HB

108

(FILE 1)

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STATE OF ALASKA 1987 LEGISLATIVE SESSION
FISCAL NOTE

121

REQUEST:

Bill Version : CSHB 108(L&C)
Publish Date : HOUSE 3/4/87

Revision Date: 2-4-87

Agency Affected: Natural Resources
BRU: Land and Water Management

Title : An Act Relating to Aquatic Farming

Sponsor : Ellis, Rieger, Cotten, Brown,
Requestor : etc.

Components :

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 87	FY 88	FY 89	FY 90	FY 91	FY 92
PERSONAL SERVICES	0	84.6	171.3	171.3	210.6	210.6
TRAVEL	0	20.0	25.0	25.0	22.0	22.0
CONTRACTUAL	0	2.0	4.0	4.0	4.0	4.0
SUPPLIES	0	1.0	2.0	2.0	2.0	2.0
EQUIPMENT	0	0	0	0	0	0
LAND & STRUCTURES	0	0	0	0	0	0
GRANTS, CLAIMS	0	0	0	0	0	0
MISCELLANEOUS	0	0	0	0	0	0
TOTAL OPERATING	0	107.6	202.3	202.3	238.6	238.6
CAPITAL	0	0	0	0	0	0
REVENUE	0	15.5	23.5	32.0	36.0	40.0

FUNDING: (Thousands of Dollars)

GENERAL FUND	0	107.6	202.3	202.3	238.6	238.6
FEDERAL FUNDS	0	0	0	0	0	0
OTHER	0	0	0	0	0	0
TOTAL	0	107.6	202.3	202.3	238.6	238.6

POSITIONS:

FULL-TIME	0	2	3	3	4	4
PART-TIME	0	0	2	2	2	2
TEMPORARY	0	0	0	0	0	0

ANALYSIS : (Attach a separate page if necessary)

See Attached

Prepared by : Paula Burgess
Division : Land and Water Management

Phone : 465-3400
Date : 2/13/87

Approved by Commissioner :
Agency : Natural Resources

Date :

Distribution (by preparer):
- Legislative Finance
- Legislative Sponsor
- Requestor
- Office of Management and Budget
- Impacted Agency(ies)
- Senate Secretary

In order to assess the fiscal impact of HB 108, we estimate the number of new applications for tideland leases and permits that we expect. The actual number of applications will vary depending upon the fee structure for leasing and permitting, and the "prove up" requirements of the bill. At present our permit fees are extremely low and the cost of obtaining a lease is quite high. At this stage no "land law" accompanies the bill to alter the lease or permit structure. We recognize that certain changes are desirable to encourage growth of the industry, such as the acceptance of a paper plat rather than a full survey for a lease in remote areas. While such changes may be forthcoming in later committees, the fiscal note here reflects the existing permit structure.

We estimate the number of new applications the first year to be the following:

30 salmon
25 scallop
10 oyster
3 mussel
2 kelp

We require one adjudicator in the Southeast Region and one adjudicator in the Southcentral Region to handle the new applications. The second year we require one additional adjudicator (to be located where the need is the greatest) to handle additional new applications. By the fourth year we are assuming the need of two adjudicators in each of the two regions.

The second year we require a part time contract administrator to handle the accumulation of two years of lease contracts, and a part time surveyor to review survey plats. (The survey cost may be reduced somewhat if the bill is amended to allow paper plats rather than full surveys in remote areas.)

A goal of the state and of those seriously interested in aquatic farming is to avoid land speculation. In order to accomplish this, it will be necessary to inspect most lease and permit sites once a year. Some inspections can be combined with other field investigations, and some may be performed under cooperative agreements with other agencies. A lean inspection program will cost $10,000 for each adjudicator the first year (travel and per diem). In subsequent years the cost will decline as we establish inspection efficiencies.

Under existing statutes and regulations, the number o leases and permits estimated above would generate

approximately $15,500 in revenue the first year. As the number of operations increases each year, the revenue increases modestly. If the bill were amended to allow the Commissioner to charge a percentage of gross receipts, revenues could increase substantially once the industry began to flourish.

Position Summary

Fiscal Year '88

Two (2) - Natural Resource Officers II (Range 16)

Fiscal Years '89 and '90

Three (3) - Natural Resource Officers II (Range 16)
One (1) - Part-time Contract Administrator (Range 14)
One (1) - Part-time Surveyor (Range 20)

Fiscal Years '91 and '92

Four (4) - Natural Resource Officers II (Range 16)
One (1) - Part-time Contract Administrator (Range 14)
One (1) - Part-time Surveyor (Range 20)

No. 1

125

STATE OF ALASKA 1987 LEGISLATIVE SESSION
FISCAL NOTE

Bill Version : CSHB 108(L&C)
Publish Date : HOUSE 3/4/87

REQUEST:

Revision Date:
Title :

Agency Affected : ADF&G
BRU : FRED

Sponsor : Zharoff et al, Ellis et al.
Requestor :

Component : FRED

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 87	FY 88	FY 89	FY 90	FY 91	FY 92
PERSONAL SERVICES		157	157	183	236	330
TRAVEL		6	6	10	17	20
CONTRACTUAL		1	1	2	4	9
SUPPLIES		2	4	6	10	22
EQUIPMENT				1	2	5
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING		166	168	202	269	385
CAPITAL						
REVENUE						

FUNDING: (Thousands of Dollars)

GENERAL FUND		166	168	202	269	385
FEDERAL FUNDS						
OTHER						
TOTAL						

POSITIONS:

FULL-TIME		2	2	3	3.5	9
PART-TIME		1	2	1	2	0
TEMPORARY		1	0	0	0	0

ANALYSIS : (Attach a separate page if necessary)

This analysis estimates costs of pathology services and permitting based on 100 permit applications in FY 88, ultimately resulting in 20 operational fish farms by FY 92 of economically significant size.

(see attached for additional comments)

Prepared by : Dr. Mike Kaill
Phone : 465-4160
Division : ADF&G/FRED
Date :

Approved by Commissioner :
Date : 2-2-87
Agency :

Distribution (by preparer):
Legislative Finance
Legislative Sponsor
Requestor
Office of Management and Budget
Impacted Agency(ies)
Senate Secretary

CONTINUATION OF FISCAL NOTE, SB106/HB108. rev 3/2/87

Estimated cost of services to be provided by ADF&G are fish pathology services, permit processing and technical oversight.

For pathology services, estimated costs are based on current workload and budget for the section at this time, to arrive at a per-unit cost (e.g. $600,000/37 hatcheries = $16,000/hatchery). An additional $12,000 is budgeted for investigations and diagnostic services in the first year. Types of services are: diagnostic, broodstock, water source analysis, shellfish certification, pre-release inspection, and human health concerns.

For permitting and technical oversight services, an assessment of work requirements was made by calling the Marine Resources Division of the B.C. provincial government. For the first three years, two full-time technicians would be required. Thereafter, manpower needs will diminish. The types of work to be undertaken will be communication with applicants, review of application materials, coordination with programs such as coastal zone consistency review, and technical biology and fish culture oversight.

It is very difficult to anticipate what will happen if a mariculture program is enabled in Alaska. We have prepared this note based on observations and consultations with managers of similar programs. We then applied this to Alaska, using the incomplete data at hand. These must be considered rough estimates of cost. As further information becomes available, the fiscal note could change. Also, as the bill becomes modified as it passes through the legislative process, there may be changes in the bill that will have corresponding changes in the fiscal note.

STATE OF ALASKA 1987 LEGISLATIVE SESSION
FISCAL NOTE

Bill Version: CSHB 108(L&C)
Publish Date: HOUSE 3/4/87

128

REQUEST

Bill/Resolution No.: HB 108
Title: "An Act relating to aquatic farming"

Sponsor: ELLIS
Requestor:
Date of Request:

FISCAL DETAIL

Agency Affected: Environmental Conservation
BRU: Environmental Health

Components: Seafood Industry, Palmer Laboratory

EXPENDITURES/REVENUES : (Thousands of Dollars)

OPERATING	FY 87	FY 88	FY 89	FY 90	FY 91	FY 92
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	0	0	0	0	0	0
CAPITAL	0	0	0	0	0	0
REVENUE	0	0	0	0	0	0

FUNDING : (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER						
TOTAL	0	0	0	0	0	0

POSITIONS :

FULL-TIME	0	0	0	0	0	0
PART-TIME	0	0	0	0	0	0
TEMPORARY	0	0	0	0	0	0

ANALYSIS : Attach a separate page if necessary

This Bill will have no fiscal impact on the Department of Environmental Conservation.

Prepared by: Douglas Donegan — Phone: 465-2609
Division: Environmental Health — Date:

Approved by Commissioner: [signature] — Date: 3/6/87
Agency: Environmental Conservation

Distribution (by Agency preparing fiscal note):
- Legislative Finance
- Legislative Sponsor
- Requestor
- Office of Management and Budget
- Impacted Agency(ies)

9/16/86

STATE OF ALASKA 1987 LEGISLATIVE SESSION
FISCAL NOTE

126

REQUEST:

Bill Version: CSHB 108(L&C)
Publish Date: HOUSE 3/4/87

Revision Date: N/A
Title: Aquatic Farming: Mariculture

Agency Affected: Commerce & Econ. Dev.
BRU: Economic Development Advocates

Sponsor: Rep. Ellis/Senator Zharoff
Requestor:

Components: Office of Commercial Fisheries Development

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 87	FY 88	FY 89	FY 90	FY 91	FY 92
PERSONAL SERVICES	15.0	5.5	6.0	6.6	7.3	8.0
TRAVEL	10.0	5.5	6.1	6.7	7.3	8.1
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	25.0	11.0	12.1	13.3	14.6	16.1
CAPITAL						
REVENUE	5.0	10.0	15.0	20.0	25.0	30.0

FUNDING: (Thousands of Dollars)

GENERAL FUND	25.0	11.0	12.1	13.3	14.6	16.1
FEDERAL FUNDS						
OTHER						
TOTAL	25.0	11.0	12.1	13.3	14.6	16.1

POSITIONS:

FULL-TIME						
PART-TIME						
TEMPORARY						

ANALYSIS: (Attach a separate page if necessary)

This program will become a priority mission of OCFD and shall be assigned to existing personnel. Initial permit requests are not expected to exceed 80% of one Development Specialist II available time. Travel is programmed for site visits as envisioned by the bill and contractual includes phone, photocopy and

Prepared by: W.G. Paulick
Division: Office of Commercial Fisheries Development
Phone: 465-2162
Date: 2/17/87

Approved by Commissioner: J. Anthony Smith
Agency: Department of Commerce and Economic Development
Date: 2/17/87

Distribution (by preparer):
- Legislative Finance
- Legislative Sponsor
- Requestor
- Office of Management and Budget
- Impacted Agency(ies)
- Senate Secretary

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1987 LEGISLATIVE SESSION
FISCAL NOTE

Analysis: (Continued)

other expenses related to permitting as required by the bill. FY 87 includes funding for public hearings, etc., to finalize new regulations. Program receipts have been estimated by using a fee of $100 per annual permit; 50 new permits per year.

MEMORANDUM

State of Alaska

DEPARTMENT OF FISH AND GAME

TO: Steve Cowper
Governor

DATE: March 13, 1987

FILE NO.:

TELEPHONE NO.: 465-4100

SUBJECT: Fisheries Cabinet Recommendation on Mariculture

FROM: Don W. Collinsworth DWC
Commissioner
Department of Fish and Game

Enclosed for your consideration is a recommendation from the Fisheries Cabinet for an administration position on mariculture legislation. The recommendation was arrived at after extensive review of the legislation and the issues surrounding these bills. The intent of the position is to give general guidance to the Legislature regarding the principles which any legislation must address, and yet provide flexibility to work out the details.

The agencies involved with this review include the Departments of Natural Resources, Commerce and Economic Development, Environmental Conservation, Labor, Community and Regional Affairs, Fish and Game, and the Limited Entry Commission.

Enclosure

cc: Fisheries Cabinet

MEMORANDUM

State of Alaska

DEPARTMENT OF FISH AND GAME

TO: Distribution

DATE: March 17, 1987

FILE NO.:

TELEPHONE NO.: 465-4100

SUBJECT: Mariculture

FROM: David Benton
Special Project Assistant
Commissioner's Office
Department of Fish and Game

The Governor has approved the mariculture position put together by the Fisheries Cabinet. I am sending you all copies of the position plus some other materials on mariculture for your files. I want to thank all of you who worked on this project for your help.

Enclosures

Distribution:

John McMullen, Governor's Office
Rod Swope, Governor's Office
Sam Stoker, Office of Management and Budget
Diane Mayer, Division of Governmental Coordination
Bill Paulick, Department of Commerce and Economic Development
Paul Peyton, Department of Commerce and Economic Development
John Williams, Department of Commerce and Economic Development
Michael Cushing, Department of Community and Regional Affairs
Doug Donegan, Department of Environmental Conservation
Mike Kaill, Department of Fish and Game
Rick Erickson, Department of Labor
Paula Burgess, Department of Natural Resources
Kurt Schelle, Commercial Fisheries Entry Commission

MARICULTURE ISSUES
POLITICAL AND ECONOMIC ANALYSIS
for
Fisheries Mini Cabinet
March 6, 1986

ECONOMIC ISSUES

Will pen rearing salmon in Alaska affect the market and/or price for wild salmon? World pen-reared salmon production is increasing at a rate that will soon make Alaska's premium quality wild salmon a minor component of world supply. There does appear to be considerable substitution going on in Europe with fresh Atlantic salmon displacing frozen Pacific troll salmon in smoker markets. The reasons seem to be that it minimizes inventory costs, allows uniform sizing and assures consistent (superior) quality.

Domestically, there is a major new market developing for fresh salmon year round. Further, the only study comparing Pacific salmon (frozen) with Atlantic salmon (fresh) found that most domestic distributors surveyed did not consider them substitutes - ie, there was no direct competition. The reason is that Pacific salmon is not generally available fresh and that the sizing of Atlantic salmon is controllable. The magnitude of Norwegian imports and relative stability of troll prices appears to support this finding.

However, what will happen in the future? Substantial increases in production are expected from Norway, New Zealand, Chile, Scotland, Ireland, and British Columbia. The technical limit of European Atlantic production is projected to be between 250,000 and 300,000 MT; 200,000 MT of that from Norway.[4]

By comparison, the total U.S. and Canadian production of kings and cohos (all gear groups) has averaged 70-80,000 MT over the last ten years.[2] Thus the Alaskan increment of production, which is not likely to exceed 10,000 MT, would be adding a relatively small increment to the overall supply.[3]

The industry will likely go through the same type of over-production and share fight seen in most markets with high margins. At some point the saturation level for the high priced fresh market will be reached, and the surplus fish will likely go into fillet and frozen markets. Prices will be pushed down to the level of the lowest cost producers, with a shakeout of the less experienced and higher cost producers. Alaska will likely be one of the higher cost areas.

Some feel Alaska shouldn't get involved in an industry where the market will peak before Alaskan products hit the market while others say Alaska must act quickly to get in before the window of opportunity is closed. Determining the saturation point and when it will be reached is highly speculative at this point. One study done in Norway uses a 130,000 MT market figure, a production figure likely to be surpassed by 1990.[4] Norway expects Atlantic production to be 153,000 MT by that year.[4,5] The resulting 23,000 ton surplus is creating considerable controversy among Atlantic farmers. No other study known at this time makes a projection.

There will be major changes in the market for Alaskan salmon whether Alaska gets into pen-rearing or not. These changes will likely occur before the first Alaskan pen-reared fish could reach market. It would appear that the only way Alaska's production could have a significant impact on the price would be if that increment coincided with the topping out of the market. As supply surpasses demand, and the growth rate in consumption drops, a market share fight seems inevitable. To further complicate the equation, recent projections indicate US and Canadian releases under the recent salmon treaty will provide additional product. The juxtaposition of this projected increase with that of European Atlantic production could lead to more severe fluctuations in the price of salmon products. The long term indication is for declining salmon prices, with fresh prices capping the frozen salmon price.

