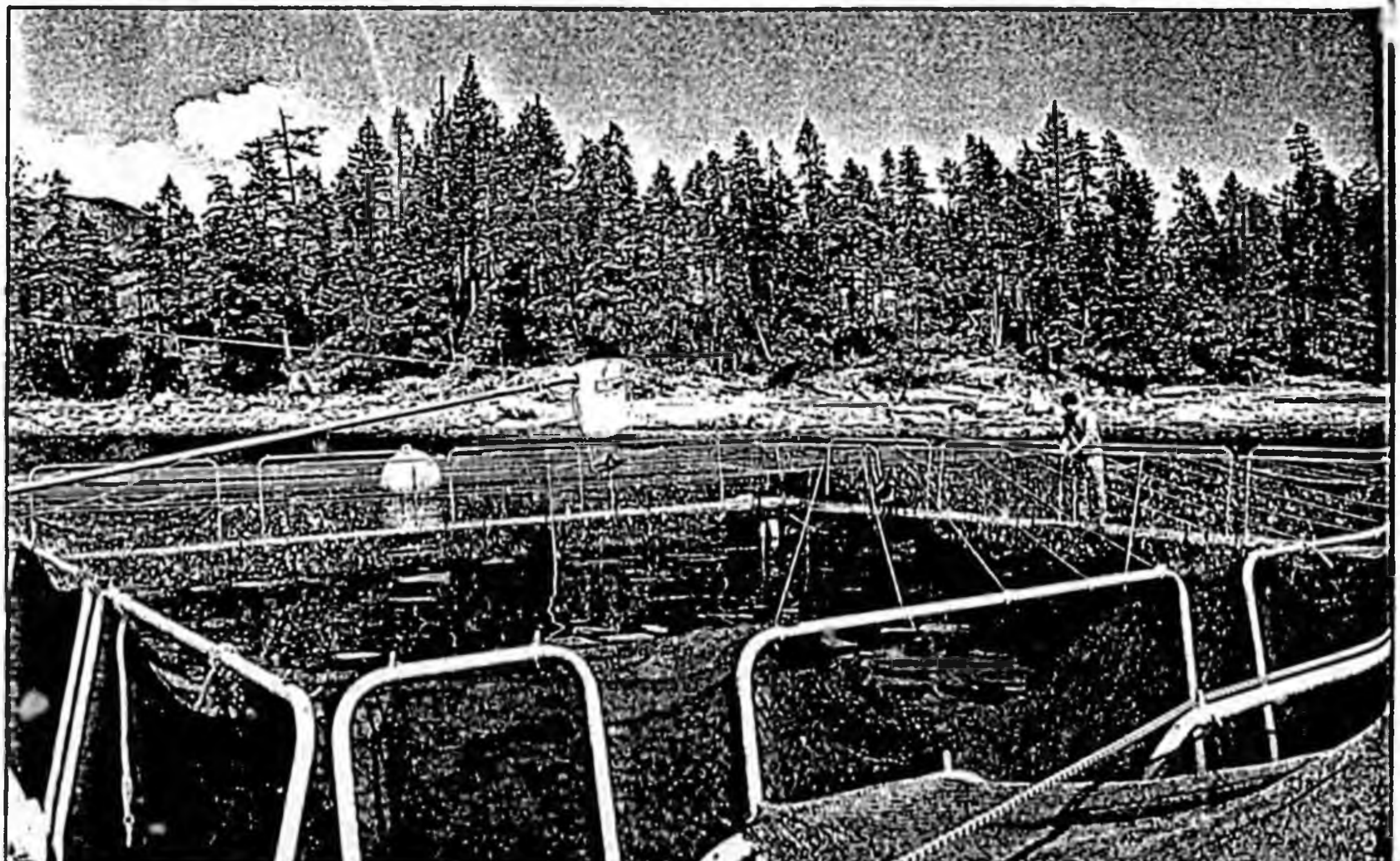
Yvonne and Norbert Kraft, founders of Aquarius Sea Farms, owe much to the faith and financing of the Norwegians. In 1984, Yvonne was a retail florist, and Norbert operated a construction business in Sechelt. A year later, they had fish in the water in a small farm in Hotham Sound. A contingent of Norwegians visited B.C. in 1985 and met with the Krafts, who decided to expand their farm and become leaders in the industry. Norbert went to Norway later that year; he came back with a financial partnership and plans for a hatchery.

This year the hatchery produced three million smolt, about half for sale to outside companies. Five million eggs will be incubated there this winter, but the hatchery will hold 12 million at full capacity — the largest production in B.C.

Yvonne and Norbert Kraft are described as "big thinkers" by their colleagues. Their production and marketing plans reflect that thinking, and the company's performance confirms it. By May Aquarius will have produced 1.5 million pounds of salmon (680 metric tons) — more than any other farm in Canada. This season they plan to harvest 4 to



Hardy Sea Farms' salmon pens eventually will share beautiful Hardy Island; prime lots are being reserved for resort development.



PEGGY PARKER (3)

by, established brokerages and distributors. Tom and Linda May of Royal Pacific worked out a deal with B.C. Packers, one of the largest salmon packers in North America, to process and market most of their harvest.

The Krafts wanted to sell fresh salmon under the Aquarius label and applied for trademark rights. When Marketing Director Jack McLennan learned that the name was already taken but was not being used, he contacted the company that had the rights to it. Serendipity being what it is, the company that had trademarked "Aquarius" was Clouston

An Aquarius farm — there are 10 in all — takes delivery of smolt (left). The company's hatchery will incubate 5 million eggs this winter; its capacity is 12 million.

Al Archibald (left), marketing director for the B.C. Salmon Farmers Association, and Mike Mulholland, operations manager for Hardy Sea Farms.

5 million pounds — four times British Columbia's entire output of farmed salmon in 1986.

They'll probably do it. The Krafts have met every goal they've set for themselves in the past three years, and they've done it on time. Company performance has been strong enough to attract investment from oil-and-mineral tycoon Edgar F. Kaiser, Jr., who recently bought just over 10 percent of the firm.

Aquarius' latest project is a state-of-the-art processing plant with a shift capacity of 20,000 pounds. Centrally located among the company's 10 farms on B.C.'s Sunshine Coast, the plant began processing in November.

Now that harvesting and processing schedules are being met, marketing has replaced production as the farmers' first priority. The B.C. Salmon Farmers Association (BCSFA), an industry group in charge of allocating eggs from the provincial and federal hatcheries to private companies, began marketing studies in 1986. Al Archibald, marketing director for the association, has provided the farmers critical information on market needs in Europe and the U.S.

Armed with this preliminary data, individual companies began developing their own marketing plans in early 1987. Most of them either sought out, or were sought out

Foods, Canada's premier seafood broker. Clouston is now the exclusive marketing agent for Aquarius.

Pacific Aqua Foods, a huge, vertically integrated company that has been traded on the Vancouver Stock Exchange for several years, signed an agreement with the giant Canadian processor, National Sea Products, in September. The transaction provided $2 million in financing for PAF, named National Sea Products as the exclusive marketing agent for PAF's products, and put Gordon Cummings, president and CEO of National Sea, at the head of PAF's board.

Another B.C. company, Hardy Sea Farms, is affiliated with Saga Seafoods A/S, a Norwegian firm founded by Thor Mowinckle after he made A/S Mowi the leading salmon producer and marketer in Norway. The Canadian subsidiary owns Hardy Island, a beautiful tract of land off the northern reaches of B.C.'s Sunshine Coast. In these protected bays, Hardy will raise coho and chinook salmon. But it has reserved half of the island for real estate development — a carefully planned collection of prime waterfront lots for resort use.

Hardy produced about 250 tons of chinook and coho last year; it expects to triple that in 1988. "After that, production will more than double every year," says John

Spence, president of Hardy. "By 1990 we are projecting about two to three thousand tons."

Spence, a Mowinckle protege who ran and is still a shareholder in one of Ireland's most successful farms, Fanad Fisheries, recognizes the market's critical role in his company's success. "We are in a market-driven industry," he asserts. "We need to respond to what the market wants, when it wants it and at what quality."

Hardy's marketing agent is J.S. McMillan, B.C.'s largest family-owned seafood processor and distributor. McMillan will tap its broker network to promote Hardy's pen-raised salmon, but is test-marketing fresh and frozen fillets and vac-packed portions in other markets.

Hardy Sea Farms will be going public this winter, in a move to raise between \$5 and \$6 million. Most of the capital will be used to develop the company's domestic brood stock.

"We are self-sufficient on brood stock," says Spence, "but we've only got two generations behind us." Spence's interest in developing reliable domestic brood stock is prudent. Those companies that now do not have enough of their own brood stock rely on wild eggs allocated by the BCSFA. By controlling production of their own eggs, companies not only gain further integration, but the ability to develop a "signature" product and to plan their production more carefully.

"The farmers have placed orders for 30 million eggs this year," says Al Archibald of the BCSFA. "They've asked for 27 milllion chinook eggs and 3 million coho. Last year, the mix of chinook to coho was more like 50-50." Clearly, the farmers are not going to get all that they want. When *Seafood Business* went to press, allocations were expected to be only 20 million eggs.

While most B.C. salmon farmers either own or have exclusive arrangements with processing and marketing firms, there are dozens of farmers who have decided to stick to what they do best — raising salmon. This has led to the formation of companies like Sechelt Processing Ltd., a small, custom processor that serves independent farmers up and down the Sunshine Coast. To transport live fish to the plant, Sechelt uses a 40-foot vessel equipped with a "fish well." Each of four compartments has its own circulation and oxygenation systems to keep live fish healthy during a five-hour run.

This winter, farm-raised Pacific salmon will come face to face with Norwegian and Chilean product, at a time when sales of farmed salmon are strong and prices generally high. How the market shakes out will depend as much on marketing methods as on size and species.

With the involvement of such marketing heavyweights as Clouston and National Sea

Big Players in B.C.

Aquarius and Royal Pacific are the front-runners in terms of production today, but they are by no means the only — or the largest — players in B.C.'s fastest-growing industry. Many of the companies operating salmon farms in the province have corporate charts that look like detailed road maps.

Pacific Aqua Foods Ltd. (PAF), with interest in both Pacific and Atlantic salmon, was one of the first aquaculture companies to be traded on the Vancouver Stock Exchange. PAF owns Tidal Rush Marine Farms (pen-raised Pacific salmon), Aqua Foods (cultured oysters), Deluxe Seafood (processor and marketer), American Aqua Foods (pen-raised Atlantic salmon), and Nationwide Seafood Distribution Centers (California-based distributor). Its affiliates include Crystal Waters Sea Farm Inc., the largest Atlantic salmon hatchery in British Columbia, and Quatsino Sea Farms, another salmon farm.

Crystal Waters, owned jointly by PAF and Sea Farms Canada, is one of the few companies that have obtained the right to import Atlantic salmon eggs. By 1989, however, it intends to be producing enough of its own brood stock to meet egg needs.


ALBERT NORMANDIN/SEASTAR

One of Seastar's four grow-out sites.

The economic benefits of vertical integration are not lost on Hugh Cooper, chairman of Seastar Resource Corporation. Cooper grew up in the farm country of southern Manitoba and watched as farmers struggled through bad weather, poor crops, and mounting debt.

"The poor sodbusters in Manitoba never made a buck," he says. "It was the grain companies that made money. And they made it because they sold the farmer his seed grain, his fertilizer, his equipment — and then they marketed his product."

Cooper applied what he had learned when he was hired by Seastar, a former oil, gas, and mining firm that turned to renewable resources in 1985. For the next two years Seastar was in an acquisition mode, culminating in the ownership of two salmon hatcheries, four operating grow-out sites, two processing companies with major cold-storage and freezing capacities, a fish-buying station, a smoked-seafood processor, a fish-food manufacturer, a net-pen manufacturer, and a major marketing firm that imports and exports farmed Norwegian salmon all over the world.

Seastar's production of salmon is in the early stages — 160 tons, mostly coho, will be harvested this year. But once the tonnage is there, Seastar will have everything else in place. Processing will be done primarily at Long Beach Shellfish, the largest shrimp processor in B.C. and "a major cash cow" for the company now. The plant will portion and vacuum-pack salmon for the retail market, which will get about 30 percent of Seastar's production.

HAGENSBORG RESOURCES LTD. (2)

Taking to the Land

One of the most bullish of the publicly held salmon-farming firms is Hagensborg Resources, a company with tremendous vertical integration. With a $5 million line of credit from Norwegian financiers, Hagensborg is building a land-based facility large enough to produce 1,000 tons of coho and chinook salmon annually — the largest land-based operation on the continent.

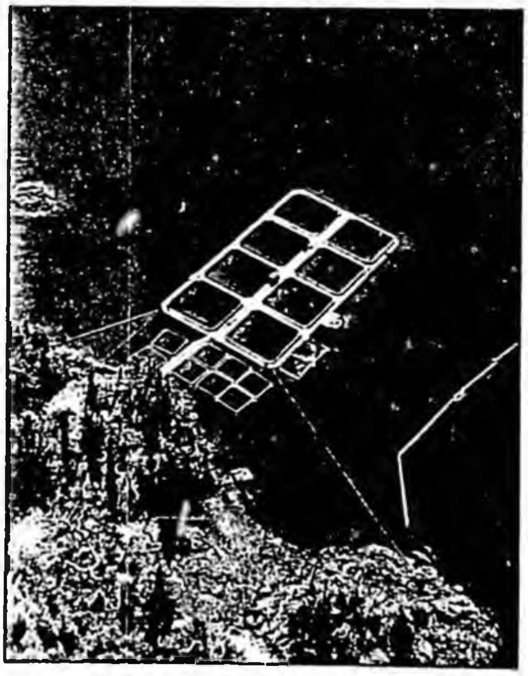
The advantages of land-based salmon farming are numerous: disease control, protection from predators, more efficient feeding, and full control of water temperatures and oxygen levels. The initial costs, however, are much higher than for a sea-pen operation. Smolt will be put into tanks early this year, with the first harvest set for late 1989.

Two company-owned sea pens on the west coast of Vancouver Island are currently producing small quantities of chinook and coho. (About 250 tons of 4/6 coho and chinook are expected to be harvested between November '87 and May '88.) Five more sites — each with production capacity of 900 tons per year — will be in operation there this year. When both land-based and sea-pen operations are in full production, 7,300 tons of salmon will be produced annually.

The base camp in Cypress Bay doubles as a staging center for other farms in the area. Hagensborg owns a ferry boat to bring in supplies from Tofino, the closest town and a major port on Vancouver Island. Space on the ferry is leased to other companies bringing supplies in to their farms.

Last summer, Hagensborg bought a 45-acre dairy farm located above the largest aquifer on Vancouver Island. This unlimited source of water will supply Hagensborg's hatchery, which in turn will provide smolt to the company as well as cash from outside sales.

Hagensborg salmon will be fed food pellets made by another company subsidiary that also sells to other farms. Finally, Hagensborg Foods (a wholly owned subsidiary) will market fresh, smoked, and frozen salmon, as well as salmon pates and other value-added products, through existing broker networks in the U.S., Europe, and Asia.



The drawing (top) shows what will be "Canada's largest Tank Fish Farm," the land-based salmon facility being built by Hagensborg Resources. The company also will have seven sea-pen operations like the one in bottom photo.

Products, B.C.'s farmed salmon will enjoy a higher profile this year than ever before. But it will be the combined efforts of all the brokers and traders handling B.C. product that determine its market position. Many have already made their moves with small amounts of fish in select markets. Besides the firms already linked to the farmers through exclusive marketing arrangements, independent brokers have flocked to the farms on the Sunshine Coast. Demand has grown exponentially since the first big harvests of last year, and B.C. salmon farmers may find that even 20,000 tons in 1990 will not be enough to satisfy everybody. □

A STIR IN THE SALMON MARKET

How new supplies are changing the picture.

BY PEGGY PARKER

Salmon farmers are banking on high quality and reliable supply to sell their fresh product, while domestic producers of wild-caught fish are looking to create a market niche based on the price and year-round availability of high-quality frozen salmon.

Despite the salmon family's abundant market forms and diverse species, the attention of today's market seems riveted on fresh and frozen salmon, both farmed and wild.

Much of the stir in the fresh market is due to the Norwegians, who began exporting large volumes of fresh Atlantic salmon to both the East and West coasts in the early 1980s. The Norwegian exports meant that, for the first time, high-quality fresh salmon was available in the winter — and in reliable quantities.

It used to be that fresh salmon was sold only from June to September. There were regional exceptions where winter runs of kings or steelhead (a member of the trout family, often sold as salmon) put fresh salmon on the tables of gourmet restaurants in February and March, but volumes were minuscule. The savvy Norwegians created a whole new market with their product, a market that went far beyond the niche of the domestic product in winter.

The urge to target this market is strong among domestic producers: returns are high, and the potential for growth is excellent. There are only two rules in this high-stakes game, but they must be followed to the letter. First, the product must be of highest quality; and second, supply must be reliable.

Salmon producers are taking two approaches to the market. One is to join the competition. Interest and investment in farming operations are high on the coasts of both Canada and the U.S. Another is to promote high-quality frozen salmon as a product that meets the aesthetic standards of fresh, yet is available — usually at lower prices — all year.

The Alaska Seafood Marketing Institute introduced "Premium Quality" salmon to the winter market this year in an effort to prove that frozen salmon beats fresh in the overall picture. The cohos selected for the promotion were troll-caught, bled and immediately iced on board, then frozen on shore using meticulous handling techniques.

No time for kid gloves

But it is unlikely that Alaskan plants will produce an elite product in great quantity anytime soon. With half a billion pounds of salmon returning to Alaskan rivers in a period of four months, processors have little time for kid-glove treatment on the majority of the catch.

Harvest timing is more critical with salmon than with any other seafood. Wild salmon must be caught

between the time they enter the fishing grounds (often a several-hour boat run from the fish plant) and the time they reach the fresh water of their spawning streams. It is during this window of time — often only a matter of hours — that wild salmon are at their peak.

Processors market the cream of this crop — troll-caught chinooks and cohos and gillnet-caught sockeyes — to high-ticket restaurants. Like fine wine, they are sold with the area of origin and the date of harvest identified. While the percentage of wild salmon that is sold fresh or frozen is much higher than it was six years ago, growth in this area has slowed. Last year, fresh and frozen salmon amounted to 53 percent of the entire pack, 10 percent *below* the 1985

1986 U.S. Imports of Salmon

(IN METRIC TONS)

FROZEN:		FRESH:
136.9	NORWAY	8,871.4
5,078.6	CANADA	2,485.0
4.2	CHILE	680.8
3.0	U.K.	367.5
263.0	OTHER	540.7
5,486.0	TOTAL	12,945.4

GRAND TOTAL FRESH & FROZEN: 18,431.4

figure. Short-term growth in the market for fresh and frozen salmon will most likely come from farming operations.

A rush to the fjords

Much as in the westward homestead rush of the 1850s, salmon farmers are stampeding to the fjords of Maine, Washington, and British Columbia to set up sea pens and claim their share of the market. The U.S. has been slow to embrace sea-pen salmon farming, but British Columbia has issued more than 100 permits for the floating farms.

In July 1984, the B.C. Salmon Farmers Association was formed to allocate eggs from the federal hatcheries (the surplus from the government's salmon-enhancement program) to the farmers. Today the industry-funded group not only divvies up the eggs, but screens them for disease. B.C. farmers are building their own brood stock for secure supply and quality. Garth Hopkins, the association's director of communications, says, "In another five to seven years, we will be self-sufficient on eggs."

Following the Norwegian lead, Hopkins' group is developing a marketing strategy for B.C. salmon. It expects to implement the plan before the end of the third quarter this year. Membership, at 75 firms today, is expected to grow to 250 by next year. B.C. production of farmed cohos and chinooks was about 500 metric tons last year. In 1988, that number is expected to reach 10,000 mt.

Right now, world production of farmed salmon is less than 50,000 mt. But salmon farms in New Zealand and Chile are just beginning to produce salmon in large volumes, and in the U.S., successful farms are expanding in Washington and Maine, while others wait in line for permits.

The world's first land-based fish farm is expected to open in June in Westport, Washington. Financed by Seacom A/S of Norway, the plant will raise pan-sized coho in salt water pumped from the ocean. A second facility is slated to open in British Columbia in August.

In Alaska, where pen-rearing of salmon is illegal, the legislature is considering a bill to develop a mariculture industry.

"Although the Norwegians certainly have a jump on prospective Alaska fish farmers," says Brent Paine of the Alaska Mariculture Association, "we do have some advantages, such as sharply lower transportation costs, no import duties, and the lack of currency fluctuations between producers and customers." Paine has marketed Norwegian salmon in the U.S. and worked on fish farms in both the U.S. and Norway.

Will prices drop?

These advantages and high wholesale prices are what make the gamble worth it for many aquaculturists in North America. But will rapid growth in the farmed sector mean a drop in prices at the wholesale level?

Norwegian producers are betting their kroner that the market will expand to support price levels, even with the added supply. Their strategy is to provide consistently excellent fish, and sell them with flair. Branded products -- not often seen in the fresh-seafood market — will become more common. Designer tags in the gill plate, such as MOWI of Norway's "Superior" tab, have great snob appeal; they also identify the fish and guarantee quality standards. The Scottish Salmon Growers Association now marks its boxes with a special "British Food Quality, Scottish Salmon" stamp. The Shetland Seafood Quality Company and the Shetland Salmon Farmers Association use a grading scheme that awards top quality a "Grade A" sticker.

But not all salmon-farming countries have the quality schemes of Norway, the U.K., or Canada. Some brokers fear that large volumes of farmed salmon may be "dumped" at low prices to gain a foothold in the U.S. market in the next year or so. That could be disastrous to small or recently established farming operations, but the major producers would likely survive.

Just how large could U.S. imports become, and how does that potential compare with domestic supply?

Norwegian salmon farmers are now producing about 30,000 mt per year. Of that amount, about 9,000 mt reached the U.S. market last year, an increase of 34 percent over 1985 imports. Total imports from other countries were just over 18,000 mt.

U.S. fishermen landed 285,000 mt last year, of which about 110,000 mt were exported. About 100,000 tons went into the domestic canned market, leaving about 75,000 mt in the domestic fresh/frozen market. Imports from all countries, then, account for about 24 percent of the domestic supply of fresh and frozen salmon.

These figures could change rapidly. Japanese sea ranching could supply more of that country's needs for salmon, which would leave more sockeyes and cohos for the domestic market. Alaska salmon landings are mercurial, but generally have been increasing over the past decade. Imports are likely to rise — perhaps even double — in the next five years. But a rapidly expanding market will move these supplies quickly. □

What is real?