Politically, some fishermen hold the view that stopping pen-rearing in Alaska will either stop the competition or make a significant dent in the competition they face from pen-reared fish. When pressed, the answer appears to be that they will accept no chance of increased competition now or in the future. This attitude is not likely to change, but may be mitigated by providing opportunities for those fishermen who want to participate. There are regional differences in attitude as well, with most of the opposition coming from the Southeast, particularly the trollers.

Another point raised is that resources will be diverted from management and enhancement of wild and hatchery stocks to pen-rearing. This is based on the propensity of the legislature to not fund fiscal notes, and is a valid concern. A fee structure adequate to cover costs needs to be considered.

Environmental pollution problems appear to be manageable through siting selection, though this needs to be monitored closely. More problematic is site selection itself, given the potential for conflict between commercial fishing areas, anchorages, recreational areas, log transfer sites and mariculture sites. The best anchorages will likely offer the most protected sites, and the areas nearest transportation centers will be the most economic, leading to inevitable tidelands use conflicts with recreation boaters and commercial fishermen. A gold rush approach to tidelands leases cannot be allowed if this situation is to be resolved satisfactorily.

1. NMFS, world farmed salmon production projections.
2. NMFS, 3/87; Alaska Trollers Assn. 3/87; INPFC-Statistical Data.
3. Projected 50 farms @ 200 MT each. ADCED/OCFD.
4. Fish Farming Int'l: 12/86.
5. Norway=100 MT, Scotland=25 MT, Ireland=10 MT, all others=18 MT.

PROJECTED COSTS/BENEFITS
SALMON FARMING IN ALASKA

The economics of salmon farming in Alaska are not well known at present. A breakdown of the investment and operating costs of a family-sized (50 MT) operation and a corporate-scale (200 MT) Atlantic salmon farm in the Seattle/Vancouver area are presented in table 1. Production cost/revenue projections for the same two farms are presented in Table 2.

Table 1
Investment and Operating Costs[1].

50 MT Salmon Farm		200 MT Salmon Farm	
Investment Costs:			
Pens and Nets	$ 30,000	Pens (15)	$125,000
Anchoring	2,000	Anchoring	8,000
Automatic Feeders	1,000	Automatic Feeders	2,000
Storage Facilities	4,000	Simple House/Storage	6,000
Slaughterhouse & Equipment	15,000	Slaughterhouse	22,000
Dock	3,000	Equipment	22,000
Transport Equipment	5,000	Boat and Motor	6,000
	$ 60,000	Dock	11,000
		Truck	20,000
			$222,000
Operating Costs:			
Smolts (1$ ea.)	$ 26,000	Smolts	$103,000
Freight for Smolts	2,000	Freight for Smolts	10,000
Vaccination	500	Vaccination	1,000
Feed ($600/ton)	60,000	Feed	240,000
Labor (2 full-time + Extra)	70,000	Labor (1 Mgr, 8 Emp)	202,000
Energy Costs	1,000	Energy Costs	10,000
Miscellaneous	2,000	Miscellaneous	20,000
Maintenance	2,000	Maintenance	10,000
Insurance (facilities)	3,000	Insurance (Facilities)	10,000
Insurance (fish)	3,500	Insurance (fish)	13,000
Containers ($5.50 ea)	13,000	Containers	55,000
Total	$183,000		$674,000
Gross Sales:			
91,300 lbs @ $3.50/lb	$320,000	365,143 lbs	$1,278,000

Table 2
Production Costs/Returns[1].

50 MT Atlantic Salmon Farm

Year	1	2	3	4	5	6-11
Operating	76	159	183	183	183	183
Financing (15%/10)	0	97	171	71	12	29
Subtotal	76	256	354	254	195	192
Transportation	0	9	22	22	22	22
Subtotal	76	265	376	276	217	214
Sales	0	117	320	320	320	320
Gross Profit	(76)	(148)	(56)	44	103	106
Gross Profit Margin				13.7%	32%	33%

200 MT Atlantic Salmon Farm

Year	1	2	3	4	5	6-11
Operating	277	584	674	674	674	674
Financing	0	353	553	144	45	34
Subtotal	277	937	1,237	818	719	708
Transportation	0	35	88	88	88	88
Total	277	972	1,315	906	807	796
Sales	0	506	1,278	1,278	1,278	1,278
Gross Profit	(277)	(466)	(88)	372	471	482
Gross Profit Margin				29.7%	36.9%	37.7%

A 1985 Sealaska Corporation Study estimated employment and income effects from a Norwegian-style 20,000 MT Alaska-based industry to include 2,640 additional jobs and a payroll of $67.8 Million on gross sales (3$/lb) of $132 Million. In a more recent study compiled by Brad Pierce of HRA, it was suggested that certain assumptions including income multipliers and availability of smolt rearing facilities were not valid for Alaska. Adjusting those factors for Alaska yields a total employment effect of about 1,920 jobs and a payroll of $48.8 Million.

[1]. Brad Pierce, Aquaculture in Alaska, Feb., 1987

M A R I C U L T U R E I N A L A S K A

An Examination of Government Programs
by the Alaska Mariculture Technical Work Group
December 1986

STATE OF ALASKA / STEVE COWPER, GOVERNOR

December 16, 1986

Mr. Rodger Painter
Alaska Mariculture Association
P.O. Box 020704
Juneau, AK 99802-0704

Dear Mr. Painter:

As chairmen of our respective technical subcommittees, we are pleased to present the enclosed documents representing the product of our committee's deliberation on a variety of topics relating to development of a mariculture industry in Alaska.

Our purpose is to provide, to the extent possible, an unbiased and accurate analysis of issues relating to a potential mariculture industry in Alaska. We recognize that final decisions must be made by the people of Alaska working through the public process. Because of the complexity and uncertainty of these often new issues, decision makers should find the enclosed documents very useful.

On behalf of the entire technical committee, we would like to thank you for your role in this important effort. We expect that the educational process will continue as Alaska moves forward into this new area of resource development. Hopefully, the information provided here will be of continuing use.

In the interest of public education, we would appreciate the widest possible dissemination of this information.

Michael Kaill, Ph.D.
Alaska Department of Fish & Game
Co-Chair, Siting and
Operations Subcommittee

William G. Paulick
Alaska Department of Commerce
and Economic Development
Co-Chair, Development and
Research Subcommittee

MK/WGP/wfs4926W
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Enclosure

Susan Braley, A.D.E.C., Co-Chair
Amy Kruse, A.D.E.C.
Dick Stokes, A.D.E.C.
Dave Gibbons, USFS
Diane Mayer, DGC
Bob Clasby, ADF&G
Paula Burgess, ADNR
Bill Smoker, UAJ

Ole Mathisen, UAJ, Co-Chair
Bill Heard, NMFS
Dolly Garza, M.A.P.
Kellus Sewell, Consultant
Bill Woolf, ASMI
Ted Meyers, ADF&G
Bob Palmer, ADNR

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Reference Materials

Alaska Mariculture Technical Work Group
Broodstock Development--Bill Heard, NMFS
Feed Development & Research Facilities--Ole Mathisen, UAJ
Investment Incentives/Financing--Kellus Sewell, Nordic Alaska
(These discussion papers are available through the Alaska Mariculture Association, P.O. Box 020704, Juneau, AK 99802-0704.)

The Environmental Effects of Floating Mariculture in Puget Sound
Donald P. Weston, School of Oceanography, University of Washington
August 1986

Marine Net Pen Salmon Rearing
Larri Spengler, Alaska Department of Law, Memo, 1/31/85

DNR Tideland Permit for Shellfish Culture
Bob Palmer, Alaska Department of Natural Resources, Memo, 9/19/86

US Forest Service Permitting of Uplands Use for Alaska Oyster Farmers
Michael Barton, U.S. Forest Service Regional Forester, Letter, 7/25/86

A Philosophy for Aquaculture Development in Alaska
Governor Sheffield's Aquaculture Advisory Committee, Memo, 1/20/86

INTRODUCTION

Mariculture--or sea farming--is the for-profit captive culture of shellfish, finfish and sea vegetables in the marine environment. This is distinct from Alaska's existing salmon ranching program which involves the release of juvenile fish into the ocean to intermingle with wild stocks. The latter also is non-profit and returning fish are a common property resource.

Food products from sea culturing operations are becoming increasingly important throughout the world as seafood consumption climbs and wild fisheries landings remain relatively static. The world aquaculture production (fresh water and marine culture) was estimated at 22 billion pounds in 1983, and is expected to reach 48 billion pounds by the turn of the century.

The productive, unpolluted waters of Alaska's many sheltered bays and fjords are considered ideal for mariculture operations.

The first mariculture operations in Alaska involved the experimental culturing of oysters near Ketchikan in the early 1900s. Several oyster and mussel farms are now in operation and other farms are underway or are under consideration in Southeast, Southcentral and Southwest Alaska.

The State of Alaska recently began a joint project with Japan to test the feasibility of growing scallops in Kodiak and giant kelp (Macrocystis) in Sitka. The National Marine Fisheries Service also is cooperating with the state in an experimental research station in Southeast dealing with problems related to salmon farming.

A general need for policy and issue clarification was recognized by state and federal agencies, potential fish farmers and industry. The Alaska Mariculture Technical Work Group was formed at the invitation of the Alaska Mariculture Association. This cooperative effort represented here could assist in meeting the need for an information base to be used by policy makers.

EXECUTIVE SUMMARY

Legal Status--The legal status of mariculture in Alaska is unclear. While there is recognition of sea farming in statutes, clear regulatory processes are not available to guide individuals wishing to engage in many mariculture activities.

The Department of Law has said that technically the only species for which an applicant can presently receive a fish farming permit is oysters, a non-indigeneous shellfish. However, there are mechanisms that allow individuals to harvest some undersized species and hold the animals in a farming environment until they reach salable size.

Specific regulations must be passed by the Board of Fisheries and Department of Fish and Game before sea farmers can obtain permits to collect and hold most native species of shellfish and finfish. Current statutes do not allow state or nonprofit salmon hatcheries to sell or transfer surplus eggs to private farmers.

Siting--The environmental impacts of mariculture operations are site- and species-specific. When siting mariculture facilities, it is important to consider the water circulation in the area and flushing action in the immediate vicinity. Concerns that water quality would be degraded beyond the immediate vicinity of mariculture operations are generally unwarranted. Such conditions would exist only in areas of extremely limited flushing or if culture density was very great.

Mariculture is one of many potential uses of Alaska's tidelands and adjacent uplands. The current decision-making process for these land use decisions involves weighing mariculture against a host of other potential uses.

Permitting--Mariculture is likely to become a significant use of Alaska's tidelands and adjacent uplands. This has prompted the Department of Natural Resources to work on a new tideland permitting process for shellfish operations that would require permittees to meet certain benchmarks to ensure project viability. The new permitting process also provides the mariculture developer greater security than the present system.

Disease and Genetics--Alaska's existing disease and genetics policies appear to provide adequate safeguards for the protection of native and cultured stocks. Endemic disease agents are ubiquitous in wild stocks and the marine environment. Many are opportunistic, causing disease in fish primarily when they are crowded or stressed. Although it is possible for such disease to be transmitted from cultured to wild stocks, catastophic mortalities from indigeneous pathogens would not be expected because of the lack of stress factors in the receiving populations and the wide environmental dispersion of host animals. Mariculture would produce no further risk to wild stocks than the current salmon ranching program provided state disease and genetic policies are followed.

Public Health--Growth of a mariculture industry presents no special public health concerns as existing state regulatory programs governing sanitary practices and seafood product wholesomeness appear to be adequate to provide proper protections.

Brood Stocks--The availability of brood and seed sources will be a major factor in shaping the initial growth of a mariculture industry in Alaska. Orderly development of mariculture would be enhanced by a policy of allowing access to necessary seed and brood sources from wild stocks, but sea farmers should develop captive brood sources for many species over a period of time. Acquisition of brood stocks for salmon and some other fully allocated species may require changes in statutes and regulations. Proper protection of Alaska's wild fisheries resources will require the cautious development of mariculture brood sources. Brood stock programs for captive culture populations should follow appropriate policy guidelines for disease, genetic and exotic species issues.

Research and Development--The success of mariculture throughout the world is largely due to government research in disease prevention and control, broodstock development, and nutritional requirements, including use of local fish meals. The industry is likely to look at government to continue fulfilling these functions.

Training and Education--One of the best methods for the State of Alaska to encourage a strong resident involvement in mariculture is through training, education and extension service programs. Particularly important to local involvement in mariculture operations is the availability of these programs to residents of rural areas. Education and training programs should (1) provide a novice with enough knowledge to allow him or her to start a mariculture business with a reasonable chance of success and (2) train Alaskans to work as technicians at sea farms or hatchery operations.

Taxes--The Department of Revenue was seeking at the time of this report legal clarification of the applicability of the Fisheries Business Tax on cultured seafood. This issue also is important to municipalities, however, since half of the tax is shared with local governments.

Investment Incentives--There appears to be a number of strategies available to the State of Alaska to encourage mariculture development or to influence the composition of the industry. A clear state policy supportive of mariculture is perceived to be a vital factor, while incentives such as credits on the Fisheries Business Tax may influence growth. Resident participation in mariculture could be encouraged through state loans and other non-conventional financing.

Market Development--Although overall consumer demand for high quality seafood is strong and growing, a critical factor to development of a strong mariculture industry is establishment of specific market channels. Early development could help farmers avoid holding products for which there are no markets. It would be helpful to gather market information in an easily accessible format.

Policy and Administration--Selection of a lead state agency has been recommended by a leading mariculture expert, but much more important is development of a strong and clearly articulated state policy regarding mariculture.

I. SITING

A. Species Requirement Criteria

Each species of cultured plant or animal has a unique and specific set of environmental needs. Consideration of the environmental requirements of the species targeted for a sea farm will help assure that the site will be suitable for the proposed operation. Conditions, such as salinity, temperature, flushing action, depth of water at the site and other factors may vary from species to species. For example, oysters are tolerant of salinity changes and exposure to air, while scallops are quite sensitive to those factors.

This procedure could allow for evaluation of permit applications to assure that the site is suitable for the proposed farming operation.

B. Requirements for Aquatic Environmental Protection

Mariculture facilities have several possible environmental impacts on areas adjacent to their location. These effects include changes in water current circulation, an increase in sedimentation and various changes in water quality. These environmental impacts are species- and site-specific, depending on the size of the operation.

When siting mariculture facilities, it is important to consider the water circulation in the area and flushing ability in the immediate vicinity. The placement of mariculture facilities in the water (either rafts with suspended mesh bags or trays for shellfish, or net pens for finfish) will alter the water-current patterns. These structures will decrease water movement which may in turn result in an increase in sedimentation from food particles, feces, and shell debris. The concentration of ammonia-related compounds generated from decomposing organic material may increase, and the amount of dissolved oxygen may decrease. All of these factors may combine to effect the quality of the seafood product being cultured.

Generally, floating facilities have less problems with sedimentation than bottom-culture operations. One way to alleviate a water circulation problem is to place multiple net pens or rafts in a line parallel to the direction of water flow. Proper spacing between nets or rafts should be maintained to allow adequate water circulation. Choosing a site with adequate flushing capabilities will eliminate much of the sedimentation problem. The culture structure should be far enough off of the bottom to allow normal water flow beneath it.