A word or two about real salmon. There are two genera, or classifications of salmon: *Oncorhyncbus* (on ko *rin* kus) and *Salmo*. Members of the *Oncorhyncbus* genus are found in the Pacific and are all called salmon. Members of the *Salmo* genus are most often found in the sea pens of Norway (although there are still some small wild runs in the Atlantic), and are called, depending on the species, either salmon or trout. The fish that created such a splash on the winter market in the early 1980s is *Salmo salar*, or Atlantic salmon. In the wild, both Pacific and Atlantic salmon hatch in streams, migrate to open ocean for a growing period, then return to the streams of their birth to spawn. A major difference between the two groups is that *Oncorhyncbus* spawn once and die; *Salmo* spawn several times.

Opinion

"Commercial fishermen are, I think, by and large philosophically unprepared for this kind of change. I am a high seas hunter."

This quote from a Canadian fisherman may be the shortest and most accurate summary of the feelings of some in the fishing community toward fish farming. Appropriately for the prevailing pattern of relationships between fishermen and aquatic farmers, the comment was delivered to a government panel studying the effects of B.C.'s newly burgeoning salmon farming during a permitting moratorium.

Fish farming in Alaska does not have to be a neolithic clash between hunters and farmers. Most of the members of my organization have close ties to the fishing industry, and, yes, many are fishermen. I am a fourth generation Alaskan, and my family has always been involved in the fishing industry.

We simply believe aquatic farming is a legitimate business with a great future and can be conducted in a fashion that protects the wild stocks and environment. As for threatening the fishing industry, consider the realities of salmon being farmed in 15-20 countries worldwide and several other states. You don't have to be an economist to figure out that Alaska's participation in salmon farming isn't going to make that much difference in the global supply picture.

The Alaska Mariculture Association is eager to work with the seafood industry in meeting the challenge posed by the phenomenal international growth of salmon farming. We believe Alaska farmed salmon will compete primarily with Norwegian and Canadian cultured products.

Working together makes a lot more sense than battling in the political arena anyway. We're willing to sit down and work out a conservative approach to development of a farming industry in Alaska.

This can be accomplished by legislation that provides adequate disease, environmental, and land use protections for the interests of fishermen, and a system to ensure farmers pay their own way through a mariculture products tax and responsible users fees.

And, importantly, we are willing to accept a reasonable method of phasing in finfish farming in an orderly manner so state agencies can slowly build adequate regulatory and support programs.

Alaskans need to refocus the enormous amount of energy spent discussing the pros and cons of fish farming toward solving the fundamental problems preventing Alaska salmon from creating the kind of excitement in the marketplace as the Norwegians. We all know what they are: quality, marketing, availability of fresh product, and consistency of supply.

These problems can be addressed. The only way for Alaska salmon to regain its premier spot in world markets is to fight back with a superior product, improved marketing, and lots of it.

Despite its loss of status as the almost exclusive world supplier of salmon, Alaska still is the Saudi Arabia of global salmon markets. With farmed salmon added to its product line, the Alaska seafood industry gains considerable strength and versatility. A well-funded joint marketing campaign between Alaska salmon farmers and fishermen could be very effective.

Fishermen should consider the reality that the world salmon farming industry is here to stay, then start exploring ways the fishing community can benefit. Here are two examples:

Hatchery Programs—Alaska's hatchery programs have been called one of the best investments ever by the State of Alaska in terms of direct returns to the economy, but cutbacks in state spending threaten to close down many of the public facilities. Repayment of the private loans will require the private hatchery systems to divert substantial amounts of fish from harvests by commercial fishermen for cost recovery programs by hatchery managers.

One of the biggest potential sources of new funding for these public and private enhancement programs could be the sale of juvenile fish to Alaska salmon farmers. The Alaska Department of Fish and Game estimates there were 88.6 million eggs surplus to the needs of state and private hatcheries in 1986. A 44 million pound salmon farming industry in Alaska would require roughly 10 million of these surplus eggs per year.

Should the state or private hatcheries decide to utilize these surplus eggs to produce the juvenile fish (smolts) needed by salmon farmers, these sales could generate \$7-\$10 million annually.

Fish Food Manufacturing—A fully developed salmon farming industry in Alaska would require roughly 88 million pounds of fish feed a year (worth \$30-\$40 million) provided by regionally based meal plants. That much fish feed would require 264 million pounds of raw product (fish waste or whole fish). At 6 cents a pound, fishermen could make \$15.8 million for fish that are now unmarketable.

Production of fish feed can enhance the viability of shore-based surimi plants. In fact, Alaska's largest surimi plant already utilizes its byproducts to produce a fish meal now sold to Taiwanese eel farmers.

The Alaska Mariculture Association remains committed to working with fishermen. With both wild and farmed salmon, Alaska would regain its competitive position in world markets. Now, that's something worth fighting for.

Rodger Painter

Rodger Painter, executive director of the Alaska Mariculture Association, formerly was executive director of the United Fishermen of Alaska, editor of a commercial fishing newspaper, and chairman of the Alaska Seafood Marketing Institute's Quality Committee.

"Fish farming in Alaska does not have to be a neolithic clash between hunters and farmers."

AKVAFORSK
The Agricultural Research Council of Norway
Institute of Aquaculture Research

Ås-NLH
Sunndalsøra
Averøy
Oslo

16.02.88

Dr. William W. Smoker
Juneau Center
Fisheries & Ocean Science
University of Alaska
11120 Glacier Highway
Juneau, Alaska 99801

Our ref.: TG/mw
Your ref.:

Dear Dr. Smoker,

I am sorry for late answer, but I had to get some information about the frequencies of farmed salmon in rivers. The person has been away until today.

In some rivers there has been electric fishing for broodstock in order to collect milt for deep freezing. In most rivers only a few fish were caught, and from them some high frequencies of farmed fish were obtained. In total 166 male fish were caught, and 26 % were classified as farmed fish, 79 female fish gave 11 % farmed. The classification was based on looking at damage of fins.

- o So far no positive (except that more fish enter rivers for sport fishing) or negative effect has been found to be caused be renegade fish in wild populations.
- o None has shown that renegade fish spawn in rivers.
- o No information is available whether or not renegade fish and their progeny can compete with wild fish in a river system.

One should be aware of that a river strain is not a static population. As physical and environmental changes take place in a river, natural selection will change the fish to become better adapted to the new environment.

If renegade fish enter a river and spawn, it is likely that the genetic variation will increase. This will make the natural selection more efficient. The newcomers have to fight the wild. Positive gene will be kept, and negative will be rejected.

This is just some comments from me. You may use them as is most appropriate.

Sincerely yours,

Trygve Gjedrem

Trygve Gjedrem

Juneau Center
Fisheries & Ocean Science
University of Alaska 11120 Glacier Highway, Juneau, Alaska 99801
(907) 789 4444

MEMORANDUM

Date February 16, 1988

From Bill Smoker

To Bill Heard
Brian Allee
Bob Burkett
Bob Davis
Earl Krygier
Rodger Painter

Subj Genetic Effect of Farmed Fish

In the past month a newsclipping from Fishermen's News has made the informal rounds; it told of renegade fish from salmon farms in Norway invading wild spawning populations and quoted Prof. Harald Skjervold as being concerned about the genetic effect of these fish on wild salmon.

I sent the clipping to Prof. Trygve Gjedrem of the Agriculture University of Norway. He is a PhD genetecist well known for his work on Atlantic salmon breeding in Norway and is, I believe, Prof. Skjervold's successor at the University. He is the current President of the International Association for Genetics in Aquaculture. Last month I asked him for whatever information he could provide about the newspaper article, for his opinion, and whether I could share his comments publicly. Enclosed is his reply to me. I believe Bob Davis has made a similar request of Prof. Skjervold.

It's still not entirely clear to me what interpretation can reasonably be made of the information. As I understand things some Norwegian scientists went into some Atlantic salmon rivers to collect gametes, sperm, for cryopreservation. I expect their plan is to use the gametes in future aquaculture broodstock improvement. They used electroshocking gear which in my experience can be a very efficient method of catching spawners, i.e. they could have sampled a very high proportion of fish in each river. Of 166 males captured 43 showed external evidence of coming from a farm (damaged fins.) We don't know if the fish were mature (presumably they were), what proportion of the wild fish were sampled (it may be that the 123 wild males comprised nearly all of the males in the rivers), how many rivers were sampled, or whether the mouths of the sampled rivers were all nearby to farms.

DISEASE
Department of Fish and Game
Division of Fisheries, Rehabilitation,
and Development

ISSUE:

Protect native and hatchery stocks from potential disease arising from salmon farming operations.

DISCUSSION:

All populations of fishes, whether in saltwater or fresh, in the wild or in captivity, at some time contain disease agents such as bacteria, viruses, fungi, and invertebrate parasites. In Alaska, endemic disease agents are present throughout wild stocks and the marine environment. Many are opportunistic, causing disease primarily when the fish are crowded or stressed. However, it is extremely important to recognize that populations of fishes differ in the disease agents they carry, and that diseases newly introduced to fish populations can be very devastating.

To control disease in the ocean ranching program, Alaska set in place stringent regulations that govern the movement of salmon and their gametes within the state, and prohibited the import of any fish species or their gametes for aquaculture purposes. These regulations have applied for some 16 years and include requirements for thorough broodstock screening for disease agents, routine treatment of eggs to prevent disease outbreaks, annual inspections and strict reporting requirements, and the destruction of stocks if the state finds that this is necessary to control disease. The state's prohibition on importing species ensures that no new diseases are introduced into the state. For example, many chinook salmon stocks in Washington and Oregon carry IHN virus. Importing these fish could introduce new strains of IHN virus to indigenous stocks. Similarly, importing Atlantic salmon would bring the risk of importing exotic viral and bacterial diseases not found in Alaska. This could have serious impacts on the health of existing native and hatchery stocks, and must be avoided.

To maintain adequate protection of existing fishery resources, any future fish farming industry must be governed by the same fish health regulations currently governing Alaska's ocean ranching program. The species made available for farming should be from native or hatchery stocks having complete and acceptable disease histories. Prohibitions on importing species including Atlantic salmon must be maintained. This way, any diseases would be those already present in wild populations, not exotic diseases which could cause serious harm to the native stocks. All transport and possession of fishes and their gametes needs to be closely

GENETICS
Department of Fish and Game
Division of Fisheries Rehabilitation,
Enhancement, and Development

ISSUE:

Ensure that salmon farming does not impact the genetic integrity of existing natural and hatchery stocks of salmon and trout.

DISCUSSION:

Preserving the genetic diversity of Alaska's fishery resources has been recognized as an important fisheries management goal. This is especially true for the state's enormous salmon resources.

Alaska, in maintaining the health and perpetuity of its salmon resources, subscribes to the theory that identifiable units of salmon (populations, stocks, races) have through natural selection become adapted to the particular watershed that serves as home. This adaptation is preserved in the genetic make-up (gene pool) of the stock. State fisheries managers have sought to maintain stock diversity to ensure the long-term health of our salmon populations. Loss of stock diversity can occur through dilution brought about by interbreeding with other stocks. For these reasons, Alaska at the outset of its salmon ocean ranching program set in place stringent regulations that govern the movement of salmon and trout within the state and prohibited the import of salmon and trout for aquaculture purposes.

The Department of Fish and Game's genetics policy prohibits the importation of live salmonids (salmon family) into the state, and does not allow stocks to be transported between major geographic areas, such as Southeast, Kodiak Island, Prince William Sound, Cook Inlet, Bristol Bay, and AYK/Interior. The policy has been adopted in order to protect Alaska's diverse natural salmon and trout stocks.

Any new aquaculture venture, such as salmon farming, must be governed by the same policy, transport regulations, and statutes that have applied to the salmon ocean ranching program for the past 16 years. This is particularly true for provisions prohibiting the importation of exotic species, such as Atlantic salmon. Atlantic salmon are acutally a trout and are the ecological counterpart of Alaska's indigenous or native steelhead trout. Since these species have not evolved together and thereby have not developed mechanisms to avoid competition with steelhead

DISEASE
Department of Fish and Game
Division of Fisheries, Rehabilitation, and Development

ISSUE:

Protect native and hatchery stocks from potential disease arising from salmon farming operations.

DISCUSSION:

All populations of fishes, whether in saltwater or fresh, in the wild or in captivity, at some time contain disease agents such as bacteria, viruses, fungi, and invertebrate parasites. In Alaska, endemic disease agents are present throughout wild stocks and the marine environment. Many are opportunistic, causing disease primarily when the fish are crowded or stressed. However, it is extremely important to recognize that populations of fishes differ in the disease agents they carry, and that diseases newly introduced to fish populations can be very devastating.

To control disease in the ocean ranching program, Alaska set in place stringent regulations that govern the movement of salmon and their gametes within the state, and prohibited the import of any fish species or their gametes for aquaculture purposes. These regulations have applied for some 16 years and include requirements for thorough broodstock screening for disease agents, routine treatment of eggs to prevent disease outbreaks, annual inspections and strict reporting requirements, and the destruction of stocks if the state finds that this is necessary to control disease. The state's prohibition on importing species ensures that no new diseases are introduced into the state. For example, many chinook salmon stocks in Washington and Oregon carry IHN virus. Importing these fish could introduce new strains of IHN virus to indigenous stocks. Similarly, importing Atlantic salmon would bring the risk of importing exotic viral and bacterial diseases not found in Alaska. This could have serious impacts on the health of existing native and hatchery stocks, and must be avoided.

To maintain adequate protection of existing fishery resources, any future fish farming industry must be governed by the same fish health regulations currently governing Alaska's ocean ranching program. The species made available for farming should be from native or hatchery stocks having complete and acceptable disease histories. Prohibitions on importing species including Atlantic salmon must be maintained. This way, any diseases would be those already present in wild populations, not exotic diseases which could cause serious harm to the native stocks. All transport and possession of fishes and their gametes needs to be closely

GENETICS
Department of Fish and Game
Division of Fisheries Rehabilitation,
Enhancement, and Development

ISSUE:

Ensure that salmon farming does not impact the genetic integrity of existing natural and hatchery stocks of salmon and trout.

DISCUSSION:

Preserving the genetic diversity of Alaska's fishery resources has been recognized as an important fisheries management goal. This is especially true for the state's enormous salmon resources.

Alaska, in maintaining the health and perpetuity of its salmon resources, subscribes to the theory that identifiable units of salmon (populations, stocks, races) have through natural selection become adapted to the particular watershed that serves as home. This adaptation is preserved in the genetic make-up (gene pool) of the stock. State fisheries managers have sought to maintain stock diversity to ensure the long-term health of our salmon populations. Loss of stock diversity can occur through dilution brought about by interbreeding with other stocks. For these reasons, Alaska at the outset of its salmon ocean ranching program set in place stringent regulations that govern the movement of salmon and trout within the state and prohibited the import of salmon and trout for aquaculture purposes.

The Department of Fish and Game's genetics policy prohibits the importation of live salmonids (salmon family) into the state, and does not allow stocks to be transported between major geographic areas, such as Southeast, Kodiak Island, Prince William Sound, Cook Inlet, Bristol Bay, and AYK/Interior. The policy has been adopted in order to protect Alaska's diverse natural salmon and trout stocks.

Any new aquaculture venture, such as salmon farming, must be governed by the same policy, transport regulations, and statutes that have applied to the salmon ocean ranching program for the past 16 years. This is particularly true for provisions prohibiting the importation of exotic species, such as Atlantic salmon. Atlantic salmon are acutally a trout and are the ecological counterpart of Alaska's indigenous or native steelhead trout. Since these species have not evolved together and thereby have not developed mechanisms to avoid competition with steelhead

CORRECTION

THIS DOCUMENT
HAS BEEN REPHOTOGRAPHED
TO ASSURE LEGIBILITY

DISEASE
Department of Fish and Game
Division of Fisheries, Rehabilitation,
and Development

ISSUE:

Protect native and hatchery stocks from potential disease arising from salmon farming operations.

DISCUSSION:

All populations of fishes, whether in saltwater or fresh, in the wild or in captivity, at some time contain disease agents such as bacteria, viruses, fungi, and invertebrate parasites. In Alaska, endemic disease agents are present throughout wild stocks and the marine environment. Many are opportunistic, causing disease primarily when the fish are crowded or stressed. However, it is extremely important to recognize that populations of fishes differ in the disease agents they carry, and that diseases newly introduced to fish populations can be very devastating.

To control disease in the ocean ranching program, Alaska set in place stringent regulations that govern the movement of salmon and their gametes within the state, and prohibited the import of any fish species or their gametes for aquaculture purposes. These regulations have applied for some 16 years and include requirements for thorough broodstock screening for disease agents, routine treatment of eggs to prevent disease outbreaks, annual inspections and strict reporting requirements, and the destruction of stocks if the state finds that this is necessary to control disease. The state's prohibition on importing species ensures that no new diseases are introduced into the state. For example, many chinook salmon stocks in Washington and Oregon carry IHN virus. Importing these fish could introduce new strains of IHN virus to indigenous stocks. Similarly, importing Atlantic salmon would bring the risk of importing exotic viral and bacterial diseases not found in Alaska. This could have serious impacts on the health of existing native and hatchery stocks, and must be avoided.

To maintain adequate protection of existing fishery resources, any future fish farming industry must be governed by the same fish health regulations currently governing Alaska's ocean ranching program. The species made available for farming should be from native or hatchery stocks having complete and acceptable disease histories. Prohibitions on importing species including Atlantic salmon must be maintained. This way, any diseases would be those already present in wild populations, not exotic diseases which could cause serious harm to the native stocks. All transport and possession of fishes and their gametes needs to be closely

controlled through Fish Transport Permits, and strict reporting and inspection requirements need to be enforced.

However, extending the Department of Fish and Game's fish health services to this new industry cannot be accomplished without the addition of new staff and monies to support these activities. Private sector fish health practitioners could pick up some of this additional workload. Such private practitioners would need to be certified by the state and monitored on a routine basis to ensure acceptable performance, but presently there are no private sector fish health practitioners currently operating in-state.

SUMMARY:

Assuming that imports of Atlantic salmon or other fish species to Alaska remain prohibited, that the state continues to meet its responsibilities in fish disease control, and that monies are provided for additional fish health services, this new industry can be accommodated without the threat of disease to existing native and hatchery stocks of fish.

GENETICS
Department of Fish and Game
Division of Fisheries Rehabilitation,
Enhancement, and Development

ISSUE:

Ensure that salmon farming does not impact the genetic integrity of existing natural and hatchery stocks of salmon and trout.

DISCUSSION:

Preserving the genetic diversity of Alaska's fishery resources has been recognized as an important fisheries management goal. This is especially true for the state's enormous salmon resources.

Alaska, in maintaining the health and perpetuity of its salmon resources, subscribes to the theory that identifiable units of salmon (populations, stocks, races) have through natural selection become adapted to the particular watershed that serves as home. This adaptation is preserved in the genetic make-up (gene pool) of the stock. State fisheries managers have sought to maintain stock diversity to ensure the long-term health of our salmon populations. Loss of stock diversity can occur through dilution brought about by interbreeding with other stocks. For these reasons, Alaska at the outset of its salmon ocean ranching program set in place stringent regulations that govern the movement of salmon and trout within the state and prohibited the import of salmon and trout for aquaculture purposes.

The Department of Fish and Game's genetics policy prohibits the importation of live salmonids (salmon family) into the state, and does not allow stocks to be transported between major geographic areas, such as Southeast, Kodiak Island, Prince William Sound, Cook Inlet, Bristol Bay, and AYK/Interior. The policy has been adopted in order to protect Alaska's diverse natural salmon and trout stocks.

Any new aquaculture venture, such as salmon farming, must be governed by the same policy, transport regulations, and statutes that have applied to the salmon ocean ranching program for the past 16 years. This is particularly true for provisions prohibiting the importation of exotic species, such as Atlantic salmon. Atlantic salmon are acutally a trout and are the ecological counterpart of Alaska's indigenous or native steelhead trout. Since these species have not evolved together and thereby have not developed mechanisms to avoid competition with steelhead

trout or other trout, there is a concern about negative impacts on Alaska's indigenous trout.

Therefore, the genetics policy advocates the use of locally adapted stocks of salmon and trout of natural or hatchery origin because this will maintain the state's genetic diversity. This is important in the event of escape or "leakage" through holes in nets or other damage. The magnitude of impact on natural stocks is a function of numbers of fish that escape and that survive to spawn. It is assumed that low levels (less than 5 percent) of escapees can be managed by properly designed net-pen rearing units. Impacts on natural stocks from salmon farming would be minimized because of the policy of using locally adapted stocks.

SUMMARY:

Assuming that imports of exotic species such as Atlantic salmon or other fishes remain prohibited, that current regulations and policies remain in place, and that "leakage" of fish from the pens is kept low, salmon farming can be accommodated without the threat of impact to the genetic integrity of native and hatchery stocks of salmon and trout.

INDICATOR INC.

JAN ERICKSON

P.O. BOX 92285
ANCHORAGE, ALASKA 99509
907-279-5097

INDICATOR INC.

February 8, 1983

Member
Alaska State Legislature
State Capitol
Juneau, Alaska 99801

Dear Legislator:

We believe it important that the legislature pass this year a bill which authorizes finfish mariculture and requires an effective system of regulation. Our company is intending to establish a hatchery and future fish farm facility in Anchorage and would benefit from the expeditious passage of such legislation. Our efforts for obtaining adequate financing, obviously, would be enhanced by a clear state policy in favor of development. It is not only for our own project that we would like to see finfish mariculture authorized, but also because (and more importantly) this is the one strong growth potential for economic development beneficially affecting both rural and urban areas.

A sister company, Energy Pacific Corporation, has recently assumed ownership of the old Chugach Electric Association Knik Arm Power Plant on Whitney Road near downtown Anchorage. Along with the facility comes 20 acres which line Ship creek. We are actively seeking financing for construction of a power/fisheries/tourism complex in that area. The project will eventually involve a moderate-sized aquarium, fisheries research and development facility, ponds and growing tanks and various tourism amenities.

Briefly, we are proposing to grow four species of salmon eggs, fry, and smolt for both sale and release into Ship Creek for the benefit of Upper Cook Inlet commercial and recreational fishermen. We would then harvest a portion of the returning salmon for continued propagation and commercial processing for cost recovery purposes. We would like to rear various species of finfish --salmon, arctic char, and perhaps sheefish-- on that site as well. Because we will be able to utilize inexpensive waste heat from the power plant, we can be very efficient in this operation.