The effects of finfish culture and shellfish culture on water quality of surrounding areas are quite different. Shellfish cultures feed on indigenous phytoplankton and so do not introduce any 'new' nutrients into the area. As much as 40% of the total nutrients can be removed from the water column by these shellfish. Shellfish excrete relatively small amounts of ammonia and related compounds. Finfish cultures may increase the concentrations of ammonia, organic and total nitrogen, phosphate, and total phosphorous and Biological Oxygen Demand (BOD) in the surrounding area. Surrounding concentrations of dissolved oxygen may decrease. Generally, this phenomena is not a problem in culture areas with good water circulation because the metabolic wastes are diluted over a short distance.

The culture of finfish and shellfish results in the release of nutrients and the consumption of dissolved oxygen. A net increase in environmental nutrient levels may be expected in salmonid culture because of nutrient input in the form of feed. Culturing molluscs requires no addition of feed, so no input of "new" nutrients to the marine ecosystem results. However, molluscs do enhance the recycling of nutrients in the water column as they ingest phytoplankton and return a portion of the nutrients to the water column and sediments, making those nutrients available to primary producers again. The filter-feeding activities of the molluscs also serve to concentrate nutrients from a wide area into the area of the sea farm.

Concerns that water quality would be degraded beyond the immediate vicinity of mariculture operations are generally unwarranted. Such conditions would be anticipated only in areas of extremely limited flushing or if culture density was very great. In the few cases where measurable water-quality changes have been noted, the effects have been largely confined within the culture structure.

C. Site-Use Determination

Mariculture is one potential use among many of Alaska's tidelands and the uplands. The current decision-making process for these land-use decisions involve weighing mariculture against a host of other potential uses, including recreation, subsistence, personal use, log transfer sites, commercial fishing, and wilderness, as well as social, political, and economic factors associated with these uses. The most logical procedure to determine site usage is to have potential mariculture locations identified (using a set of predetermined, proven site criteria) and then included in the State Land Use Plans, such as the Prince of Wales Island area and

the Prince William Sound area plan. These plans attempt to balance many disparate and sometimes competing interests. If the potential mariculture sites were included in such a plan, site decisions would be straightforward and timely. While these area plans would be developing mariculture policies within the planning areas, statewide mariculture policies could result from these efforts. Another option is the development of a new plan similar to the ones generated by the Private Nonprofit Hatchery Program, which are presently working quite well. The development of a new plan does not seem currently possible because of the time and resources needed to develop such a plan. The inclusion of potential sites into state plans also seems unlikely due to the present lack of state funding for future plans. Thus, it seems that the present and future basis for the site decision making will be made on a case-by-case basis by all state and federal agencies involved with either permitting or resource review. These decisions will involve, for example, on federal public lands, wilderness capability analyses using the Alaska National Interest Lands Conservation Act (ANILCA) Sections 507(a) and 1315(b and d), and subsistence evaluations using ANILCA Section 810. Subsistence, as defined by ANILCA, provides for the customary and traditional consumptive uses of fish, wildlife, and other wild renewable resources by rural Alaska residents on federal public lands. It does not preclude the use of other resources but requires that an evaluation of effects be made. In Section 804, the nonwasteful subsistence uses of fish and wildlife shall be accorded a priority over the taking of fish and wildlife on public lands for other purposes. Another determination, which may be and probably will be required, is a cumulative effects analysis. This determination will probably be the result of legal actions and the expected large number of mariculture sites. These two determinations, and especially the case-by-case determinations, will necessitate more work by all the agencies involved as well as time delays for the applicants.

II. PERMITTING

A. Statutory/Regulatory Status

The legal status of mariculture in Alaska is unclear. While there is legal recognition of sea farming in statute, clear regulatory processes are not available for applicants to engage in many mariculture activities. Unclear are issues such as the ability of individuals to gather brood stock in limited fisheries, use of gear not authorized in the commercial fishery, and the harvesting of juveniles for culturing in fisheries with size limitations.

The Department of Law has determined that private, for-profit mariculture is covered by existing statutes. However, the department said, the Board of Fisheries and ADF&G must enact specific regulations before sea farmers can obtain permits to hold live fish or shellfish. To date the board has approved the farming of a non-indigenous species--oysters. Current statutes do not allow state or private nonprofit hatcheries to sell surplus salmon eggs to private salmon farmers.

There is no clear regulatory structure supportive of the development of a mariculture industry, although there are mechanisms to allow some activities. For instance, it is legally possible to obtain a permit to commercially harvest some undersized species and to hold the animals in a farming environment until they reach salable size. This method would appear to be most suitable in fisheries where there are no size and sex restrictions and little competition for the resource, such as mussels. There also is provision in law (AS 16.05.050 (11)) under which the Commissioner of ADF&G can authorize interim-use permit holders to engage in the experimental taking of fisheries resources. This statute may be a vehicle to allow the collection of brood stock for farming purposes in some fisheries.

ADF&G and the Department of Commerce and Economic Development are conducting a joint project with Japan to test the feasibility of culturing scallops in Kodiak. Local "cooperators" participating in the experiment have been issued scientific/educational permits for the collection of spat, and will be allowed to hold scallops for experimental purposes. However, the cooperators are not allowed to engage in "commercial" activities such as the sale of spat, juvenile or adult scallops.

B. Agency Coordination

Oyster farmers follow the established permitting path for use of state tidelands, and production and sale of shellfish products. The most critical permitting process is physical aquatic siting. This generally involves the Departments of Natural Resources, Fish and Game, and Environmental Conservation, the Army Corps of Engineers, and the Environmental Protection Agency. Permits for uplands usage at individual sites may require the additional involvement of the U.S. Forest Service, U.S. Fish and Wildlife Service, Bureau of Land Management, National Park Service, or other federal agencies.

Coordination of state and federal agency responses to the physical siting process is handled by the Division of Governmental Coordination (DGC) in the Office of Management and Budget. The DGC's review process is designed to

coordinate federal, state, and local review of projects in the coastal areas of the state. It is oriented to address any land management or resource regulatory issue related to physical siting and design of proposed projects. A key component of the process is review of the "consistency" of the proposed project with the standards of the Alaska Coastal Management Plan. Mariculture projects will be reviewed for their consistency with recreation, subsistence, habitat, and with air, land, and water quality standards. Applications for mariculture projects are reviewed on a 50-day schedule, which means the DGC will complete its review within 50 days unless non-consistency or other problems are raised.

New permitting systems required for mariculture development should fit within the existing DGC review process and timetable.

C. Project Development

Based on the growing interest in sea farming, mariculture is likely to become a significant use of Alaska's tidelands and adjacent uplands. As such, land managers and upland owners are interested in ensuring that sites are utilized for permitted activities and do not result in speculation. At the same time, these land managers have interest in developing a system that responds to the needs of the individual grower and results in a strong, diverse mariculture industry. ADNR currently is working on a new tidelands permitting process for shellfish operations that would require permittees to meet certain benchmarks to ensure project viability, while providing greater security for the mariculture developer than the present permitting system.

The characteristics and the scope of a mariculture project will be determined during the permit process. The applicant's development plan will become a part of the permits and they will describe: (1) what species will be raised; (2) size and location of the project; (3) type of structures used for growing; (4) whether upland support facilities will be allowed; (5) environmental safeguards that will be implemented; and (6) a timetable that will be used to monitor the progress during construction and development.

During the early stages of development, ADNR will be using these permits and develop a plan to monitor the progress of a project. ADNR will be emphasizing the need to use the land for its intended purpose within a specified period of time. The intent of this monitoring is to ensure the land speculation is not occurring and that approved sites are available to create a land base large enough to support a self-sustaining industry.

As the project gets into the production phase, the monitoring by ADNR will become less important and the roles of ADF&G and ADEC will become more important in regulating water quality, protecting public health, and certifying brood sources.

To ensure mariculture develops into a self-sustaining industry, ADNR is considering modification of land-use permits and leases to meet the need of a grower. At the present time, there is no guarantee for the grower that starts out with a land-use permit and then requests a lease with a term of more than ten years. The site will be put up for bid at a public auction and the grower may lose the site if he is outbid. A lease term of less than ten years may be negotiated if the director finds it in the best interest of the state.

III. FIN/SHELLFISH HEALTH AND GENETICS

A. Fin/Shellfish Health

1. Importation of exotic diseases

Current regulations (5AAC 41.070) prohibit importation of exotic finfish or shellfish species into Alaska except Pacific Northwest-cultured, Japanese oysters and ornamental fish for non-release only. Oysters can be imported only after disease certification by the ADF&G, Division of Fisheries Rehabilitation, Enhancement and Development's Fish Pathology Section and only after the importing party obtains a Fish Transport Permit (5AAC 41.005), which must also be evaluated by the Fish Pathology Section. Adequate control to prevent importation of exotic diseases is in effect.

2. Potential dissemination of indigenous aquatic animal diseases within the State of Alaska by movement of mariculture species

Possession or transport of any live fish or gametes thereof requires a Fish Transport Permit, as above, the application of which is evaluated regarding various concerns, including finfish or shellfish disease within the stock or brood source on which the permit is approved or denied (5AAC 41.020; 41.030). The definition of a fish includes all invertebrates and amphibians (AS 16.05.940). In addition, disease control is required at hatchery or rearing facilities (5AAC 41.080) through disinfection procedures and yearly hatchery inspections by a qualified fish pathologist. Disease outbreaks must be reported to the Fish Pathology Section which is governed by these

regulations in recommending to the Commissioner the disposition of said diseased fish. Current regulations appear adequate to control movement of finfish and shellfish diseases affecting mariculture practices.

3. Transmission of diseases from cultured finfish or shellfish species to wild stocks

   Future mariculture practices would produce no further risk to wild stocks than practices currently employed. Certain disease agents are already ubiquitous in the environment and opportunistic, infecting fish only when they are crowded or stressed artificially by aquaculture practices. Other disease agents which are obligate pathogens could possibly transmit from cultured finfish/shellfish to wild stocks. Although this would be undesirable, most generally clinical disease or catastrophic mortalities do not result in the receiving wild populations due to the lack of stress factors and wide environmental dispersion of host animals.

   Although some risk is present now and will be present in future mariculture endeavors, there are adequate, current regulations cited previously for monitoring cultured fish/shellfish stocks for disease, and control of such diseases to protect both wild and other cultured stocks.

4. Environmental contamination by therapeutic drugs or chemicals used in mariculture practices

   There are no data on which to evaluate this possibility. However, certain premises suggest that this is an unlikely concern: (1) The great magnitude of dilution of such drugs in the water column would make the final exposure concentration so far below efficacious levels that natural fauna and flora should be unaffected; (2) the infrequency of use would prevent chronic exposure of natural flora; (3) in most instances, a systemic chemotherapeutant is the only practical method to treat a disease affecting thousands of captive fish. Consequently, the drug is administered in the diet and metabolized with very little of the medicated feed left to allow leaching of the drug into ambient water.

   Circumstantial information suggests that drugs used in mariculture operations present a negligible risk to the environment.

5. The increasing demand on state pathology laboratories to conduct disease surveillance for private enterprise

will incur additional costs that must be borne by the state in order to maintain control of disease occurrence within cultured and wild stocks of finfish and shellfish.

B. Genetics

ADF&G has a detailed policy statement developed dealing with the issue of genetics, including transportation of stocks and importation of non-indigenous species. Exceptions to this genetics policy will be made on a case-by-case basis. While it appears that there is considerable opportunity for genetic engineering as part of mariculture activities, that field is largely unknown.

IV. PUBLIC HEALTH

The Alaska Department of Environmental Conservation (ADEC) is responsible for ensuring sanitary control and product wholesomeness of all phases of the seafood industry. This responsibility is addressed in 18 AAC 34, the Fish Inspection Regulations.

With regard to the shellfish industry, ADEC certifies all shellfish waters for harvesting on the basis of sanitary quality and public health safety, regulates the harvesting of shellfish, makes laboratory examinations of shellfish and shellfish waters, and restricts the harvesting of shellfish from particular areas in public health emergencies.

Processing of other mariculture products also would be dealt with through existing ADEC regulations to protect the sanitary quality and public health safety of the particular mariculture product.

A. Water Quality

Water quality of a shellfish growing area must meet minimum standards established by the federal Food and Drug Administration, "National Shellfish Sanitation Program (NSSP)." Prior to harvesting a shellfish growing area, ADEC conducts a sanitary and biological survey of the area before approving it to allow shellfish harvesting for sale for human consumption.

The examination is verified by laboratory findings when needed to indicate that pathogenic microorganisms, radionuclides, pesticide chemicals, harmful industrial wastes, and sewage wastes do not reach the area in dangerous concentrations and do not pollute the shellfish in the area.

Laboratory water samples from the sanitary survey are analyzed by the ADEC Palmer Laboratory to ensure that the samples do not exceed standards established by the NSSP.

Factors which may affect water quality are location of nearby pollutant sources, other users of the growing site, vessel traffic, freshwater streams, float houses, human habitation, and point source pollution.

The use of nets treated with tri-n-butyl tin (TBT) has been extensive in Norway and other countries involved in sea farming. This compound is used as an antifoulant to reduce labor costs associated with cleaning nets. Public health concerns have been raised over the use of TBT, a heavy metal.

However, the use of TBT in connection with mariculture in Alaska is not likely to be a problem since the ADEC presently is not approving permit applications for aquaculture operations using TBT-treated nets.

For information on requirements of the "National Shellfish Sanitation Program", refer to the program's Manual of Operations, Part 1. Sanitation of Shellfish Growing Areas, U.S. Department of Health and Human Services, Food and Drug Administration, 1986 Revision.

B. Food Quality of Mariculture Products

ADEC is responsible for ensuring that all seafood products intended for human consumption are wholesome and uncontaminated.

Shellfish (clams, mussels, and oysters) possess the ability to filter and concentrate pathogenic microorganisms and toxic substances from the water. Furthermore, shellfish are packed whole and alive and are often consumed raw or lightly cooked. For these reasons, the public health significance of consuming shellfish for food is very important.

Other mariculture products intended for sale for human consumption would need to be evaluated and protected from potential contamination or adulteration that could result from pathogenic microorganisms and toxic substances.

1. Paralytic shellfish poisoning

Paralytic shellfish poisoning, or "PSP", is a very serious illness caused by poisons concentrated in some varieties of dinoflagellates, a kind of microorganism. Since shellfish feed on these organisms, they can absorb and store the PSP toxin. The presence of PSP in Alaska has been well documented, and shellfish intended for commercial markets must be quarantined and tested for the toxin before being released for sale for human consumption.

Currently, testing for PSP is done through the ADEC laboratory in Palmer. The only test currently certified by the Food and Drug Administration is a mouse bioassay. Research is ongoing at several universities to establish other testing methods for PSP, but none have been certified to date.

2. Coliform testing

The National Shellfish Sanitation Program has minimum coliform standards for shellfish meat that must be met before shellfish can be commercially marketed. The need for actual coliform testing of the meat is determined by an ADEC review of the sanitary survey to see if actual or potential pollution may be present.

3. Sanitation

Harvesting and processing areas must meet state and federal regulations currently in existence to guarantee proper sanitation and product wholesomeness. This includes, for example, separation of raw and finished product, transporting under refrigeration, and holding shellfish during PSP and/or bacterial testing.

V. BROOD STOCKS

Development of dependable, high quality brood stock sources in sufficient quantity to meet initial and long-term needs will be a critical step in providing a strong foundation for mariculture. During the initial phases of growth, general availibility of brood and seed sources will likely be a major factor in deciding which species are developed and where development occurs.

Proper protection of Alaska's wild fisheries resources will require the cautious development of mariculture brood sources. Brood stock programs for captive culture for profit populations should follow specific policy guidelines for disease, genetic, indigenous and non-indigenous species issues.

Orderly development of mariculture would be enhanced by adoption of a policy by the State of Alaska to assist in initial access to necessary seed and brood sources from appropriate wild stocks. Over the long term, however, sea farmers should develop captive brood sources for many species. This will be particularly important in brood sources secured from fully allocated common property resources.

Acquisition of brood stocks and seeds also may require changes in statutes and regulations. For instance, the sale of surplus eggs from existing hatcheries to private farmers appears to be prohibited by state law. Legal issues also are raised by the capture of under-sized juveniles, use of gear not authorized in the commercial fishery, captures when the commercial fishery is closed and ability to capture wild brood sources in limited fisheries.

A. Salmon

Most interest in salmon farming in Alaska revolves around chinook and coho stocks. Alaska now has well developed public and private hatchery programs releasing large numbers of smolts of these species. Many of these programs achieve large enough returns to satisfy brood needs, provide catches to common property fisheries and allow terminal area cost recovery harvests. Present performance and estimates of survival rates and other factors suggest that these hatchery programs could provide large enough surpluses of chinook and coho eggs to satisfy the initial needs of a salmon farming industry in Alaska.

The food quality of returning hatchery salmon deteriorates rapidly, and many fish harvested in terminal areas for cost recovery would be more valuable as egg sources for salmon farming. A higher value for cost recovery catches could mean more fish are made available to the common property fisheries. It is estimated that 10 to 20 million surplus chinook and coho eggs per year could be made available for farming purposes under a strategy of allowing cost recovery

egg sales. Statutes would have to be amended to allow surplus egg sales from private or public hatcheries for salmon farming.

B. Trout, Char, Steelhead

There are no current brood stock surpluses in Alaska's hatchery programs for these species. Farming brood stock development for these species probably would be modeled after the conservative, carefully controlled egg take schedules from wild stocks taken already for our existing salmon ranching programs. These salmon egg takes are conducted on the healthiest wild stocks on varied schedules to ensure protection to the donor populations.

C. Non-indigenous Salmonids

Atlantic salmon is the most intensely farmed salmonid in the world. Some British Columbia and Washington State farms are now growing Atlantic salmon, partially because of limited sources of Pacific salmon brood stocks. The State of Alaska's disease and genetics policies and regulations currently prohibit the importation of live salmon or eggs.

D. Black Cod

Present interest in black cod (sablefish) farming is based upon the concept of capturing early life-stage juveniles from wild populations, and growing the fish to marketable size. Farming of black cod is being conducted on an experimental basis in British Columbia. High market prices have created strong competition for Alaska's black cod, and the state's only in-shore fishery already has been limited. Knowledge of this species is somewhat limited, suggesting that black cod farming should proceed cautiously.

E. Oysters

Several oyster farms are presently operating in Southeast with seed spat being imported primarily from Washington. Logistical problems in importing this spat have resulted in significant losses to many operators and remain a primary concern of existing farmers. While it may be necessary to develop an oyster seed hatchery in Alaska to ensure continuous dependable supplies, present sources of spat appear adequate to meet foreseeable demand.

F. Mussels

Mussel farming is based upon the collection of wild spat. In this case, Alaska has an abundant, widely distributed and unutilized resource, and there does not appear to be any biological need for constraints upon collection of wild spat.

G. Scallops

Interest in scallop farming has grown rapidly, particularly in the Kodiak area where a feasibility study is being conducted on collection of weathervane scallop spat using Japanese techniques. The distribution of natural populations is limited, but scallops produce enormous quantities of gametes and continuous collection of wild spat for farming probably won't pose biological or allocation problems.

H. Abalone

Abalone farming in Alaska probably would follow the development of culturing programs in Japan and California where hatcheries are used to produce spat for brood purposes. Competition is strong for Alaska's relatively small abalone resource open to commercial harvest.

VI. RESEARCH AND DEVELOPMENT

The success of mariculture is largely due to progress in three areas: (1) controlled breeding of domesticated broodstock; (2) understanding of the nutritional requirements of cultured organisms; and (3) control and prevention of disease. All three elements are involved in development of any mariculture operation, including shellfish, finfish and sea vegetables. Even if mariculture development is industry-driven in Alaska, there's a major role for government to play in research and development.

A. Broodstock Development

The biggest initial problem facing shellfish farmers in Alaska is location of dependable sources of spat. Indeed, the collection of spat is a major concern of established shellfish farming industries throughout the world. For the short term, the farming of indigeneous shellfish probably will rely upon the capture of wild spat or juvenile animals. Hatchery production of shellfish spat is an option for development of dependable sources for farming operations, but technical obstacles must first be overcome for some species.

The Norwegian success in salmon farming can be partially linked to the establishment of an experimental government genetics laboratory. A variety of salmon stocks were tested for growth characteristics, food conversion, fecundity, disease resistance, maturity schedules and other desired characteristics. The few stocks selected form the basis of an ongoing selection program. The University of British Columbia is undertaking a similar broodstock development program for Canadian farmers using coho hatchery stocks.

Development of salmon farming in Alaska would pose similar needs involving chinook and coho. Broodstock development using hatchery stocks would help guide farmers to the most suitable brood stock sources. Selection of the right broodstock could be critical to the success of fish farming.

B. Fish Nutrition and Dietary Requirements

Since about 60 percent of the production cost of farmed fish is procurement of food and feeding, a successful fish farming industry creates a demand for local production of food. An important research need is experimental work to develop the proper diet for Alaska conditions using ingredients that can be procured locally. While there is substantial agreement to the ratio of fish meal, dry ingredients and the fresh fish components of a diet, it is desirable to utilize stocks of local fish which aren't currently harvested in a commercial fishery. This would create new fishing opportunities and provide raw product to feed mills at low cost. Some waste products from processing plants also can be utilized in fish food.

C. Experimental Facility

A variety of fisheries research programs exist in Alaska, but no single agency has the resources to undertake the research outlined in this document. One potential solution is a coordinated approach to mariculture research involving a number of state and federal programs, resulting in a pooling of talent and financial resources under a single program. An important potential source of operating funds for such an experimental facility could be proprietary research for individuals and companies.

D. Database

Orderly development of a mariculture industry will be assisted by the gathering and organization of solid statistical data on the growth and performance of the industry. This database will be particularly helpful in market development and the growth of in-state support industries. The state could incorporate reporting requirements for quantities of brood or seed, production and product on hand into licensing programs.

VII. TRAINING AND EDUCATION

One of the best methods available to the State of Alaska to encourage a strong resident involvement in mariculture is through education, training and extension service programs. A special effort should be undertaken to make these programs available to residents of coastal communities to ensure local involvement.

Education and training programs should focus on two separate objectives: (1) provide a novice with enough knowledge to allow him or her to embark upon a mariculture business with a reasonable chance of success; and (2) train Alaskans to work as technicians at sea farms or hatchery operations.

A. Components of a Comprehensive Program

The most effective program would provide education and training at all levels: high school, post-secondary, vocational and extension services. High school technical training will serve to inform young Alaskans about jobs and career opportunities in mariculture. Post-secondary mariculture education helps ensure a resident pool of expertise, while vocational-technical courses provide focused education aimed at providing local residents with operational job skills needed by the industry. Extension services are particularly important to residents desiring to develop small scale mariculture operations and support services.

B. Coordination

Components of this comprehensive program are likely to be located throughout Alaska's diverse educational system, including local school districts, University of Alaska, Marine Advisory Program, community colleges, private institutions (Sheldon Jackson College), vocational education programs, and services offered by various governmental agencies (Office of Commercial Fisheries Development, FRED Division). Coordination of these programs could help avoid duplications and identify gaps in programs.

C. Training Areas

Education and training should cover the spectrum of planning, operational and regulatory concerns, including but not limited to physical operations, biological operations, economics, regulatory programs and technology.

1. Physical operations--site selection, physical plant design, equipment, utilities, support services, chemicals, transportation, processing, product quality

2. Biological operations--brood stock acquisition and development, disease management, nutrition, environmental quality

3. Economics--business management, operational costs, supply and demand, marketing, cash flow, financing, short- and long-term financial and operational planning

4. Regulatory--explanation of the regulatory process involving training and applicant manuals, helpful agencies and nonprofit organizations

5. Technology--dispersal of information regarding technological advances in equipment, nutrition, disease and other operational concerns

VIII. TAXES

Development of a clear and stable taxing policy is an important ingredient of governmental response to a developing industry such as mariculture. While municipal taxing authority over locally raised mariculture products appears clear, the applicability of existing seafood taxes levied by the state is uncertain. Clarification of this issue will be important to the state, local governments and prospective farmers alike.

A. Fisheries Business Tax

The Fisheries Business Tax currently imposed on commercially processed or exported seafoods ranges from one to six per cent of the product value at its first point of sale or export. Except for limited circumstances, the tax is based upon the amount paid a harvester by a processing company or broker. If mariculture products were to be taxed under the current structure, most mariculture farmers would be taxed at three per cent of the export product value. In-state sales of fresh product probably would not be taxed.

After studying the statutes and regulations, the Department of Revenue decided it should seek a legal advice from the Department of Law concerning the applicability of the Fisheries Business Tax on mariculture products. The Department is uncertain whether the tax was designed as a severance or product tax. Since state law provides municipalities with 50 percent of the collections of the Fisheries Business Tax within their jurisdiction, the issue is important to local governments.

B. Local Taxing Authority

Recent revisions to Title 29 broadened the taxing authority of local governments. All municipalities appear to have the authority to impose local sales taxes on seafood products purchased or sold with their taxing jurisdictions. Several local governments currently levy such taxes ranging from one to three percent of the initial purchase value.

C. Seafood Marketing Assessment

The Alaska Seafood Marketing Institute is partially funded through the Seafood Marketing Assessment which is a tax applied to processing operations and round fish exports or in limited cases to seafood brokers or distributors. This tax currently is fixed at .2 percent of the initial purchase

or export value. It appears to be applicable to mariculture products.

IX. INVESTMENT INCENTIVES

There appear to be a number of strategies available to the State of Alaska to encourage mariculture investments or influence the composition of the industry. In crafting these strategies, social and economic objectives should be carefully weighed. For instance, local employment and resident ownership may be achieved through divergent policies, and economic stability may come through involvement of a blend of corporate and family farming operations.

Large corporations or companies desiring to develop mariculture operations generally have access to venture capital through existing collateral bases or established relationships with financial institutions. These investors also can afford to hire experienced professionals to craft a financial prospectus,deal with difficult regulatory processes or manage a farm. Individual Alaskans interested in small to moderate farms generally lack the collateral base, trust of financial institutions and operational experience. These competitive disadvantages can be partially offset through non-conventional financing and other incentives designed to encourage resident investment.

Important to note is that other countries with developed mariculture industries have used combinations of incentives and regulatory devices to achieve socio-economic goals. Examples can be found in Norway where the government has restricted production size of salmon farms and extended licensing preference to local residents to encourage small operations in rural locations. These policies are directed at reversing population migrations to urban areas. The Japanese government has actively encouraged the development of cooperative farms involving local residents of coastal communities who often combine fishing and farming activties.

A. Regulatory/Political Climate

A clear policy supporting and encouraging mariculture development throughout the state's regulatory structure is perceived to be extremely vital to the growth of sea farming. A strong governmental policy supporting salmon farming has been critical to the rapid development of pen-rearing operations in British Columbia. This also has been true in Hawaii, Japan and Norway. Conversely, the growth of salmon farming in Washington State has been hampered by confusing and conflicting policies between various state agencies and county governments.

B. Taxes

A major attraction to venture capital in the British Columbia salmon farming industry has been a government program allowing tax-free profits up to $500,000 (Canadian currency) from qualified farming investments. This policy helped attract millions of dollars in investment capital. This avenue would be open to the State of Alaska through amendments to its corporate tax laws.

If the Fisheries Business Tax is applied to mariculture products, another potential incentive available to the state would be tax credits or a temporary moratorium on Fisheries Business Taxes on new facilities. A model for a tax credit program could be found in legislation approved by the 1986 Legislature. The legislation (House Bill 58) was designed to encourage the building of new shore-based processing facilities, expansion of existing plants, diversification of product lines, and improvement of product quality. This incentive also could be accomplished by a moritorium on the Fisheries Business Tax during the first years of production of a new farming operation.

C. Non-conventional Financing

The state could encourage resident involvement in mariculture through establishment of a state loan program or loan guarantee fund. These non-conventional financing arrangements could be geared toward small to medium sized projects to qualified Alaskans. This program could potentially be targeted to assist residents of economically depressed rural communities. Non-conventional financing could be particularly important to family-sized mariculture operations.

Another option could be to focus on amendments to national agricultural loan funds to include financing for small-scale mariculture projects.

D. Non-cash Incentives

Another method to intice investment capital is through long term tideland leases, water rights and lease or grants of state-owned uplands for staging facilities. These non-cash incentives and tax advantages could be offered to firms which meet certain state objectives, such as employment of residents from areas of high unemployment or with commercial fishing backgrounds, or providing equity participation by Alaskans.

X. MARKET DEVELOPMENT

Although overall consumer demand for high quality seafood is

strong and growing, a critical factor to development of a strong, diversified mariculture industry is establishment of specific market channels. This market development ideally occurs before farms reach the production stage, so farmers don't end up with products at the marketing stage that cannot be sold. Failure rates in mariculture can be affected by the early establishment of market development programs.

A. Market Information

A large body of knowledge exists concerning seafood quality and marketing of Alaska products. While most is directed at products of wild origin, much of the information also will be applicable to cultured seafood. The information has not been gathered in an easily accessible format that could benefit prospective sellers of cultured--or wild--seafood products. Consequently, each interested individual must invest significant amounts of time and energy into essentially duplicative research.

B. Market Research

A good market research program would focus on development of specifc market-related information on target species prior to commercial production. Critical market problems and opportunities should be identified for each species on a priority basis.

C. Alternative Markets

Cultured seafood products may not follow existing marketing channels, forcing farmers to focus on development of specialty or select markets. In analogous situations this need has led to the creation of private marketing entities conducting common promotion and assuming direct involvement in the sales process.

D. Quality

A primary benefit of cultured seafood is the relative ease of providing consistently high quality products. The early development of minimum and target quality standards for each product would benefit pioneering farmers and prevent problems as the industry grows and operational patterns are developed.

E. Transportation

The cost of moving product to market will play a significant role in siting of farms and market price of the finished product. Concentration of Alaska's mariculture activities or development of innovative transportation systems will help allow economies of scale in shipping and make Alaska cultured seafood price competitive.

F. Generic Promotion

The Alaska Seafood Marketing Institute's programs are designed to promote the benefits of all Alaska seafood products and do not make such distinctions as "troll-caught" or "net-caught," and "wild" or "cultured." However, some differentiations are possible under ASMI's enabling statutes but must not create competitive advantages for specific companies or regions of the state. ASMI promotions are determined by its industry board of directors which generally allocates the promotional budget in proportion to the value of Alaska's seafood production sold in U.S. markets. These amounts are adjusted to reflect market conditions and other factors.

XI. POLICY AND ADMINISTRATION

As outlined in this document, government will play a major role in the development of an Alaska mariculture industry. The specific roles of state agencies in that process will be determined through policy direction from the governor and legislature. One critical policy decision will be the determination of how the various agencies involved should interact, and whether a lead agency for mariculture should be designated. In determining the appropriate governmental structure, it might be useful to view the primary functions of agencies in terms of development advocacy and regulatory functions.

A. Lead Agency

A leading U.S. aquaculture law specialist brought to Alaska in early 1986 to discuss mariculture development strongly recommended the designation of a lead agency. The lead agency should be a development advocate with the ability to pull together state, local, federal and private resources to ensure success. The goal for this lead agency would be to streamline the permitting process and strengthen advocacy programs, while the objective would be to put Alaskans to work and create new wealth with the sale of a finished product.

While this concept is sound, the present structure of state agencies do not easily facilitate a lead agency with both advocacy and regulatory functions. The Department of Commerce and Economic Development has a strong advocacy program, but lacks regulatory jurisdiction and staffing. This also is the case with the Department of Community and Regional Affairs. At the same time, the resource agencies (DNR, ADEC and ADF&G) and the Division of Governmental Coordination in the Office of Management and Budget have strong regulatory and permitting functions but lack economic development staffs.