Other aspects of the project involve construction of a boardwalk community around Ship Creek (which will be maintained at a high water level) with retail shops, a high quality seafood restaurant and salmon bar-be-que, below water surface windows for tourists to watch migrating salmon, and a theatre for screening films about Alaska's natural resources. Eventually, we would like to construct an Alaska Native Arts and Culture Center, A Gold Exchange (small smelter and coin mint), an historical railroad museum, and botanical gardens.

P.O. BOX 92285 • ANCHORAGE, ALASKA 99509 • 907-279-5097

There are many possible spin-offs from the power operation, not the least of which is the inexpensive manufacture of fish feed. Pending a feasibility examination, we hope to find that we can process fish carcasses and other nutritional elements to produce an economical, high quality food for use in fish farms. As you may be aware, costs for fish feed in Alaska are relatively high. This could be the critical factor in whether Alaska fish farms can be competitive in the world market.

All these components --the hatchery, fish farm, aquarium, research and development facility-- do much to build infrastructure for this important new industry. Alaska may never become headquarters for the North Pacific fishing fleet as Seattle has been for so many decades, but it could become a world model for a modern and highly successful and diversified mariculture industry.

Your support on this issue is important. Currently, there is a stalemated situation between proponents and opponents of finfish mariculture. Most legislators believe that as long as powerful senators have vowed to block a bill, any effort is futile. There appears to be a strong perception on the Senate side that the moratorium enacted last year will be extended. At the same time, House proponents of finfish mariculture legislation maintain that they have the votes to prevent an extension. We may end up on July 1 with NO moratorium and a free-wheeling situation with numerous development companies attempting to get a head start. Already a handful of persons have vowed to be preparing for construction of farms and will test what few statutory constraints exist.

A related paper (attached) suggests a strategy for enacting finfish mariculture legislation this session. We solicit your interest and support. Our state's severe recession demands that every possible avenue to increase investment and employment for Alaskans be explored.

With best regards,

Jay L. Merelius
President

March 2, 1988

BACKGROUND INFORMATION

AND A

SUGGESTED COMPROMISE ON FINFISH MARICULTURE
prepared by Indicator, Inc.

Political Situation

As you are undoubtedly aware, the legislature has before it several bills authorizing the operation of fish farms (HB 108/SB 106, SB 425/HB 518, SB 482). The stalemate which had existed for some time with Senate opposition to finfish mariculture appears to be fading. As you may be aware legislation being readied in Senate Resources for Sen. Dick Eliason (SB 482) contains some significant changes to authorize finfish mariculture, namely for freshwater finfish and to allow uplands farm operations. Amendments will be offered that would postpone saltwater pen-rearing for one year to allow for additional study. On the House side, revisions in Rep. Johnny Ellis's bill (HB108) will limit the number operators in the initial years and place some strong controls on development of this industry.

IT NOW APPEARS THAT SOME ACTION WILL TAKE PLACE THIS SESSION WITH REGARD TO AUTHORIZING A LIMITED MARICULTURE ACTIVITY. The moratorium which was enacted last year when the legislation failed to pass will expire on June 30, 1988. House proponents believe that they have the requisite number of votes to prevent the moratorium extension and to pass legislation authorizing finfish mariculture. So if no authorizing legislation is approved, then we may end up with a free-wheeling situation with No moratorium and No state policy! In our opinion, that would be a very undersirable situation.

We have met with close to 40 legislators at this point and found a general philosophical support for developing this industry among a majority of that number. Support cuts across political parties, urban and rural representation, coastal and interior regions. Most legislators in this group expressed interest in seeing finfish mariculture eventually move forward in Alaska out of a belief that the free market out to be allowed to function and that fish farming would strengthen our existing seafood industry. Of the reservations voiced, the main concerns are listed as follows:

"How can we make certain that pen-reared Alaska salmon do not directly compete with wild salmon and eventually drive down prices?"

"How can we assure that resident Alaskans will control this industry and that benefits will go first to these folks?"

"How can we help small and medium sized operations survive and discourage large, foreign corporations from dominating the industry?"

"How can we pay for regulation and support of this new industry given that we are not adequately funding management of natural resources right now?"

"Is the potential for disease-outbreak among pen-reared salmon and a consequent spread to wild stocks serious enough to forego salmon farming?

"What are the consequences to the "genetic purity" of wild stocks should pen-reared salmon escape and mingle with the wild stocks?"

And finally:

"Does salmon farming, in fact, have a realistic chance in Alaska given in our higher costs of operation and a speculated decline in world salmon prices?"

A Compromise Solution

These and many other legitimate questions and answerable deserve to be dealt with by state leaders. Finfish mariculture is a paramount economic development issue that has tremendous import for the long-term well being of the Alaskan economy. It has proven positive economic benefits given the right kind of governmental controls. Legislators are cognizant of the fundamental need for expansion and diversification of our economic base. Public desire for new sources of jobs, new industries, and new investment is keen at this time --especially in recession-hit southcentral. Finfish mariculture will mean thousands of new jobs in both rural and urban Alaska as well as an infusion of millions of dollars in needed investment capital. Impacts in the transportation, communications, marketing, equipment supply and other areas of the state economy will be beneficial.

In conversations with state officials, potential fish farmers, and various legislators a series of possible answers to fishermen's and coastal communities' concerns have been proposed. Basically, these revolve around a a GO-SLOW, PHASE-IN APPROACH for finfish mariculture. This essentially experimental experience will last from four to seven years and provide key pieces of information for state policy makers to better fashion the statutory authorities and regulatory processes. At the same time, the Go-Slow procedure will help allay the fears of fishermen, coastal community groups, environmentalists, and others who express fears about negative impacts in water quality, tideland usage, genetic purity and health of the wild salmon stocks, stability of fish prices, and other issues.

The main elements of this GO-SLOW APPROACH are:

1) ADOPT A PHASED-IN PROCESS FOR FINFISH MARICULTURE OPERATIONS, LASTING FOR ABOUT FIVE OR SIX YEARS. THIS PERIOD CORRELATES WITH THE NORMAL SPAN FROM START-UP TO RECEIPT OF FIRST OR SECOND YEAR RETURN ON INVESTMENT.

2) AUTHORIZE ONLY A SELECT GROUP OF OPERATORS, INITIALLY, CHOSEN ON THE BASIS OF CAREFULLY DEVELOPED CRITERIA. AS STATE REGULATORY ABILITY INCREASES, THE NUMBER OF OPERATORS MIGHT BE INCREASED.

3) THE SELECTION CRITERIA SHOULD REFLECT KEY INFORMATIONAL NEEDS OF STATE AND LOCAL GOVERNMENTS AND SHOULD DISTRIBUTE OPERATING PERMITS OVER A BROAD SPECTRUM OF OPERATIONS, I.E., SCALE OF OPERATION, OWNERSHIP STRUCTURE, TECHNOLOGY APPLIED OFF-SHORE AND ON-SHORE, SPECIE TYPE, GEOGRAPHIC REGION, EVIRONMENTAL CHARACTERISTICS, AND OTHERS.

4) AS A CONDITION OF RECEIVING THE PERMIT TO OPERATE, MARICULTURISTS WOULD AGREE TO PROVIDE THE GOVERNMENT CERTAIN DATA FOR THE PHASE-IN PERIOD. THIS MAY RELATE TO VARIOUS PRODUCTION EXPERIENCES SUCH AS EQUIPMENT EFFECTIVENESS, POSSIBLY INCOME AND EXPENDITURES, AND OTHER ITEMS TO BE IDENTIFIED.

5) MORE IMPORTANTLY, THIS LIMITED NUMBER OF OPERATORS WILL BE FUNCTIONING UNDER STRICT BIOLOGICAL AND ENVIRONMENTAL QUALITY REGULATORY MEASURES AND WILL BE CONTINUALLY MONITORED IN THOSE AREAS. EMERGENCY REGULATIONS CAN BE QUICKLY ADOPTED AND STATUTORY AUTHORITIES ADJUSTED DURING THAT PERIOD.

6) THUS THE FLOW OF INFORMATION NECESSARY TO CAREFULLY DEVELOP APPROPRIATE POLICIES AND PROGRAMS IS ASSURED DURING THIS TIME. BECAUSE IT IS AN EXPERIMENTAL SITUATION, THERE IS THE OPPORTUNITY TO MAKE QUICK RESPONSES WHEN THE NEED ARISES.

7) POLICY WITH REGARD TO HOW RESIDENT-OWNED AND SMALLER SCALE FISH FARMS WILL BE ENCOURAGED (THROUGH TAX CREDITS, TECHNICAL SUPPORT?) CAN BE DETERMINED UNDER THE GO-SLOW APPROACH.

8) ALL THE WHILE, FISH FARMERS WILL BE OPERATING AS PRIVATE, FOR-PROFIT ENTITIES AND ESTABLISHING REAL WORLD BUSINESS EXPERIENCES UPON WHICH ALL THOSE QUESTIONS NOTED ABOVE CAN BE ANSWERED.

Several strong advantages accrue to the phased-in, experimental approach. For one thing, it is a cautious and sensible political compromise which most legislators can embrace. Secondly, it allows us a valuable opportunity to monitor this potential industry, to make adjustments based on actual experience, to collect the vital data, and to identify needs for any further in-depth studies. A ceiling on the number of fish farmers will allow for adequate public notice and thorough review on tidelands leasing questions, water quality control, and other possible environmental problems. And, a limited number of operations will have a minor impact on the fiscal resources of state natural resource management agencies.

Because the program is clearly established as an experimental undertaking, the option exists for making major policy and program changes. For instance, should we find a direct and unavoidable price competitive between pen-reared salmon and the wild stocks and this is consequently determined not to be in the general public interest, certain actions may be taken. Limitations in size (perhaps pan-size only), season limits on the sale (e.g.,not during wild runs), prohibitions on the growth of particular species, are some of these options. Insofar as the disease potential is concerned, it should be apparent that limiting the number of fish farms, providing strict controls, and assuring consistent monitoring is the best procedure to follow. Fish and Game officials, university researchers, and other experts have repeatedly stated that we have the tools to adequately respond to those threats, should they ever arise.

We believe that several special studies should be undertaken soon: one, a set of recommendations from the Alaska Departments of Labor, Commerce and Economic Develcpment, and Revenue proposing tax and regulatory policy as well as technical assistance programs. These would be designed to help maintain Alaska resident ownership and control, encourage local investment sources, provide for the training and hiring of Alaska residents, and suggest any special arrangements that would enhance viability of small rural operations.

Other reports might include an annual one to the Governor and the Legislature on the condition of the Alaska mariculture industry, its affect on the common property fishery, and world market trends in demand and prices for various species. Additionally, a review of the type of protection that may be sought by fish farmers for when and if disease should affect their operations. Protection through private insurance carriers may be adequate, but, if not, then some form of self-insurance pool may be needed.

There are undoubtedly many important questions that can be raised and should be dealt with; it is unfortunate that the dialogue has been so limited. But, in the end, only the actual experience of engaging in fish farming is going to give us the opportunity to determine what other consequences may occur and to develop the appropriate solutions.

If the moratorium should expire without any clear state policy, this potentially beneficial industry could be severely damaged. Not only might there be undesirable environmental and biological impacts, the future economic health of the industry would be threatened. It behooves state legislators and the governor and interested groups to begin resolving political, policy, and technical issues now.