The present structure of state government might be more easily adapted to a cooperative approach with lead advocacy and permitting agencies. This concept would have prospective farmers making initial contacts at the lead advocacy agency which would in turn provide permitting road maps directing applicants to the proper lead permitting agency.

B. Policy Development

Regardless of which agency is considered lead, the parade should be led by a strong, clearly articulated state policy regarding mariculture development. This policy should give clear guidance to the agencies for making such value judgments as:

(1) The balance between creation of jobs and the maximum amount of industrial capital.

(2) Balance of environmental protection and economic development.

(3) The importance of mariculture as a use of state tidelands and uplands.

(4) Role of mariculture in efforts to diversify Alaska's economy.

(5) Weight of specific social objectives (local employment, Alaska equity, tax revenues, etc.).

(6) Recovery of private wealth created from common property resources.

-DRAFT-

Mariculture
Issues Discussion Paper
March 4, 1987

1. Issue: Can the state legally give Alaskans either exclusive or preferential access to mariculture permits? Can legislation have provisions to give priority to Alaskan residents or Alaska-owned businesses or corporations?

   Option: a) Have the Department of Law analyze our options, including:

   1) Restricting mariculture leases to Alaskan residents or corporations.

   2) Give priority for aquatic farm and broodstock permits to Alaska residents or businesses.

2. Issue: Should the state recover all or part of the administrative and other state costs associated with managing a mariculture program and get fair return for use of state resources (i.e. tidelands)?

   Options: a) User fees charged as part of the permitting process to cover administrative costs, the cost of inspections, etc.

   b) Fees or "rents" for use of state tidelands and water resources to ensure fair return to the state.

3. Issue: There needs to be a vehicle to focus the permitting process for mariculture operations. There will be a wide variety of mariculture ventures. Most will require multiple permits and multi-agency review. We need to prevent a piecemeal approach to the approval process, and promote efficient review of each operation. In addition, we need a way to guage the commitment the applicant is willing to make to seriously develop the project.

Option: Require the applicant to submit a mariculture plan of operations and prospectus. This plan would be prepared by the applicant and used by the agencies in the permit process. It would be the document used to make an initial fit, willing, and able determination to screen out speculators. The plan would describe the measures used to ensure compliance with water quality standards, disease control measures, etc. Specific elements in the plan could include the location, type of operation, species involved, size and scale of the operation, a financial plan, and a project development schedule to provide milestones to measure the project's progress as part of any "prove-up" requirements.

4. Issue: There is concern that there needs to be an initial screening of applicants to prevent rampant speculation and to encourage serious mariculture operations. At the same time there is a concern that this "test" not present an insurmountable barrier to small-scale, mom and pop ventures.

Options: a) Perform a "Fit, Willing, and Able" test. This would be an initial determination that the operator is "fit, willing, and able" to successfully conduct operations as described in the mariculture plan of operations and prospects. By tying the fit, willing, and able determination to the operations described in the plan, there should be latitude to allow for "mom and pop' operations as well as larger corporate ventures. The Department of Commerce and Economic Development would make the determination in consultation with other state agencies, and specific criteria would be developed through regulation. General standards should, however, be in the legislation. Such standards could include consideration of financial resources; level of expertise, presence or absence of full-time personnel, etc.

b) Require a bond from the applicant for the purposes of covering any site clean-up or other costs should the operation fail. Posting an bond could be viewed as a signal of the applicant's commitment.

5. Issue: As part of the attempt to discourage speculation and encourage serious mariculture ventures, there needs to be on-going review of these projects. Once they receive the initial permit the state needs to ensure that they are actually making a serious effort to develop their project.

Options: a) Have a "prove-up" requirement which would entail a periodic review of the project. The project development schedule could provide milestones to guage the progress the operator has made. The "prove-up" determination could then be used to ensure that a serious effort was being made to follow the plan and develop a successful mariculture facility.

b) Divide the permit/lease into a two stage process. Grant an initial permit/tidelands lease for a period of 5 years for development purposes. At the end of that time review the status of the project. If it is a viable operation then grant a 25-year operational permit/lease.

6. Issue: Tidelands leases could be locked up by individuals or businesses which are not actively operating their facilities.

Options: a) Ensure that tidelands leases are non-transferable from one company or individual to another.

b) Ensure that there are provisions for revocation of the permit and tidelands lease in the event an operator is not making a serious attempt to develop the project.

7. Issue: There needs to be criteria for resolving space-use conflicts. Many excellent sites for mariculture facilities are also highly prized for other uses including log storage, commercial fishing, anchorages, subsistence, and recreation.

Options: a) Use coastal zone management program to resolve conflicts. Unfortunately, ACMP standards do not address the issue of resolving conflicts between competing water-dependent uses, and there are no local CZM plans for most of the areas where mariculture might occur.

b) Use DNR tidelands planning process to resolve space-use conflicts. Land-use plans could

address many of these issues, but DNR budgets may need to be adjusted accordingly.

c) Develop standards in the legislation which would provide general guidance to the agencies when reviewing these projects. These criteria would include provisions so that mariculture facilities will be sited to minimize land use conflicts; provide environmental safeguards; maintain navigation and access channels; and reduce visual and aesthetic impacts.

8. Issue: Considerable speculation is already occurring. Individuals are presently "staking" potential mariculture sites in order to get the jump on the market.

Option: Place a retroactive moratorium on mariculture site applications until the regulatory mechanisms have been established. Already-existing operations would have to be grandfathered in.

MEMORANDUM

State of Alaska

DEPARTMENT OF FISH AND GAME

TO: John McMullen
Fisheries Policy Coordinator
Office of the Governor

DATE: March 11, 1987

FILE NO.:

TELEPHONE NO.: 465-4100

SUBJECT: Reply to your March 5 Memo

FROM: David Benton
Special Project Assistant
Commissioner's Office
Department of Fish and Game

Thanks for sending me your notes on the staff workgroup meeting we had on mariculture. I was pleased to see that your list of the tasks which remain to be completed coincide with mine. I appreciate you taking the time to write them up and get them to me.

You may have missed the discussion we had early in the meeting about whether or not to support the current legislation. I opened the discussion by suggesting that, for the purposes of that particular meeting, we should discuss the technical issues which remained to be addressed. I specifically did not want to get into the larger policy questions at that time. Many of the staff present were on short schedules and we had a lot of ground to cover without getting bogged down in a debate about the merits of salmon farming.

The test you propose is interesting and contains many of the questions which need to be addressed. Undoubtedly, you know that the Legislature is planning extensive hearings on these issues and they should provide much useful information. I personally believe that the best approach for the Administration to take at the present time is to allow these issues to be fully debated in the legislative arena. The Administration can adopt the position that it supports the mariculture industry in concept but that specific legislation must meet certain principles. This is the approach we are pursuing in the Fisheries Cabinet.

Once again, thank you for your notes. I will keep you informed about our progress on this issue.

DB/rlc

STEVE COWPER
GOVERNOR

RECEIVED
MAR 6 1987
DEPARTMENT OF FISH AND GAME

STATE OF ALASKA
OFFICE OF THE GOVERNOR
JUNEAU

MEMORANDUM

TO: David Benton
Special Assistant
Department of Fish and Game

DATE: March 5, 1987

PHONE: 465-3652

FROM: John McMullen
Fisheries Policy Coordinator
Office of the Governor

SUBJECT: Aquatic Farming Bill (HB 108)

Agency representatives attending the February 26, 1987, staff meeting to begin developing the Administration's position on aquatic farming generally agreed that it is reasonable and should be pursued in Alaska if workable policy and administration procedures can be established.

The work group's discussion revealed the need to develop a number of procedures to accommodate an aquatic farming program, but I believe the working group might have considered a test that could be applied as a means of developing the Administration's position on HB 108. In this instance the test might be:

- Does aquatic farming represent new economic opportunity?
- Will that opportunity principally benefit Alaskans?
- Is the cost to the state affordable?
- Can the program be managed to provide for competitiveness between farms?
- Can the program be managed so as not to interrupt existing commercial fisheries?
- Can the program be managed to ensure a reasonable level of success?

The Bill and the program pass the test if the answers are in the affirmative, at which time the Administration should support it.

Meanwhile, back at the staff meeting, the group believed there is need for staff work on the followirg subjects.

- Determine criteria that must be met to qualify for a site permit.

- Define "fit, willing, and able" as applies to the determination of qualified applicants.
- Define "proving up."
- Determine if "resident preference" is obtainable for Alaskan applicants.
- Determine if resident hire bill now before the Legislature is applicable to resident preference.
- Determine the site acquisition process.
- Define the sites available for selection.
- Determine the stipulations of competitive leases.
- Determine the involvement (if any) of the Board of Fisheries in the stock acquisition process.
- Make the same determination for the Limited Entry Commission.
- Determine what regulations would need to be written to implement the program following passage of the legislation.

The above determinations should be completed as soon as possible, but the large questions to be answered are still, how does the state control who gets the permits and what will regulate the size of the individual production units? That's important, for I can imagine that companies with lots of money would secure the better sites close to transportation centers and that the lesser funded outfits would end up at the more remote, least cost effective locations.

Thanks.

cc: Rod Swope, Special Staff Assistant
Office of the Governor

Commissioner Don W. Collinsworth
Department of Fish and Game

MEMORANDUM

State of Alaska
DEPARTMENT OF FISH AND GAME

TO: Grace Schaible
Attorney General
Department of Law

DATE: March 26, 1987

FILE NO.:

TELEPHONE NO.: 465-4100

SUBJECT: Pen-Reared Salmon Farming

FROM: Don W. Collinsworth
Commissioner
Department of Fish and Game

Thank you for the work you have been doing to research and clarify the authorities presently available to the department to permit mariculture activities in Alaska. The recent hearings in House Resources highlight the interest in this issue. The March 10 memorandum from Sarah McCracken to Commissioner Collinsworth (enclosed) indicated that there may need to be clarification from the Board of Fisheries regarding the use of the Fish Transport Permit to govern the possession and transportation of live fish for farming purposes.

In your opinion, can the department under the current regulation issue permits for these fish farming purposes without action by the Board of Fisheries?

cc: Larri Spengler

Enclosure

DWC/DB/rlc

MEMORANDUM State of Alaska

Michael J. Frank
DNR Section Chief
Assistant Attorney General

DATE March 11, 1987

FILE NO

TELEPHONE NO

SUBJECT CS HB 108(L&C)
Aquatic Farming

SEM

Sarah E. McCracken
Assistant Attorney General

The major legal problem I see with this bill is the provision that the Commissioner of Fish and Game must issue an acquisition permit unless the Commissioner finds that the proposed harvest "will substantially impair sustained yield of the species." The Alaska Constitution article VIII, requires management on a "sustained yield" basis, and the "substantially impair" standard in the bill might not be consistent.

Also, the provision that in order to qualify for a tidelands lease for aquatic farming the applicant must be a resident or corporation authorized to do business in Alaska might present some problems, in terms of restricting a non-resident person's ability to engage in a vocation (fish farming) in the state.

In addition, the provision that a fish farm may only sell or transfer stock to another fish farm that has an AS 08.06 permit may create commerce clause problems, especially where a farm in Alaska seeks to sell to one out of state.

There are other policy considerations that should be noted.

First, this bill transfers some authority over aquatic farming from the Commissioner of Fish and Game to the Commissioner of Commerce. Under existing law, the Commissioner of Fish and Game already has the statutory tools to allow fish farming (see my recent MOA on this). Second, the bill also eliminates a potential (albeit small) revenue source -- the $200 fish farming permit fee.

These are just a few quick comments. If you want something in more detail, please let me know.

SEM:jem

cc: Larri Spengler
Bob Clasby

COMMISSIONER'S OFFICE
RECEIVED
MAR 17 1987
DEPARTMENT OF FISH AND GAME

MEMORANDUM

State of Alaska

DEPARTMENT OF LAW
MAR 16 1987
DIVISION OF FISH & GAME

TO: Hon. Don W. Collinsworth
Commissioner
Department of Fish & Game

DATE: March 10, 1987

FILE NO: 661-87-0360

TELEPHONE NO:

THRU:

SUBJECT: State authority to permit and manage fish farming

Grace Berg Schaible
Attorney General

FROM: Sarah E. McCracken
Assistant Attorney General
Natural Resources-Anchorage

Your memorandum of February 6, 1987, sets out various statutory and regulatory provisions relating to fish farming and requests our legal advice regarding whether your department may authorize and regulate fish farming in the manner outlined in your memorandum.

Our summary response is that under existing law the Department of Fish and Game ("department") does have authority to allow fish farming essentially as set out in your memorandum. As you know, however, there is pending legislation (SB 106 and HB 108) that would significantly alter the existing responsibilities and authorities of the department. Our analysis follows.

As noted in 1985 Inf. Op. Att'y Gen. (Jan. 31; 663-84-0187), fish farming is an activity that is expressly contemplated by the legislature. AS 16.05.340(a)(14) and AS 16.05.360 provide for issuance of a $200 fish farming license, and AS 16.05.940(14) defines "fish farming" as:

> the business of propagating, breeding, raising, or producing fish ... in captivity for the purpose of marketing the fish ... or their products, and "captivity" means having the fish ... under positive control, as in a pen, pond, or an area of land or water which is completely enclosed by a generally escape-proof barrier; 1/

1/ Similar provisions for fish farming were included in the first Alaska fish and game code. See sec. 2(u), art. I, ch. 94, SLA 1959 (definition of "fish farming"); sec. 2 (15), art. II, ch. 94, SLA 1959 (fish farming license fee).

In addition, AS 16.05.930 specifies that AS 16.05.920 (which generally prohibits possession and sale of fish or game unless authorized by state law) does not prohibit "the rearing and sale of fish from private ponds ... under regulations adopted by the appropriate board." 2/

Fish farming is to be distinguished from the activity of operating a salmon hatchery, which latter activity is separately provided for by statute, AS 16.10.375--AS 16.10.475. The primary difference between fish farming and operating a salmon hatchery is that in the former fish are not released into the wild, but are kept in captivity under "positive control." AS 16.05.940(14). See generally 1985 Inf. Op. Att'y Gen. (Jan. 31; 663-84-0187).

Reading the above statutory provisions together as a whole, it is clear that the activity of fish farming is one that the legislature intended to allow. 3/ As you noted in your memorandum, however, the question then arises of how a potential fish farmer may acquire fish for the farming project. Obviously there are two sources of fish: imported or in-state.

Turning first to the availability of fish within the state, one must look at three possibilities: fish from the wild, hatchery fish, and fish from other fish farms. With respect first to fish from the wild, as you noted in your memorandum the Commissioner of Fish and Game ("Commissioner") has authority to issue permits for collecting fish "for scientific, propagative, or educational purposes." AS 16.05.340(b). This authority is also reflected in AS 16.05.930(a), which specifies that AS 16.05:

> does not prevent the collection or exportation of fish ... or a part of fish ... for scientific or educational purposes, or for propagation or exhibition purposes under a permit which the

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2/ This section is virtually identical to that in the first Alaska fish and game code, sec. 28, art. I, ch. 94, SLA 1959.

3/ Although the business of fish farming is an as yet basically undeveloped industry, it has existed for a long time. See, e.g., 2 Alaska Compiled Laws §39-2-7 (1949), allowing lease of water bottoms for oyster cultivation.

department may issue and prescribe the terms thereof. 4/

You noted in your memorandum that it is a long-standing department policy that fish collected under a department collecting permit cannot be sold, bartered, or used for human consumption. This "policy" is consistent with legal advice given to you previously indicating that commercial uses are not included within the purposes for AS 16.05.340(b) collecting permits. See 1986 Inf. Op. Att'y Gen. (Nov. 14; 661-87-0149) at 6; see also 1985 Inf. Op. Att'y Gen. (Jan. 31; 663-84-0187) at 3. 5/ Thus, a person desiring to establish a commercial fish farm could not, absent legislative amendment, acquire fish under an AS 16.05.340(b) collecting permit. Similarly, a potential fish farmer could not obtain fish from an existing private fish hatchery because under AS 16.10.420(3) and (7), hatchery fry and eggs may only be sold

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4/ As we noted in 1986 Inf. Op. Att'y Gen. (Nov. 14; 661-87-0149) at 4 n.2, AS 16.05.340(b) does not list the additional permit purpose of "exhibition" that is specified in AS 16.05.930(a); however, we view exhibition purposes as being included within scientific, propagative, or educational purposes and thus find the two statutory provisions compatible.

5/ We note here that AS 16.05.340(b) and AS 16.05.930(a) are susceptible to a broader reading that would allow commercial use of fish or game taken under a collecting permit. The term "propagating" in AS 16.05.340(b) is not restrictively defined and could be viewed as including breeding for commercial sale. This interpretation may be strengthened by the fact that AS 16.05.340(b) also directs the Commissioner to issue a permit to collect wild fur animals for improving genetic stock on commercial fur farms. (Although we note that there is no parallel provision requiring issuance of a permit for collecting fish for fish farms). We believe, however, that the stronger argument is that the terms "scientific," "propagative," and "educational" in AS 16.05.340(b) should be read as addressing similar purposes, and that "propagative," in the context of "scientific" or "educational" purposes, does not include commercial uses. See generally, 2A J. Singer, Sutherland Statutory Construction §47.16 at 161 (1984) (principle or noscitur a sociis, that associated words are to be construed similarly).

to another hatchery or to the department - - not to a fish farmer. This provision does not, however, apply to sale of fish from a fish farm. Thus, if there were an existing permitted fish farm in the state, that fish farmer could sell brood stock to another fish farmer.

As you correctly note in your memorandum, the one available source for fish within the state is from a commercial season. AS 16.05.930(c) expressly allows the board of fisheries to authorize the rearing and sale of fish from private ponds, and AS 16.05.251(a)(2) allows the board to regulate seasons and areas for the taking of fish. Also, AS 16.05.251(a)(7) allows the board to govern "use, disposal, propagation and stocking of fish." Under these broad powers, the board of fisheries could authorize and regulate the taking of fish for establishment of fish farms, so long as the board's regulations were consistent with constitutional provisions such as managing fish on the sustained yield basis (article VIII, section 4 of the Alaska Constitution). 6/ The board could set a special fishery for collection of fish for fish farms, or, as you noted in your memorandum, fish could be taken during a normal commercial fishery (assuming the commercial fishery timing and lawful gear made this practical). 7/

6/ As already articulated in 1985 Inf. Op. Att'y Gen. (Jan 31; 663-84-0187), fish farming does not violate article VIII, section 15 of the Alaska Constitution, prohibiting exclusive rights or special privileges of fishing.

7/ Because a person taking fish for fish farming would be possessing and transporting live fish, the person would presumably be required, under 5 AAC 41.005, to have a fish transport license. 5 AAC 41.005 requires any person who transports, possesses, exports, or releases a fish into state waters to have a fish transport permit. 5 AAC 41.001, however, provides that the fish transport license requirement applies only to the "transportation, possession, or release of live fish transplanted for or cultivated for human consumption or sport fishing purposes, or as part of an aquaculture program for scientific, educational, or propagative purposes." That section further provides that the fish transport license does not apply to transportation, possession, or release of fish taken for commercial, sport, or subsistence purposes. We believe the term

You state in your memorandum that "since fish farming and the sale of fish to farms as brood stock are commercial operations, the taking of those fish cannot be done under sport, subsistence, or personal use fishing regulations." We agree. Unless authorized by statute or regulation, fish may not be sold (AS 16.05.920(a)), and the only sale of fish (other than ornamental fish) that is authorized by law is sale of commercial fish (AS 16.10.265--AS 16.10.296). The definitions of "personal use" (5 AAC 77.001(f) and AS 16.05.940(23)), "sport fishing" (AS 16.05.940(27)), and "subsistence uses" (AS 16.05.940(30)), do not encompass taking fish for commercial fish farming.

The second possible source for brood stock for fish farms is imported fish. Fish may be imported only as allowed by statute or regulation. AS 16.05.920(a). Under present regulations, only ornamental fish and certain oysters may be imported into Alaska. 5 AAC 41.070. 8/ This regulation could, however, be amended by the board of fisheries to allow importation of fish for fish farming brood stock if the board found that there could be adequate controls to protect indigenous species from fish disease.

"cultivated for human consumption" probably is broad enough to encompass fish transported and held for fish farming purposes, and that the exemption for fish taken for commercial, sport, or subsistence purposes probably does not apply to fish held at fish farms. To the extent that there may be any ambiguity regarding the applicability of the fish transport permit requirement, this can easily be clarified by the board of fisheries.

8/ We note here that any prohibition on importation of fish used in commercial enterprises must be based on a factually supportable legitimate state concern for the health and welfare of the state's resources or its people - - it cannot be based on protectionist economic reasons, and the prohibition against importation must be the least discriminatory option available. See Maine v. Taylor, 106 S. Ct. 2440 (1986) (upholding Maine ban on importing baitfish based on need to protect native species from disease). C.f. Hughes v. Oklahoma, 441 U.S. 322 (1979) (striking down Oklahoma ban on export of minnows, finding ban to discriminate impermissibly against interstate commerce.)

In summary, fish farming could be accommodated under existing statutory authorities. The Department of Revenue could issue a fish farming permit under AS 16.05.340(a)(14), and your department could allow a fish farmer to obtain and keep brood stock by issuing a permit under 5 AAC 41 (to possess live fish) and by allowing the fish farmer to collect fish either during a normal commercial fishery or in a new fishery to be established by the board under AS 16.05.251(a). 9/

Alternatively, fish farming could be accommodated through legislative action, such as amending AS 16.05.340(b) and AS 16.05.930(a) to authorize the Commissioner to issue collecting permits for fish farming. 10/

If you have additional questions, or would like assistance in developing appropriate regulatory changes or in addressing the specific provisions in SB 106 and HB 108 relating to fish farming, please let us know.

SEM/jmo

cc: Steven Pennoyer
Normal Cohen
Ken Parker
Stan Moberly
Bob Clasby
Tom Kron
Larri I. Spengler

9/ Fish farmers would of course still have to comply with other applicable licensing and permitting requirements, such as AS 14.43 and Department of Environmentional Conservation provisions, 18 AAC 34.

10/ Legislation presently pending in the Alaska legislature, SB 106 and HB 108, would make significant changes in the statutory framework discussed in this memorandum. In particular, the bills would shift major authority and responsibility over fish farming from your department to the Department of Commerce & Economic Development.

MEMORANDUM

State of Alaska

DEPARTMENT OF FISH AND GAME

TO: Larri Spengler
Assistant Attorney General
Department of Law

DATE: February 6, 1987

FILE NO.:

TELEPHONE NO.: 465-4100

SUBJECT: Fish Farming

FROM: Don W. Collinsworth DWC
Commissioner
Department of Fish and Game

In recent months there have been an increasing number of questions as to what is legal and not legal in conducting fish farming operations. I would appreciate your assistance in analyzing existing law on the subject. There is an immediate need to clarify what can and cannot be legally done now and begin discussions on how best to clarify any ambiguous matters.

The staff has reviewed existing Title 16 statutes and regulations dealing with fish farming, commercial fisheries, salmon hatcheries, research, and fish importation, transplantation, and holding. That review indicates that some fish farming activities are legal, although the route one must follow through the law to reach that conclusion is complex. Other matters are not so clear. Set out below are the results of the review.

I would very much appreciate your timely comments on our conclusions, as well as any suggestions for needed changes. All indications are that fish farming legislation will be introduced early this session; therefore, both departments need to be prepared to deal with the legal issues involved under existing law and any proposed in legislation.

Collecting Permits

The department has issued what are commonly referred to as "collecting permits" [AS 16.05.340 (b)] to initiate cooperative efforts with other public agencies and the private sector involved in mariculture projects. While such permits are appropriate for conducting mariculture research projects, they are not appropriate for initiating commercial ventures. The statute indicates that the permit is to be limited to scientific, propagative, and educational purposes. It has been a long standing policy that fish taken under these permits may not be sold, bartered, or used for human consumption.

We prefer to stop issuing collecting permits to private individuals involved in scallop mariculture research. Many of these people believe that by receiving these permits they are grandfathering themselves into a fishery. Such is not the case. Additionally, we feel that there are other legal

avenues that can be used to establish commercial ventures associated with farming of scallops, as well as some other species.

Fish Farming License

The Department of Revenue, under AS 16.05.340 (a)(14) may issue a fish farming license. Fish farming, by definition [AS 16.05.940 (12)] is a commercial activity, thus allowing one to sell the products of the operation. The farming operation must conform to the statutory definition, e.g. the fish must be held in positive control and enclosed in an escape-proof barrier. By informal agreement, the Department of Revenue does not issue fish farming licenses without approval from the Department of Fish and Game. This policy is predicated on the fact that we are the agency that administers the laws that govern the taking or importation of the fish species that would be farmed. This policy ensures that fish farming activities are biologically and legally sound. With the growth of mariculture, the existing policy should be formalized.

Stocking Fish Farms

Since it appears that fish farming, in general, is a legal activity, we must then look at the legal means of obtaining the fish to be farmed. Those fish can be imported or obtained instate. Most of our experience has been with imported species, so I will cover those first.

The importation, transportation, and possession of live fish are covered by the regulations found in 5 AAC 41. 5 AAC 41.001 and 5 AAC 41.070 limit importation to ornamental fish. No other species of fish may be imported for use in fish farming. – no. oysters

A question that many find perplexing is how does one obtain, other than by importation, fish for placement in a farm? It seems clear to us that, at the present time, one must do this through commercial fishing laws. Since fish farming and the sale of fish to farms as brood stock are commercial operations, the taking of those fish cannot be done under sport, subsistence, or personal use fishing regulations. If one has all the proper permits and licenses, the season is open, and legal gear is used, the fish may be harvested and subsequently farmed. For the most part, this is clearly the case for shellfish. The case is not so clear for finfish. 5 AAC 37.900 prohibits the transplantation of aquatic plants for the purpose of farming of the plant.

Procedures Under Current Law

The following lays out how we might handle requests for fish farms and associated operations under current laws. We would ask the individuals to discuss their operation with the local area management biologist, as well as FRED Division staff. They would review the request and route their recommendations up through channels. The farmer or fisherman would then, if he so desires, start the process of obtaining the needed permits and licenses. The processes, licenses, and permits will differ depending on species involved and whether the operation is to gather brood for sale to farms or the farming of purchased brood. Those who obtain their own brood stock will need to follow a combined process.

One who only takes fish to sell as brood stock would follow, with some possible exceptions, the process followed by typical commercial fishermen. The brood stock supplier would obtain an interim-use or entry permit from Commercial Fisheries Entry Commission (CFEC) for the species and gear types needed. He could then harvest those species during the normal open season provided by regulation. This will work fine for some species; particularly those without size limits, those for which the season is open during a period when individuals of the desired age are available, and those for which appropriate gear can be used. In some instances, seasons could be adjusted to allow the taking of juveniles or larva. Under AS 16.05.050 (10), the commissioner could approve the issuance of a CFEC permit for a new gear type, such as scallop spat collecting bags, which could be used to capture larvae or juveniles. Additional controls could be placed on brood stock fisheries through permitting processes. For most invertebrates and some bottom fish, this could be done through existing regulations such as 5 AAC 38.062. For other species, seasons for taking under the conditions of a permit issued by the department could be opened by emergency order. We have used this approach in the past to initiate experimental-type fisheries.

Once a brood stock is available, the Department of Revenue (DOR) licensing and DF&G permitting process for the fish farmer are relatively simple. The farmer would apply to DF&G, under 5 AAC 41, for a permit to transport and hold live fish. We would review the proposed operation for compliance with AS 16 and 5 AAC. Upon issuance of the permit, we would then recommend that DOR issue a fish farming license.

As I indicated earlier, the above processes can currently be used to handle most fish farming and brood stock requests. The process is not easily deduced by the public, and for that matter some staff, and is rather complex in

implementing. If you agree that the processes as outlined are legal, we could then develop a document that explains those processes in a logical clear manner. Additionally, your analysis and comments on the process will be invaluable in assisting the legislature in development of clear fish farming policy and statutes.

cc: Steven Pennoyer
Ken Parker
Tom Kron

MEMORANDUM State of Alaska

TO: Hon. Don Collinsworth
Commissioner
Dept. of Fish and Game

Norman C. Gorsuch
Attorney General

FROM By: Larri I. Spengler
Assistant Attorney General
Department of Law

DATE: January 31, 1985

FILE NO: 366-187-84

TELEPHONE NO: 465-3600

SUBJECT: Marine net pen salmon rearing

You have asked whether marine net pen salmon rearing is authorized under current fish and game statutes and regulations, and if it is not, what steps would be needed to do so. As discussed below, it appears that fish farming would not pose any constitutional problems, but that it is not now statutorily authorized.

As explained by your department, marine net pen salmon rearing differs from the private nonprofit hatchery program authorized and governed by AS 16.10.375 -- 16.10.475 in that the salmon are not released into the open ocean where they are subject to the common property fishery. Additionally, the salmon are not hatched from eggs as part of the operation, but rather smolts are reared in enclosures that either float or are grounded on the ocean bottom under state or federal leases. The salmon in the enclosures are placed there by the operator of the fish farm.

Fish farming is clearly contemplated by existing statutes. It is defined in AS 16.05.940(12) as

> the business of propagating, breeding, raising, or producing fish ... in captivity for the purpose of marketing the fish ... or their products, and "captivity" means having the fish ... under positive control, as in a pen, pond, or an area of land or water which is completely enclosed by a generally escape-proof barrier.

A fish farming license costs $100 and is to be obtained from the Department of Revenue. AS 16.05.340(a)(14); AS 16.05.360.

Just after statehood, the attorney general's office determined that salmon farming as defined now in AS 16.05.940(12) would not violate the Alaska Constitution. 1959 Inf. Op. Att'y Gen. (June 10; Gregg). The question arose because article VIII, section 15, of the Alaska Constitution provides in part:

> No exclusive right or special privilege of fishery shall be created or authorized in the natural waters of the State.

However, there is no mechanism under current fish and game statutes for smolts to be legally reduced to possession to transfer to rearing pens. Currently, no person may possess live fish without a permit from the Commissioner of Fish and Game. Permits may be used for transportation, possession, and release of live fish for "human consumption or sport fishing purposes" or for "scientific, educational or propagative purposes." AS 16.-05.340(b); 5 AAC 41.001 and 5 AAC 41.005. Raising salmon for sale -- commercial purposes -- is not encompassed. The salmon to be reared in marine fish farms in state waters may not be imported from outside Alaska. 5 AAC 41.070(a); compare with 5 AAC 39.-975(13) and 5 AAC 75.995(31) (defining "waters of Alaska"). Further, they could not be purchased from hatcheries within the state, for AS 16.10.420 prohibits sale or transfer of eggs or fry from hatcheries to anyone other than the department or other hatcheries.

Because of the existing statutory framework, there is no legal basis for regulations that would authorize the acquisition from hatcheries within the state of smolts for rearing and eventual commercial sale. In order to accomplish such a result, a mechanism for obtaining the smolts would need to be enacted, such as an amendment to AS 16.10.420 regarding possible sale of hatchery fry. Alternatively, the Board of Fisheries under AS 16.65.251(9) could amend 5 AAC 41.070 to allow importation of smolts. Further, in either case, the board would need to amend 5 AAC 41 under AS 16.05.251 to authorize release and possession of the smolts in the marine pens, for rearing and eventual sale.