Final Comment: The Alaska Seafood Marketing Institute recently received a $1.25 million grant from the U.S. Department of Agriculture to combat loss of market position for Alaska salmon in France and Japan, according to ASMI. Fresh Norwegian (pen-reared) salmon has captured up to 50% market share in those countries. The grant money will be used for generic product promotional purposes, but really there is no other way to effectively combat loss of market position other than by directly competing. We need to be able to sell FRESH ALASKAN SALMON year 'round any where in the world, at any time it is in demand. Only then we will be able to re-capture these significant losses.

Salmon Farming in Alaska

Economic Feasibility and Socioeconomic Impacts

Robert R. Logan

John Weddleton

University of Alaska - Fairbanks

April, 1987

Introduction

1) Overview

The dramatic increases in production of farmed Atlantic salmon has resulted in both optimism and fear for Alaskans. The optimism is expressed by those who believe salmon farming presents an alternative source of employment and income for the state. The fear is expressed by those who believe that farmed Atlantic salmon will compete with wild Pacific salmon in the marketplace, and cause reductions in employment and income for the traditional fishery.

The focal point for both groups is whether salmon farming should be legalized in the state of Alaska. (More precisely, whether the defacto restriction on production through the limitation on smolt acquisition is to be lifted.)[1] As with any public policy, the economic costs and benefits must be weighed in order to make a rational decision. The purpose of this piece is to aid in that process.

There would seem to be three important questions in this issue. The first is whether salmon farming is feasible in Alaska. If not, all arguments are moot because salmon farming wouldn't occur even if legal. If it is feasible, what kind of employment and income can we expect this industry to generate (both in terms of numbers and in terms

1 See "Aquaculture in Alaska" for a discussion of the legal issues.

of demographics)? Finally, what affect will the development of this industry have on the traditional fishery?

The central focus of this piece is a comparison of two scenarios - one with and one without Alaskan salmon farming. It is necessary to make this comparison with the recognition that world output of farmed salmon is expected to be much higher in the future. Thus, an investigation of the impact worldwide production will have on the traditional fishery must be made first. A discussion of the incremental effects Alaskan salmon farming will have can then be made.

It would be a major error to confuse the two points above. There is nothing Alaska can do to prevent the affects worldwide production will have on the traditional fishery. That is, preventing salmon farming here will not change this. These effects should not be a part of the decision to legalize salmon farming. The main concern should be the incremental effects of Alaska's own production.

The last question may be the one with the most public controversy. There is argument about the degree to which Atlantic and Pacific (and fresh or frozen) salmon compete in the marketplace. This is a vital ingredient in discussing the effects of farmed salmon on the traditional fisheries. The view taken here is that it is better to be conservative and provide a margin of safety - to assume that the species do compete directly in order to estimate spillover affects.

Even with this conservative (pessimistic) approach, it appears that Alaskan salmon farming will laregely complement, rather than displace the traditional fishery. The increases in world production are likely to have significant effects on the Alaskan traditional fishery. However, incremental Alaskan production is likely to have only marginal effects on the Alaskan traditional fishery.

Salmon farming is likely to generate thousands of jobs, and hundreds of millions in sales dollars when both direct and indirect effects are considered. The industry should earn high marks in terms opportunities for rural Alaskans. If the industry is developed properly, it will provide opportunities for family run operations as in Norway. Finally, it is an industry that provides year round employment and will result in wage dollars being spent in Alaska rather than elsewhere.

2) Putting Things Into Perspective

Before the technical analysis begins, a brief look at the relevant markets is warranted in order to put salmon farming into perspective. There has been an enormous increase in the production of farmed salmon. 1985 farmed salmon production (Atlantic and Pacific) was approximately 267% larger than 1981 production. Output increased from 12,000 metric tons to 44,000 metric tons over this period. However, as a fraction of total world salmon production, or even total world premium (Coho, Chinook, and Sockeye) salmon, the change is much less dramatic.

Table one indicates total wild, farmed, premium, and aggregated output numbers for various years. Note that even under the fairly dramatic forecasts of 142,000 metric tons of farmed salmon production by 1990, this represents only 17% of estimated world production. Currently, less than 10% of the world salmon supply is coming from farmed sources.

The above may underestimate the magnitude of farmed salmon relative to its particular market. Farmed production is sold as a fresh premium product. It may be appropriate to compare pen-raised output with wild Coho, Chinook, and Sockeye landings. Here, the comparison is more dramatic. If one thinks of these species as comprising a particular market segment, farmed production will rocket to over 40% of premium salmon production by 1990.

Thus, the dramatic increases in farmed salmon production do represent a substantial increase in the world supply of premium salmon species. The impact this will have on Alaska depends on how the demand for salmon changes through 1990. This topic is addressed after a brief discussion of salmon farming's feasibility in Alaska.

Relative Size of Salmon Farming

Year	Wild Total	Farmed Total	Farmed+Wild Total	% of Total	Premium Wild	Premium Total	% of Prem
1983	670.7	23.4	694.1	3.4%	196.4	219.8	10.6%
1986	657.0	59.2	716.2	8.3%	200.3	259.5	29.0%
1990	677.0	142.0	819.0	17.3%	200.0	342.0	41.5%

Table 1

Sources: 1983 and 1986 Wild and Farmed total figures reprinted from "World Markets for Farmed Salmon, p 2. 1990 farmed projections from "Aquaculture in Alaska" p 55. Premium wild species (Chinook, Coho, Sockeye) from "Statistical Yearbook - North Pacific Commission, 1986" p 15. (1986 estimates). Wild production of premium species assumed constant through 1990.

Conclusion

The already dramatic increases in the production of farmed Atlantic salmon force Alaska into a decision. Should salmon farming be legalized here? This project has attempted to answer the question through a socio-economic impact analysis. This is certainly not the only important point of view. Equally important are the biological issues that have been raised, and these should be considered as well.

It appears that salmon farming will be profitable in Alaska. A transportation cost advantage to Japanese, Canadian, and U.S. markets offsets higher feed and labor costs on the farm itself. Alaska has innumerable site possibilities. The infrastructure and labor force are already compatible with such an industry.

The industry does not appear to have dramatic scale economies. Rather, farms with one manager and a small crew seem to be the most profitable. The Norwegians have built a substantial fishery based on these small rural operations. There is no reason why Alaska should expect much difference. While much of the capital may initially come from outside, the same is true for virtually every significant industry this state has developed.

If this state does allow salmon farming, it appears that even a very modest development will result in thousands of jobs (part time plus full time), and over one hundred million in sales dollars when both direct and indirect effects are considered. The 20,000 metric ton scenario resulted in well over $300 million in final sales, around $90 million in final payroll, and over 4,000 in final employment.

The numbers are promising largely because second round effects are substantial. This is an industry that provides stable employment and pays year round wages - much of which will be respent within the state rather than outside.

There has been argument about the degree to which wild Alaskan salmon (both fresh and frozen) compete with the farmed Atlantic and Pacific salmon product. This is indeed the key in calculating the spillover affects of salmon farming on the traditional fishery. This study took a rather pessimistic approach, and assumed direct competition between farmed and wild products. In this way, the maximum feasible impacts may be calculated.

It was shown that the traditional fishery has reason to be concerned with the increases in worldwide production. The worst case scenario indicated a $36.4 million loss to the fishery through reduced revenues. However, incremental Alaskan production only added another $4.7 million loss on top of this. The gain from the development of the industry here was $132 million in direct sales, and the final effects listed above.

Note that these figures are the result of some very pessimistic assumptions - that demand for salmon fails to increase over time (in conflict with recent experience); that farmed and wild salmon compete directly (also in conflict with recent experience); that the enormous projected increases in world production in fact occur. For these and other reasons discussed in the text, these numbers are substantial overestimates of the effects world and Alaskan salmon farming will have on the traditional fishery.

This is not to say that salmon farming will not affect the traditional fishery. World salmon farming probably does mean millions of dollars in reduced revenue to the traditional fishery over the long run. In particular, technological and genetic improvements will make salmon farming an ever more efficient enterprise. The crucial point Alaska policymakers must not miss is that as salmon markets become larger and more competitive, the effect of one's own production on market price becomes ever smaller.

Therefore, the issue of salmon farming in Alaska involves a choice between two futures: One is a future without salmon farming, but with a permanently lower level of employment and income in the fishery and the state as a whole. The other is a future with salmon farming, and with a higher level of employment and income in the fisheries sector as well as the state as a whole.

INDICATOR INC.

March 16, 1988

Members
Senate Resources Committee
Alaska State Legislature
Juneau

Dear Senators:

RE: aquafarm legislation amendments

We have reviewed the committee draft (3/8/88) of CS for SB 482 and found some serious errors as well as areas of general policy disageement. The most fundamental of which are the severe limitations SB 482 places on the potential healthy development of the industry. The bill may be written to satisfy as many of the various interest gruops as possible, but it does so in a way which ignores basic economic facts about how the industry actually functions. A review of the economic studies conducted by the State, the university, and other groups will support this point.

Both the title and a key provision, Section 16.40.100 (d) are ambiguous and could result in major unintended consequences. If the real objective is to circumscribe the growth of salmon in a marine saltwater environment, then the language ought to reflect that. As it stands, it could be interpreted to ban the growth of all saltwater non-salmon species and disallows the use of synthesized and pumped saltwater to uplands sites.

Some suggested major goals of the committee re-write are:

1. To specifically authorize the growth of non-salmon finfish in fresh and saltwater.

RATIONALE: WE NEED TO BE ABLE TO DEVELOP BLACK COD, HALIBUT, ARCTIC CHAR, SHEEFISH, SABLEFISH, OTHER SPECIES --SOME OF WHICH REQUIRE SALTWATER. THIS WOULD ALSO ALLOW FOR THE PUMPING OF SALTWATER TO UPLANDS OPERATIONS.

2. Safequard the authorization of uplands sites on both public and private lands, with all the necessary notice, hearing, and permit process controls.

RATIONALE: IT IS GENERALLY AGREED THAT UPLAND SITES PROVIDE LITTLE OR NO THREAT TO NATIVE STOCKS AND REPRESENT A JUSTIFIABLE USE OF STATE RESOURCES.

3. Adoption of language placing a one year moratorium on marine-sited pen-rearing of salmon and directing a task force to recommend

P.O. BOX 92285 • ANCHORAGE, ALASKA 99509 • 907-279-5097

any additional statutory and regulatory authorities by January, 1989.

RATIONALE: THERE IS NO SOLID EVIDENCE THAT MARINE PEN-REARING OF SALMON REPRESENTS AN UNMANAGEABLE THREAT TO NATIVE STOCKS AND THERE IS A SUBSTANTIAL BODY OF SUPPORT IN BOTH THE SENATE AND THE HOUSE FOR THE EVENTUAL DEVELOPMENT OF THIS INDUSTRY IN ALASKA.

Additionally:

4. Authorize a very limited number (5) of uplands sites to rear salmon, beginning this year, with permits distributed by geographic region.

RATIONALE: WE NEED TO BEGIN GROWING SUFFICIENT QUANTITIES OF SMOLT TO SUPPLY AQUAFARMS AS SOON AS THEY ARE GENERALLY AUTHORIZED. THE LEAD TIME HERE WOULD BE IN MULTIPLE YEARS....FURTHER DELAY WOULD PLACE THE INDUSTRY ENTRY INTO THE MARKET IN THE MID TO LATE 1990'S. ALSO, WE NEED REAL WORLD PRODUCTION AND MARKETING EXPERIENCE WITH WHICH TO FINE TUNE THE EFFECTIVENESS OF STATE LAWS AND REGULATIONS.

Finally, we would ask that a minor amendment be added to allow for operators to enter into contractual agreements with the Department of Fish and Game to obtain the department's assistance in developing sufficient supplies of non-salmon finfish broodstock. This addition would be critical to our own proposed operation in Anchorage and others like it. Suggested language is as follows:

New Section to follow Sec. 16.40.150 (page 6, line 3 or so) "the department is authorized to enter into an agreement with a permit holder in order to assist in the collection and production of non-salmon finfish broodstock. Costs for the activity will be borne by the permit holder."

Enclosed please find materials that may be of assistance in your further consideration of SB 482. Thank you for your interest and support.

Regards,

Jan Erickson
Vice President

Alaska Mariculture Association

Sen. Jack Coghill
P.O. Box V
Juneau, AK 99811

Dear Sen. Coghill:

Salmon farming may be one of the least understood issues pending before the legislature, despite the fact that we have accumulated impressive piles of reports, studies and research, and scores of Alaskans have offered testimony and written comments of pros and cons.

As you are fully aware, this issue of salmon farming has aroused strong opposition among commercial salmon fishermen and has become a highly emotional subject of debate in coastal communities. This opposition has led some lawmakers to believe mariculture, and in particular salmon farming, is a commercial fishing issue.

This is not the case. What mariculture is all about is economic development. It is no more a commercial fishing issue than logging, mining or oil and gas development. Each have potential impacts on fisheries habitats and wild stocks that should be closely examined before decisions are made on how to proceed.

The Alaska Mariculture Association (AMA) believes that the legislature would be setting a dangerous precedent in resource development if it opts to decide the fate of mariculture based upon a popularity contest among fishermen. Certainly, it is critical that you carefully weigh the potential adverse impacts on commercial salmon fishing, but a decision to prohibit salmon farming simply because fishermen don't like it would be akin to blocking coal mining to protect oil producers from competition.

AMA urges you to carefully analyze the facts about salmon farming and its potential costs and benefits, and make a good public policy decision. We realize this is difficult on a controversial issue, but resource development issues are never easy to make in Alaska and salmon farming definitely is no exception.

One of the most critical factors to keep in mind is that a prohibition of salmon farming in Alaska really doesn't give salmon fishermen anything except a moral victory. About 20 other countries and even such unlikely states as Minnesota, South Dakota and Pennsylvania will continue to produce enormous quantities of farmed salmon.

The market impacts will not change by Alaska's non-involvement. Alaska restaurants and supermarkets will continue rely on foreign farmed salmon, and our processors will have to continue purchasing farmed salmon from other countries to satisfy consumer demand.

This means Alaska still has all the adverse impacts, but reaps

130 Seward St., Suite 201 • Juneau, Alaska 99801 • (907) 463-3600

none of the benefits. We believe this policy option doesn't make sense, and we urge you to firmly reject it.

The potential economic benefits from salmon farming simply cannot be dismissed without serious consideration. AMA believes that aquatic farming is one of Alaska's best opportunities for diversification of our economy and is a necessary step to ensure our long-term competitiveness in world seafood markets. This is particularly true of salmon farming, which currently appears to be a unique opportunity for state government to immediately create long-term jobs and attract significant private investment capital without investing state funds.

Salmon farming does not require government to initiate publicly financed markets campaigns designed to change world demand, convince trading partners to invest their money in Alaska, or provide subsidized loan programs or other giveaways. All the state needs to do is to put reasonable rules in place to protect public health, wild stocks and the environment. The private sector will do the rest.

The attached articles from the leading trade journal Seafood Business on British Columbia's salmon farming industry illustrate the economic development opportunities available to Alaska. The B.C. industry has come a long way in a very short period of time, and government officials now estimate that the value of the province's aquaculture industry will surpass commercial fishing by the early to mid-1990s.

Despite the opposition from commercial salmon fishermen, salmon farming even offers major economic opportunities for the fishing fleets. The attached opinion piece from Pacific Fishing outlines some of the ways AMA believes commercial fishermen could benefit from salmon farming.

One issue which appears to be a major concern to many legislators is the potential effect of salmon farming on our wild stocks. This is valid concern and deserves to be thoroughly examined, as our salmon fishing industry has been a mainstay in the Alaska economy since the turn of the century.

Fortunately, Alaska has tremendous experience in salmon aquaculture, and we possess some of the world's leading salmon culturists, geneticists and pathologists. These scientists have studied the issue closely and have determined that salmon farming offers no bigger threat to the wild stocks than our current hatchery program. The enclosed issues papers by the Alaska Department of Fish and Game outline the department's position regarding disease and genetics impacts of farmed salmon.

I have also enclosed a copy of a letter from Dr. Trygve Gjedrem, director of the Norwegian Institute of Aquaculture Research and president of the International Association of Genetics in Aquaculture, to Dr. William Smoker, University of Alaska geneticist, regarding recent news reports that "renegade" farmed salmon were threatening Norway's wild stocks.

Dr. Smoker said the widely publicized "study" actually appears to be what scientists refer to as "anecdotal observations" made by Norwegian scientists while collecting salmon sperm for a wild stock gene bank. Dr. Gjedrem's comments indicate the information gathered by the institute is insufficient to draw many conclusions, and that even if successful spawning were to occur no major problems would be anticipated.

This is not to suggest that escaped farmed salmon isn't a matter of serious concern, because it is, but only that it should be placed in context. Recent articles from fishermen's newspapers have made it appear that the Norwegians have convincing evidence that escaped farmed salmon threaten the very existence of the country's very small natural runs.

The current debate over the threat of fish farming to the wild stocks is reminiscent of the opposition mounted by many fishermen against the state's salmon hatchery program. The record of Alaska's success at boosting natural runs without adversely affecting wild stocks has convinced most fishermen to strongly support the program. The scientists are convinced that salmon farming could be conducted as safely.

On an final note, I'd like explain AMA's position on the pending mariculture legislation. AMA's board of directors has endorsed sponsor substitute for HB 108 (Ellis, Rieger, et al) and strongly opposes the current versions of SB 482, SB 425, HB 455 and HB 518. AMA believes HB 108 offers a good compromise on the salmon farming issue, while clearing a path for Alaska to take full advantage of its tremendous opportunity in other species.

The other bills mentioned are decidely anti-mariculture development and are as strongly opposed by AMA's shellfish and kelp members as those interested in finfish. Shellfish farmers are generally satisfied with the recent shellfish farming regulations proposed by the Cowper Administration and do not believe any significant changes should be made.

In addition to adversely affecting shellfish and kelp farming, these bills would restrict finfish farming to the uplands where development and operating costs are significantly higher. This decreases the ability of Alaskans to participate and may prevent the farming of such species as arctic char, rainbow trout and black cod. It is vital that we be able to farm these species in net pens in the marine environment. The opposition has been directed at salmon farming in net pens and any restrictions should not extend beyond the five species of Pacific salmon (genus Onchorynchus) and, of course, Atlantic salmon.

We continue to support salmon farming, and oppose a decision to prohibit it or to impose a moratorium. There is sufficient evidence available to answer the questions posed during public hearings.

We have tremendous amounts of information available and would be pleased to respond to any questions you may have regarding mariculture.

Thank you for consideration of my lengthy comments.

Sincerely,

Rodger

Rodger Painter
Executive Director

Alaska Mariculture Association

MEMORANDUM

TO: Senator Jack Coghill, Chairman
Senate Resources Committee

FROM: Rodger Painter, AMA Executive Director

DATE: March 14, 1988

RE: CSSB 482

I have reviewed in detail the original version of Senate Bill 482 and the committee substitute developed by Senator Eliason. While AMA opposes both versions, the committee substitute does offer a couple of important improvements, specifically in making permits transferable and eliminating public notice requirements imposed on applicants for tidelands.

These changes are relatively minor, however, in context of the impact of the bill overall on mariculture development. Our continuing opposition focuses on impacts on shellfish and aquatic plant farming, non-salmon finfish pen rearing, uplands finfish farming, and the prohibition of pen rearing of salmon.

Shellfish/Kelp

Policy--SB 482 should have a findings and policy section to provide better policy direction to state agencies on mariculture development issues. This is critical to all developing resource industries where agencies have to deal with many problems that aren't directly addressed in enabling legislation, and will be especially important in the case of mariculture because of the controversy surrounding the issue.

Criteria--AS 16.40.105 provides criteria for issuance of permits that AMA believes is too restrictive and would not allow flexibility by state agencies. The existing language could be interpreted to say that any degree of adverse impact will result in denial of a permit. This concern has been driven home by the fishing industry's current concerns about the absolute language in the Marine Mammal Protection Act which some environmental groups interpret as saying any taking of an endangered marine mammal could result in a total closure of that fishery.

Sales of Broodstock--AS 16.40.120 (b) restricts the sales of spat or other broodstock gathered from wild sources to Alaska farms and

130 Seward St., Suite 201 • Juneau, Alaska 99801 • (907) 463-3600

aquatic farming hatcheries. Participants in the Kodiak scallop farming project have requested that this section be amended to allow sales to out-of-state buyers who already have been calling about potential purchases. Spat fishermen want this flexibility because initial in-state markets could be insufficient.

Oyster farmers who are acutely interested in construction of a shellfish hatchery have requested a similar amendment to AS 16.40.140. Oyster farmers believe sales to outside buyers may be critical to feasibility of an Alaska oyster hatchery.

Releases--SB 482 does not include language provided in SB 106 that specifically precludes the intentional release into common property waters without prior approval of ADFG. This is an important protection for wild stocks. Farmers favor language that prohibits unauthorized releases, while allowing approved releases as a method of lower cost common property enhancement programs involving private hatcheries.

Disease Reporting--AMA endorses language developed at the suggestion of Brian Allee with the FRED Division that requires the reporting of disease incidents within 48 hours of detection. AS 16.40.150 (a) now requires the reporting of disease outbreaks, but lacks a time-certain reporting requirement.

Definitions--AS 16.40.199 (3) limits aquatic farm products to consumptive sales, except for kelp cultivated for use in dyes. This is much too restrictive a definition for aquatic plants which could be used for a wide variety of purposes in addition to dyes. The language also could prohibit, for instance, cultivation of pearls or other non-consumptive uses of aquatic animals. AMA suggests the language be amended to allows the sale of aquatic farming for all consumptive and non-consumtive uses.

Labeling--SB 482 adds language to AS 03.05.020(a) that requires DEC to label all cultivated seafood as aquatic farm products. This is a costly requirement that appears to serve no useful purpose for the farmer or consumer. We particularly question the applicability of this section to oysters and mussels (the only two seafoods presently being produced by Alaska farms) since there are no wild products available on the market from Alaska. This requirement also would apply to aquatic plants and a wide variety of finfish, such as arctic char, rainbow trout, sheefish and other species.

AMA does not believe that such labeling really affects consumer purchases, and will only result in unnecessary government spending. This section appears to be directed at farmed salmon. If commercial fishermen want to distinguish their salmon from farmed salmon then they should take the initiative to label their products as "wild." AMA believes it is inappropriate to impose this requirement on farmers.

Tideland Permit Fees--Perhaps the most objectionable provision of SB 482 is AS 38.05.856(a) which requires DNR to charge aquatic farmers "not less than the appraised fair market rental value" for nontransferable tideland permits. AMA strongly objects to aquatic farmers being charged more than other users of state tidelands. We believe this is unfair, and could result in additional costs that would push many existing farmers out of business. We also believe the required appraisals will be costly and could result in significant additions to a DNR fiscal note.