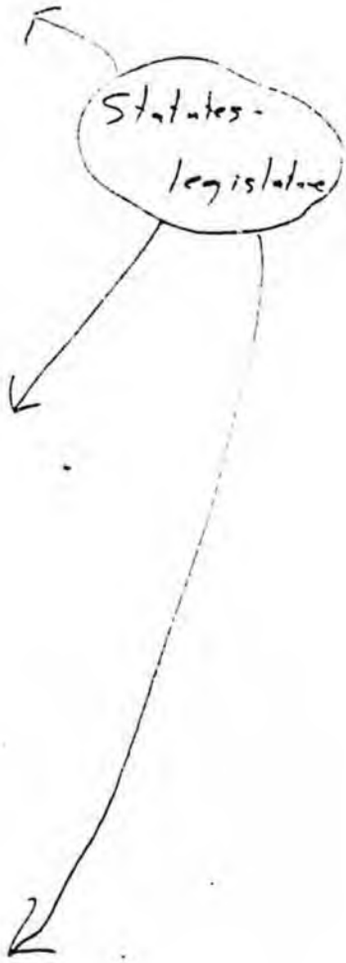
In summary, marine net pen salmon rearing would not constitute an exclusive right or special privilege of fishery, but is not currently authorized by fish and game statutes and regulations.

LIS:dlm

cc: Steve Penncyer
Norman Cohen
Stan Moberly
Kevin Duffy

§ 16.05.940

(12) "fish or game farming" means the business of propagating, breeding, raising, or producing fish or game in captivity for the purpose of marketing the fish or game or their products, and "captivity" means having the fish or game under positive control, as in a pen, pond, or an area of land or water which is completely enclosed by a generally escape-proof barrier;



§ 16.05.340

(14) Fish or game farming license 100

Sec. 16.05.920. Certain acts made unlawful. (a) Unless permitted by this chapter or by regulation adopted under this chapter, a person may not take, possess, transport, sell, offer to sell, purchase, or offer to purchase fish, game or marine aquatic plants, or any part of fish, game or aquatic plants, or a nest or egg of fish or game.

§ 15.05.340

(b) The commissioner of fish and game may issue without cost a permit to collect fish and game, including fur animals, subject to limitations and provisions that are appropriate, for a scientific, propagative, or educational purpose. In addition, the commissioner shall issue a permit for the collecting of wild fur animals for improving the genetic stock of fur farm animals. Permits issued under this subsection shall be in accordance with current sustained yield management practices for the species of wild game for which the permit is requested. The annual permit fee for an Alaska resident to collect wild fur animals for fur farming purposes is the same as the fee for resident trappers.

Statutes - legislature

16.05.940 (9) "fish" includes eggs ("any stage of its life cycle")

Sec. 16.40.010. Disposition of surplus buffalo and musk oxen. Whenever it is determined by the Department of Fish and Game that a surplus exists in the herds of buffalo and musk oxen under its control, the department may, under regulations adopted by it, grant the surplus or portions of it to persons, groups, associations, partnerships, or corporations for the purpose of raising and breeding the animals as domestic stock for commercial purposes, or for scientific and educational purposes. A person, group, association, partnership, or corporation may receive animals only after proving to the satisfaction of the Department of Fish and Game

(1) intent to raise and breed the animals; and

(2) possession of facilities for maintaining the animals under positive control. (§ 1 ch 15 SLA 1962)

AS 16.05.251

(a) The Board of Fisheries may adopt regulations it considers advisable in accordance with the Administrative Procedure Act (AS 44.-

(2) for

(9) prohibiting and regulating the live capture, possession, transport, or release of native or exotic fish or their eggs;

statute - legislature

5 AAC 41.001. APPLICATION OF THIS CHAPTER. The provisions of this chapter govern the transportation, possession, or release of live fish transplanted for or cultivated for human consumption or sport fishing purposes, or as part of an aquaculture program for scientific, educational or propagative purposes. Unless specifically provided, the provisions of this chapter do not apply to the transportation, possession, or release of fish taken for commercial, sport, or subsistence purposes.

5 AAC 41.005. PERMIT REQUIRED. (a) No person may transport, possess, export from the state, or release into the waters of the state, any live fish unless the person holds a fish transport permit issued by the commissioner or his authorized designee, and the person is in compliance with all conditions of the permit and the provisions of this chapter. A fish transport permit will be issued for a fixed term subject to the provisions of (c) of this section.

regulations - board

5 AAC 41.070. PROHIBITIONS ON IMPORTS AND RELEASE OF LIVE FISH. (a) Except as provided in (b) and (c) of this section, no person may import any live fish into the state for purposes of stocking or rearing in the water of the state.

(b) Live oysters originating from locations other than Korea, the Gulf of Mexico, and the Atlantic Coast of North America, may be imported for aquaculture purposes and may be released into the waters of the state only pursuant to a permit required by this chapter. Live oysters native to and originating from Korea, the Gulf of Mexico, or the Atlantic Coast of North America may be imported for aquaculture purposes pursuant to a permit required by this chapter and released into the waters of the state only if:

(1) the brood stock is derived from oysters commercially cultured on the Pacific Coast of North America through three or more generations; and

(2) the disease history or an inspection indicates no incidence of disease that is not indigenous to Alaska.

(c) Ornamental fish not raised for human consumption or sport fishing purposes may be imported into the state, but may not be reared in or released into the waters of the state. Fish wastes and waste water from ornamental fish may not be released directly into the waters of the state.

Sec. 16.05.930. Exempted activities. (a) This chapter does not prevent the collection or exportation of fish and game, a part of fish or game or a nest or egg of a bird for scientific or educational purposes, or for propagation or exhibition purposes under a permit which the department may issue and prescribe the terms thereof.

dept.

statute - legislature

(b) This chapter does not prohibit a person from taking fish or game during the closed season, in case of dire emergency, as defined by regulation adopted by the appropriate board.

(c) AS 16.05.920 does not prohibit rearing and sale of fish from private ponds, the raising of wild animals in captivity for food or the raising of game birds for the purpose of recreational hunting; in [OR] game hunting preserves, under regulations adopted by the appropriate board. In this subsection, "animals" includes all animal life, including insects and bugs.

board

(d) Nondomestic animals of any species may not be transferred or transported from the state under (a) of this section unless approved by the Board of Game in regular or special meeting. Animals transferred or transported under (a) of this section shall be animals that are certified by the department to be surplus and unnecessary to the sustained yield management of the resource. Each application for a permit under (a) of this section shall be accompanied by a statement prepared by the Department of Fish and Game examining the probable environmental impact of the action.

(e) This chapter does not prevent the traditional barter of fish and game taken by subsistence hunting or fishing, except that the commissioner may prohibit the barter of subsistence-taken fish and game by regulation, emergency or otherwise, if a determination on the record is made that the barter is resulting in a waste of the resource, damage to fish stocks or game populations, or circumvention of fish or game management programs.

(f) A permit may not be required for possessing, importing or exporting mink and fox for fur farming purposes. (§ 28 art I ch 94 SLA 1959; am § 1 ch 7 SLA 1972; am § 2 ch 104 SLA 1972; am § 4 ch 82 SLA 1974; am §§ 16, 17 ch 206 SLA 1975; am § 1 ch 20 SLA 1976; am § 13 ch 151 SLA 1978; am § 4 ch 23 SLA 1983)

(4)

Statute - legislature

Sec. 16.10.420. CONDITIONS OF A PERMIT. The department shall require, in a permit issued to a hatchery operator, that:

(1) salmon eggs procured by the hatchery must be from the department or a source approved by the department;

(2) no salmon eggs or resulting fry be placed in waters of the state other than those specifically designated in the permit;

(3) no salmon eggs or resulting fry, sold to a permit holder by the state or by another party approved by the department, may be resold or otherwise transferred to another person;

(4) no salmon be released by the hatchery before department approval, and, for purposes of pathological examination and approval, the department shall be notified of the proposed release of salmon at least 15 days before the date of their proposed release by the hatchery;

(5) diseased salmon be destroyed in a specific manner and place designated by the department;

(6) adult salmon be harvested by hatchery operators only at specific locations as designated by the department;

(7) surplus eggs from salmon returning to the hatchery be made available for sale first to the department and then, after inspection and approval by the department, to operators of other hatcheries authorized by permit to operate under §§ 400 - 470 of this chapter;

(8) if surplus salmon eggs are sold by a permit holder to another permit holder, a copy of the sales transaction be provided to the department;

(9) Repealed by § 5 ch 110 SLA 1980.

(10) a hatchery be located in an area where a reasonable segregation from natural stocks occurs, but when feasible, in an area where returning hatchery fish will pass through traditional salmon fisheries.
(§ 2 ch 111 SLA 1974)

WHAT IS MARICULTURE?

Mariculture is the farming for profit of shellfish, finfish and sea vegetables in the marine environment. The organisms to be cultured are produced in hatcheries or gathered from the wild. The growing takes place in net pens, from rafts, longlines, and on the ocean floor or intertidal area. In some cases sea water is pumped to shore-based enclosures. Some of the more common mariculture products are scallops, shrimp, salmon, mussels, nori and kelp.

This captive culture is distinct from Alaska's existing **ocean ranching** program which involves raising salmon to the juvenile stage for release to intermingle with wild stocks. Ocean ranching in Alaska is conducted on a private non-profit basis or by public agencies. The returning salmon must contribute to the common property fisheries (commercial, sport, subsistence and personal use).

A more encompassing term is **aquaculture** which includes mariculture, ocean ranching, and farming in fresh water with such species as catfish, shrimp, trout and crayfish.

GLOBAL MARICULTURE TRENDS

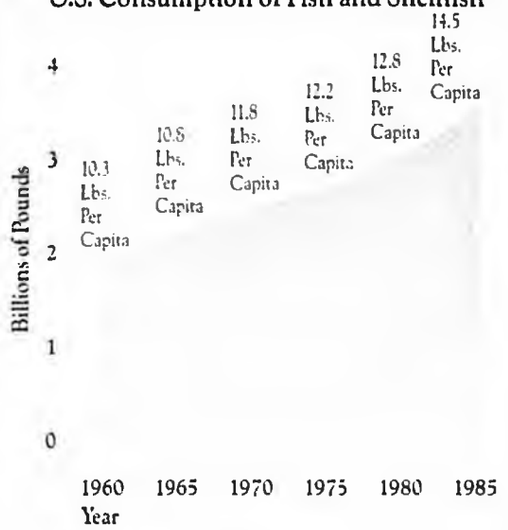
Although fish farming originated in China many centuries ago, relatively recent advances in controlling diseases, understanding nutritional requirements and breeding domesticated stock have led to an aquaculture explosion throughout the world.

Global aquaculture production of fish and shellfish was estimated at 22 billion pounds in 1983 and is expected to reach 48 billion pounds by the turn of the century. Aquaculture produced 12.2 percent of the world's total supply of edible fish and shellfish in 1983.

Meanwhile, production curves of commercial fisheries landings have flattened out. While aquaculture production is expected to rise by 5.5 percent annually over the next 25 years, the annual increase for wild fisheries is expected to be .5 percent.

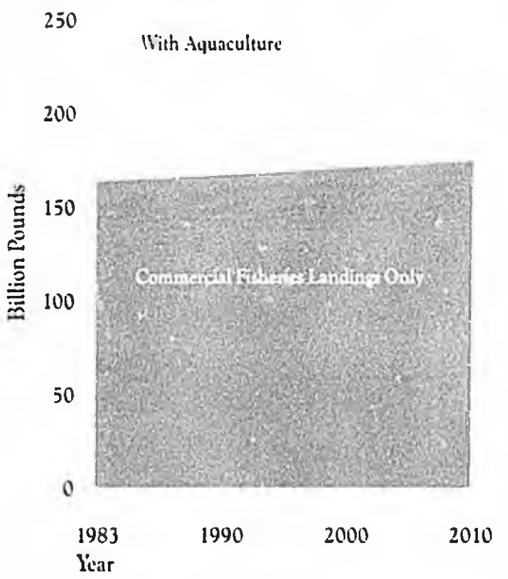
The increases in production of cultured fish and shellfish correspond with a steady growth in seafood consumption throughout the world. These trends are readily apparent in the United States where consumption of fish and shellfish climbed by 609 million pounds or 21.5 percent between 1982-1985.

U.S. Consumption of Fish and Shellfish



National Marine Fisheries Service

Actual and Projected Annual World Fish and Shellfish Production



International Aquaculture Foundation

HOW TO OBTAIN ADDITIONAL INFORMATION ON MARICULTURE

Department of Commerce and Economic Development
Bill Paulick
Office of Commercial Fisheries Development
Department of Commerce and Economic Development
P.O. Box D
Juneau, Alaska 99811
(907) 465-2162

Department of Fish and Game
Mike Kaill
Fisheries Rehabilitation, Enhancement and Development
Department of Fish and Game
P.O. Box 3-2000
Juneau, Alaska 99802-2000
(907) 465-4160

Department of Commerce and Economic Development
Office of Commercial Fisheries Development

Steve Cowper, Governor
State of Alaska

MARICULTURE IN ALASKA

A DISCUSSION OF THE ISSUES INVOLVED IN SEA FARMING DEVELOPMENT IN COASTAL ALASKA

MARICULTURE IN ALASKA

The unpolluted, productive waters of Alaska's many protected bays and fjords are considered ideal for many forms of mariculture. Alaska also has healthy populations of many species of shellfish, finfish and aquatic plants that could contribute broodstocks for sea farms.

Alaska's first experience with mariculture in[illegible]l the experimental culture of oysters near Ketchikan in the early 1900s. There now are a handful of active oyster farms in Southeast and Prince William Sound.

Blue mussels also have been successfully cultured at Halibut Lagoon in Kachemak Bay. Juvenile mussels are collected from the wild and grown on longlines or from rafts.

The State of Alaska recently entered into an agreement with the Japanese Overseas Fishery Cooperation Foundation to test the feasibility of collecting and farming weathervane scallop on Kodiak Island, and the growing of giant kelp (*Macrocystis*) at Sitka. The scallop project involves several private "cooperators" who will conduct operations at various locations around the island.

The state also is cooperating in a National Marine Fisheries Service experimental project to examine the biological feasibility of farming salmon on Baranof Island in Southeast. Growth performance during the experiments suggests that six to nine pound (market range of most farmed salmon) chinook salmon can be produced in three seasons.

Interest in mariculture has been growing in Alaska over the past few years. When a diverse group of Alaskans examined issues related to mariculture for the state in early 1986 it supported immediate development of farming operations for shellfish and aquatic plants. Voicing concern about the potential socio-economic impacts upon Alaska's important fishing industry, the group suggested that market impacts of farmed salmon be more closely examined before allowing the pen-rearing of finfish.

POLICY ISSUES RELATED TO MARICULTURE DEVELOPMENT

Legal/Regulatory Status—The legal status of mariculture in Alaska is uncertain. While it is now possible to obtain a fish farming license, changes in state law or passage of new regulations would be necessary before individuals could engage in most mariculture activities. The only clear existing permitting process currently available is for the farming of oysters. However, it is possible to obtain permits to commercially harvest some juvenile native species and to grow them to a commercial size. State law prohibits state and private non-profit salmon hatcheries from selling surplus eggs to fish farmers.

Disease and Genetics—Some concern has been expressed that mariculture could result in the spread of disease to wild stocks. However, a 1986 study prepared for the University of Washington said there is no evidence to indicate this has ever occurred. "While fish held in culture are likely to show more frequent appearance of disease than wild fish," the study said, "disease does not appear to be transmitted to wild populations." Similarly, the study said, there is no evidence to support concerns that escapes of cultured organisms will lead to interbreeding with wild stocks and cause genetic problems.