Denial of Permits--Subsection (d) of AS 38.05.856 is ambiguously worded and one interpretation is that permit issuance and renewal could be denied simply on the basis of adverse public comments, rather than for public policy purposes. AMA suggests this section be rewritten to clarify that permits applications and renewals can be denied for good cause or if DNR finds it is in the state's best interests.

Culmulative Impacts--AMA also strongly objects to subsection (f) of AS 38.05.856 which directs DNR to adopt regulations providing for limits on the number of aquatic farming sites to be approved in an area to protect the environment and natural resources. These kinds of culmulative impact requirements are extremely difficult for regulatory agencies and for the industry, and result in high regulatory costs in monitoring and determining appropriate levels of growth.

On what basis would DNR determine culmulative environmental and biological impacts? Does the state possess adequate data on aquatic farming upon which such decisions could be based? It appears that significant research could be required before this could be implemented. Such provisions generally end up being tremendously burdensome for the agencies and invite lawsuits from anti-development organizations.

Permitting Freeze--Sections 18 and 19 would impose a freeze on all aquatic farming licensing and permitting and issuance of tideland and land use leases for aquatic farming until regulations are fully implemented. This could take months, and would result in extensive delays for applicants. For example, ADFG started working on the shellfish farming regulations now pending not long after the 1987 session and those proposals were still pending final approval by the Department of Law on the first of March. Once released by DOL, another 30 day waiting period is required before the regulations are implemented. This process, to date, has taken about eight months. These kinds of delays can be very costly to an applicant.

Critical to keep in mind is that ADFG's proposed shellfish farming regulations should become effective before the end of the legislative session and will be in place to deal with shellfish farming applications.

AMA strongly objects to this moratorium since the 40 existing permitted farms represent a tiny fraction of the 2,400 tidelands permits and leases issued statewide. There are no indications that any problems will occur while agencies are working on implementation of SB 482 or other legislation.

Grandfather Limitations--While AMA is very happy that SB 482 includes provisions to grandfather existing shellfish farmers into the lease preference section, we object to the limitations that come attached. The language restricts the grandfathered farmers to conditions of existing permits and preclude the farmer and DNR from negotiating a lease. The grandfathered farmers should be treated like all other lease applicants.

FINFISH FARMING

Sales of Broodstock--SB 482 does not allow private nonprofit hatcheries to sell surplus salmon eggs to upland aquatic farms. Some large surpluses of eggs now exist in some PNP hatchery programs, and AMA believes these operations should be allowed to sell these valuable eggs to upland farmers. Existing language in AS 16.10.420 and AS 16.10.450 prohibit PNPs from selling these surplus eggs to anyone other than another PNP. Consequently, many of these surplus eggs are destroyed.

AMA believes the PNPs should be given the option of selling these surplus eggs to in-state salmon farmers as a method of generating additional revenues to help retire debt obligations incurred under the state's enhancement loan program. This new source of revenue could allow the PNPs to reduce cost recovery harvests, creating the opportunity for increased common property harvests.

These amendments should be made in conjunction with additional amendments specifying that aquatic farm animals may not be intentionally released into public waters without prior approval of ADFG. The language also should require that such releases be subject to the disease and genetics standards standards of the department.

Salt Water Prohibitions--AS 16.40.100(d) prohibits the farming of finfish in salt water. This language appears to limit upland finfish farms to the use of fresh water. AMA believes it is critical to amend this language to allow upland farms to pump salt water to upland farms, as fresh water salmon and other finfish do not perform very well in fresh water culture. Even such landlocked farms as the Fairbanks' coho salmon farm require the use of some artificially created salt water in incubation and smoltification procedures.

Critical in consideration of this issue is the fact that discharges from upland farms will be subject to the same kinds of treatment requirements now applied to hatcheries. Discharges will be screened and treated so there is no opportunity for disease transference or sediment accumulations by outfalls.

In short, upland farms utilizing salt water will have no greater impact on the environment, natural stocks or use of public tidelands that those employing fresh water cultivation, but will be much more economically viable. AMA believes it is critical that such an amendment be adopted.

Prohibitions on Pen Rearing of Non-salmon Finfish--One of the most critical amendments necessary to SB 482 is the lifting of prohibitions on the pen rearing of non-salmon species of finfish. Upland farming is far more expensive than sea cage based systems from developmental and operational perspectives, and it is vital that farmers be allowed to experiment with sea cage rearing if Alaska is to achieve its potential with the farming of such species as arctic char, rainbow trout and black cod.

The controversy over fish farming has been narrowly focused on the pen rearing of salmon, and we do not understand why the prohibitions on free enterprise has been extended beyond the Onchorynchus genus. There will be no "gold rush" to farm these species as they are more in the experimental stage of development, so government does not have to fear that agencies will be overwhelmed with applications and face a myriad of land managment conflicts.

Should the committee decide it is vital that the pen rearing of salmon be prohibited, then AMA urges you to narrow the prohibitions to the pen rearing of Onchorynchus in the marine environment and estuaries.

Prohibition on the Pen Rearing of Salmon--AMA believes it is poor public policy to pass a permanent ban on the pen rearing of salmon. While it probably is not necessary to repeat the many reasons we oppose such a prohibition, it may be useful to point out that even the most ardent opponents of salmon farming have stated that the issue will not be closed with passage of SB 482 in its present form.

With this recognition, AMA urges you to consider a method for fully resolving the salmon farming issue. We believe the pen rearing issue will not be resolved until there is a full public discussion of salmon farming in Alaska focused on fact rather than emotionalism and power politics.

The best way of settling the salmon farming issue is to impose a moratorium on limited duration on the pen rearing of salmon and appoint a task force to gather factual information on the costs and benefits of salmon farming, including an in depth analysis of disease, environmental, market and fiscal concerns voiced by opponents. The membership of such a task force would have to be well balanced, and specific goals would have to be imposed. It also would be important to give the task force the charge of simply gathering and analyzing existing information so no costly and lengthy studies are required. Its mission should not include policy recommendations as this would politicize the process.

Passage of SB 482 with a flat ban on pen rearing and no public process will only lead to a continuation or even esculation of the current debate which has been driven by wildly divergent claims by proponents and critics. This atmosphere will only serve to make the process increasingly divisive. AMA is fully prepared to accept a legislative ban on pen rearing of salmon following a well informed public policy debate.

STATE OF ALASKA

STEVE COWPER, GOVERNOR

DEPARTMENT OF COMMERCE & ECONOMIC DEVELOPMENT

DIVISION OF BUSINESS DEVELOPMENT

P.O. BOX EE
JUNEAU, ALASKA 99811-0800
PHONE: (907) 465-2017

DATE: March 4, 1988

TO: Distribution

FROM: Paul Peyton, ~~Project~~ Manager
Division of Business Development
Department of Commerce & Economic Development

SUBJECT: Preliminary Findings of Socioeconomic Studies

NOTE: Final reports are due March 11 and these findings are presented in the interim to aid discussions. These are not complete, but should not change materially.

The Department of Commerce and Economic Development (DCED) has received preliminary reports from the contractors working on the cost of production model and salmon market model. In addition, staff met with the contractors to go over the results to date and to evaluate the probable work products and timing of results.

Meetings were also arranged with several marketers of troll and farmed products, including Barry Lester, President of the Alaska Troll Salmon Producers Association, and Arnie Einmo of Dory Seafoods, a major broker of B.C., Chilean, and Norwegian salmon in Seattle. They were asked to provide input and critique the work done by others to assist in evaluating the reliability of the results.

The study topics, as related in the department's earlier memo to interested parties, were chosen to answer the maximum number of questions posed by the resource committees with the monies available. Those questions focused on the economic feasibility and ex-vessel price impacts of pen rearing salmon in Alaska. In addition, questions as to industry structure, location, and participants were posed. As these were in large part dependent on the basic feasibility and funding was not adequate to do an in-depth analysis of those questions, the Fisheries Cabinet elected to answer the feasibility and price impact questions first.

Attached are copies of the letters from the contractors, a review of the B.C. industry for 1987 by DPA Group, Inc., and excerpts from a study done by DPA Group, Inc. and Dr. Anderson in 1987 for the B.C. Salmon Farmers Association which analyzes the market for farmed salmon. That report concludes that the North American market has the best potential for B.C. farmed fish, and most of the study is directed at analyzing that market.

While this last study does not answer many of the questions concerning Alaska's potential entry into pen rearing, it does help put in perspective the world supplies and markets for pen reared fish, and B.C.'s strategy for selling their product in the U.S. Many of the same observations can be applied in analyzing Alaska's potential as a pen rearing area. This document is being reviewed by various marketers of troll and pen reared production, and we will report on their evaluation. To date none have found any serious cause for disagreement.

That study did not, however, address the Japanese market in any detail. A major focus of the study underway by DCED is to evaluate the market in Japan, and to refine the information on west coast U.S. markets. The other major effort will be in price forecasting, something DPA Group, Inc.'s study did not do in any detail.

Based on results to date, the contractor feels it should be possible to:

1. Evaluate in general terms the extent to which potential Alaskan farmed salmon would compete with Alaskan wild production in likely markets for Alaskan farmed salmon -- Japan and the west coast of the U.S.

2. Gauge the relative impact of Alaska's increment of potential production on wholesale salmon prices. As the funds are not adequate to build a worldwide supply and demand model, it is not possible to predict with certainty the overall effect of world production on markets for Alaskan wild salmon.

3. In the near term, predict what will be the actual market prices for farmed salmon potentially produced in Alaska. A point estimate for 1995 will be produced and, if possible, high and low bounds will also be determined.

The contractors have both had troub[illegible] obtaining some data and requested one week extensions, to March 11, for the final report. Given the complexity of the issues, they were in turn asked to be available to present the findings to the legislative committees. They have agreed. Dates will need to be determined.

The department is holding approximately $4.0 in reserve to address questions that arise after the costs and markets have been addressed. An overall evaluation of the positive and negative impacts might be undertaken, for example.

SUMMARY OF SIGNIFICANT FINDINGS TO DATE

WILD PRODUCTION OF KINGS AND COHOS

1976-86 average king + coho all gear types West Coast, B.C., and Alaska	70,000 mt

Source: Compilation of NMFS and ADF&G data.

NOTE: The production is increasing with ocean ranching and conservation measures taking effect. Estimates of this increase are being prepared by the contractors.

WORLD SUPPLY AND DEMAND FOR ALL FROZEN AND FRESH SALMON

Total world consumption of fresh and frozen salmon including all species and all sources in 1984.

Japan	273,600
United States	52,700
Canada	12,100
Europe	
France	21,100
U.K.	10,600
Other	18,300
Total	388,400

Total world production of salmon by species in 1983.

Atlantic Wild	7,518	1%
Farmed	17,795	3%
Pacific (Wild)		
Chinook	19,784	3%
Coho	34,445	5%
Sockeye	164,000	24%
Chum	188,850	27%
Pink	252,830	37%
Masu (Cherry)	3,300	-
Total All Salmon	688,522	100%

Note: Figures are from UN Food and Agriculture Organization.

Source: DPA Group, Inc. Market Access and Penetration Strategy

PROJECTED WORLD PRODUCTION OF FARMED SALMON BY 1990

Atlantic	150,000 mt
Pacific	35,000 mt

Projected Increase in Supply to U.S. 49,400 mt