The State of Alaska has taken a cautious approach on disease and genetic issues in development of Alaska's ocean ranching program, and this is likely to continue with mariculture. Sea farming activities will fall under the state's disease and genetic policies.

Environmental Effects—Mariculture operations appear to have a small effect on water quality beyond the immediate vicinity of the culturing facilities. Potential problems would be posed only in areas of extremely limited flushing action (tides or currents) or if culture density was very great.

Concerns also have been voiced about sedimentation under floating mariculture facilities. Shellfish culture generates relatively small amounts of solid waste, while salmon farming can produce fairly large quantities of unutilized feed and feces which settle to the bottom. This sedimentation can result in major changes to the ocean floor. However, the materials are deposited in the immediate vicinity of the culturing facility and the effects are localized.

Sedimentation and water quality issues can be addressed with the use of siting criteria to ensure proper flushing action. Mariculture operations will be monitored by state water quality enforcement programs and must comply with provisions of the federal Clean Water Act.

Use of Tidelands—Mariculture is one of many potential uses of Alaska's tidelands and adjacent uplands. A major factor in the tidelands permitting process in determining whether a site will be approved for sea farming is compatibility with existing uses. Siting of sea farms generally involves obtaining approval from at least the Departments

Leif Larson displays a shipment of oyster spat (an early life stage) at a farm near Wrangell.

of Natural Resources, Fish and Game and Environmental Conservation, Environmental Protection Agency and Army Corps of Engineers.

Brood Stocks—The initial growth of a mariculture industry will be shaped by availability of marine organisms in early life stages. In most mature mariculture industries, sea farmers purchase marine organisms in early life stages from hatcheries producing fish or shellfish with genetic characteristics adapted to farming conditions. However, some species, such as scallops and mussels, may depend upon continual access to wild stocks.

Acquisition of brood stocks for salmon farming would require changes in existing law. Access to wild stocks which support other important commercial fisheries also may require statutory or regulatory changes.

Capital Investments—As a general rule, the farming of shellfish requires a smaller front-end investment than the pen-rearing of salmon or other finfish. Many shellfish operations can be family-sized businesses, while most salmon farms have 3-10 employees. The economy of scale of mariculture operations in Alaska is unknown at this time. Japanese shellfish farmers achieve economy of scale through the use of cooperatives for processing, transportation and marketing.

Paralytic Shellfish Poisoning—Paralytic shellfish poisoning (PSP) is a serious health concern in many wild and farmed shellfish. The state requires that many species of shellfish be certified before sale. Farmed shellfish must be pulled out of the water and quarantined while samples are flown to a laboratory in Palmer for analysis prior to sale.

Tidelands Leasing—The state's current tidelands permitting process allows shellfish farmers to obtain one-year use permits. Long-term leases also may be obtained, but the surveying and appraisal process required is expensive and time consuming. The one-year permits do not provide farmers with the assurance that they will obtain the site in subsequent years and may not be used as security for loans.

Economic Impacts on Commercial Fisheries—Many commercial fishermen and processors are concerned about the impact of salmon farming on the world market price for salmon. A 1986 study by the University of Alaska's Marine Advisory Program concluded that salmon farming worldwide "may immediately impact only a small portion of the Alaskan salmon industry." However, the study went on to say, the growth of salmon farming throughout the world suggests these trends should be watched closely.

The Alaska Department of Commerce and Economic Develoment is gathering comments on mariculture development from various coastal communities for consideration by the 1987 legislature. During these "town hall" meetings, the department will present information outlining potential effects in Alaska from a range of mariculture development scenarios. Included in the report to the legislature will be an analysis of the potential impacts on existing salmon markets from additional Alaska supplies (wild and farmed sources) of chinook and coho salmon.

Alaska Sea Grant College Program
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THE MARKETING RELATIONSHIP BETWEEN PACIFIC AND PEN-RAISED SALMON: A SURVEY OF U.S. SEAFOOD WHOLESALERS

By

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Alaska Sea Grant Report 86-3
September 1986

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INTRODUCTION

The Pacific salmon industry has become increasingly concerned about U.S. imports of fresh Atlantic salmon (Atlantics) from Norway: a product that has built a very strong niche in U.S. salmon markets. Industry members and policy makers are uncertain about how these imports will affect wild Pacific salmon markets.

The worldwide trend in pen-raised Atlantic salmon production is one of rapid increase. Table 1 shows the Norwegian production of Atlantics in the last five years and their projected production in 1990.

Table 1. Norwegian production of pen-raised Atlantic salmon (mt)

Year	Production
1981	8,422[1]
1982	10,266[1]
1983	17,016[1]
1984	22,300[2]
1985	28,650[2]
1990 (projected)	80,000

[1] U.S. Department of Commerce, NMFS (1983)
[2] Michael Gordon, 1986 personal communication.

The fish are produced primarily for export, and the United States is the largest importer. Figure 1 shows imports of Norwegian pen-raised Atlantics into the U.S. from 1982 through 1985. The graph shows a substantial increase in imports for each of the last four years.[1] Note the annual upward shift during the late summer and early fall. This is when Pacific salmon reach the markets and when the potential for substitution between the pen-raised Atlantics and the Pacifics is the greatest.

Future production estimates indicate that we can expect continued increases in imports of both pen-raised Atlantic and Pacific salmon. In all, 21,742 mt of pen-raised Norwegian Atlantics were exported in 1985, 6,460 mt of which were sent to the U.S.[2] The Norwegian Fresh Fish Marketing Association predicts that by 1990 their total annual exports will reach 60,000 mt. If the ratio of U.S. imports to total exports remains constant, we can expect approximately 20,000 mt (44 million lbs) of pen-raised Atlantics imported into the U.S. in 1990. In addition, British Columbian salmon

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[1] Norwegian Export Committee for Fresh Fish. 1982-1985. Statistikk: Markeder Eksport av Fersk Fish og Skalldyr.
[2] Ibid. 1985

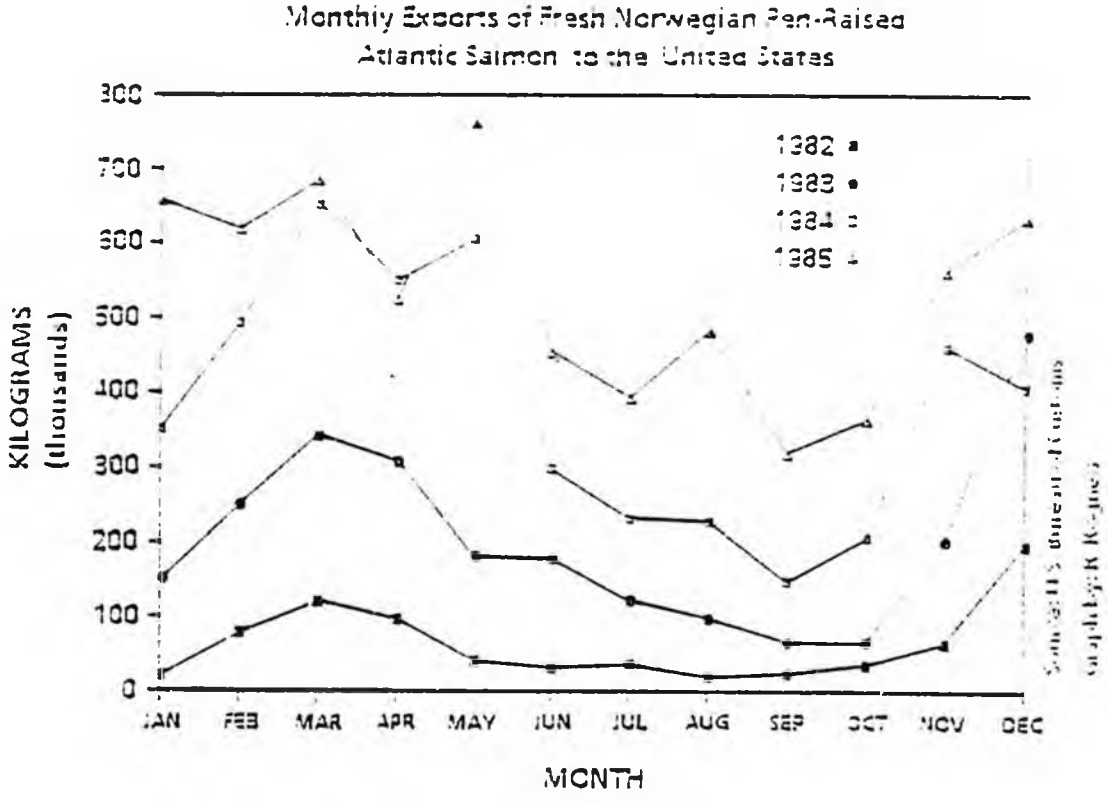
Monthly Exports of Fresh Norwegian Pen-Raised
Atlantic Salmon to the United States
KILOGRAMS
(thousands)
800
700
600
500
400
300
200
100
0
1982
1983
1984
1985
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH

Figure 1.

farmers project they will export 22 million lbs (Atlantics and Pacifics) into the U.S. in 1990.[3] Chile, Scotland and New Zealand are also anticipating major increases in their exports of pen-raised salmon to the U.S. as well. The total imports of pen-raised salmon into the U.S. will still fall substantially below the total wild Alaskan Pacific salmon harvest (729 million lbs in 1985). But these imports exceed recent Alaskan harvests of chinook and coho salmon (19 million lbs in 1985), thought to be the species most affected by increased imports of pen-raised Atlantics.[4] These projected increases in imports highlight the importance of understanding how the fresh salmon market operates.

This report summarizes the results of a mail survey about marketing pen-raised salmon in the U.S. By conducting this survey we hoped to:

* Obtain the seafood marketers' opinions on the substitutability between pen-raised and wild salmon in the U.S.
* Understand the factors promoting pen-raised salmon marketing in the U.S.
* Obtain the seafood marketers' assessments of the future marketing development of pen-raised salmon in the U.S.

This survey is part of an ongoing Alaska Sea Grant project, "Economic Impact of Farmed Salmon Upon the Alaskan Commercial Fishing Industry." In addition to this survey, an econometric analysis is being performed to estimate the cross-price elasticity between pen-raised Atlantic salmon and wild Pacific salmon, and other demand elasticities in the U.S. and European markets. Monthly data on salmon exports from the U.S., Canada and Norway from 1982 to 1985 are used in a market share approach. The econometric analysis should be completed in 1986. Because worldwide marketing of pen-raised Atlantic salmon is recent, the survey approach and the econometric study will produce complimentary results.

This survey was conducted jointly by the Alaska Sea Grant College Program and the School of Management at the University of Alaska, Fairbanks. On July 31, 1985 the Alaska Sea Grant College Program sent questionnaires to 925 seafood wholesalers and distributors listed in the Yellow Pages for Boston, New York, Chicago, Los Angeles, San Francisco and Seattle. It was impossible to determine from

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[3] Michael Gordon, March 3, 1986 personal communication

[4] Alaska Department of Fish and Game. 1985. Preliminary 1985 harvest, by region, by species: 1985 ADF&G Salmon Season Summary.

the listings whether or not the individual firm had handled pen-raised salmon, so two different questionnaires (see Appendix) were sent out to each firm. One questionnaire was for firms that handled or handle pen-raised salmon. The other was for those firms that had not ever handled pen-raised salmon.

Of the 925 firms, 127 returned their questionnaires, about 24 percent. Seven of these returned questionnaires were not used. Of those seven, five were returned blank, and two firms answered both questionnaires. Among the usable questionnaires, 63 were from firms that have handled pen-raised salmon, and 57 from firms that have not. Even though the return rate of 24 percent is less than expected, the budget did not allow for follow-up letters.

This report has two sections. In the first, survey results are reported for firms that have handled pen-raised salmon. In the second section are the results from firms that do not handle pen-raised salmon. For discussion, each question is restated (with some format modifications) first, followed by a short numerical summary of the result. Then the question is justified, followed by an interpretation of the results and how they compare with our expectations.

SECTION I
SURVEY RESULTS FROM FIRMS THAT HANDLE PEN-RAISED SALMON

QUESTION 1

1. Please designate which type(s) of pen-raised salmon your firm has distributed or currently distributes.

Type	Responses
Norwegian Atlantic	59
Pan-sized coho	30
Scottish Atlantic	20
Domestic Atlantic	13
Other Atlantic	12
New Zealand	3
Chilean	1

This question confirms the sources of supply and their relative importance in terms of the number of distributors. Norwegian Atlantics are the the major supply of pen-raised salmon, by a large margin. Fifty-nine of the 63 respondents indicated that they received at least part of their supply from Norway. The next major supplier of pen-raised salmon are the producers of pan-sized coho. These salmon are raised in the Pacific Northwest of the U.S. and in British Columbia. The other major supplier is Scotland. The Chilean product is pen-raised coho, which is notably larger than the pan-sized coho.

The results conform to expectations. Norway has been and will continue to be the world's leading producer of pen-raised salmon. In 1985, the Norwegians exported over 47 million lbs of pen-raised Atlantics with just over 14 million lbs exported to the United States. It is reasonable that the second major exporter of Atlantics is Scotland, since it was the second country to initiate commercial pen-raising. It is surprising that quite a few respondents have distributed domestically-raised Atlantic salmon. The suppliers would have to be in New England since the West Coast producers of pen-raised Atlantics had not yet marketed their fish when this survey was conducted. The large number of firms handling pan-sized cohos seems reasonable since Dom-Sea and some of the other producers around Chehalis, Washington have been marketing their product since the late 1970s.

QUESTION 2

2. Please indicate the range of values in which your firm's total sales belong.

Range	Responses
Less than $10 million	39
Greater than $25 million	12
$10 million to $25 million	11

By combining this question with others, we hoped to detect any patterns in distribution linked to the firms' sizes. The results show that the majority of firms are relatively small, with sales less than $10 million. The remainder are evenly divided between medium-sized firms with sales between $10 and $25 million dollars and large firms. These size categories were taken from a survey of seafood distributors and wholesalers done by the West Coast Fisheries Development Foundation.

QUESTION 3

3. If your firm has bought and sold pan-sized coho salmon, do you consider it a legitimate substitute for fresh or frozen wild Pacific salmon?

Product Type	Response		
	Yes	No	No Response
Fresh	5	25	1
Frozen	2	27	

Question 3 is the first of a series of three questions pertaining to substitutability between pen-raised and wild Pacific salmon. The overwhelming majority of them do not feel that the pan-sized cohos are substitutes for either fresh or frozen wild Pacific salmon. The results are consistent with our expectation. In discussions with

industry, the majority opinion has been that pan-sized cohos fill the same market niche as do pond-raised rainbow trout. Neither of these products compete directly, it is felt, with the larger Pacific salmon. Therefore, recent or further development in raising pan-sized cohos should not have any immediate economic affect on the Pacific salmon fishing industry.

Question 4

4. If your firm has bought and sold fresh, pen-raised Atlantic salmon, do you consider it to be a legitimate substitute for fresh or frozen wild Pacific salmon?

Product Types	Responses	
	Yes	No
Fresh	49	13
Frozen	15	42

This was one of the most important questions in the survey. It was to determine if firms that have handled pen-raised Atlantic salmon think fresh pen-raised Atlantics are substitutes for wild fresh or frozen Pacific salmon. We felt that these firms might be substituting the products for one another and, if the substitution occurs at the retail level, that they would be aware of it and would adjust their product line accordingly.

The results indicate that the majority of distributors of pen-raised Atlantic salmon believe that fresh Atlantics can compete with fresh Pacific salmon. If these responses truly represent the situation, the results are significant to Alaskan salmon fishermen. Very little of the Alaskan salmon harvest is marketed fresh. The Alaska Seafood Marketing Institute roughly estimates that 3 percent of the market share is for fresh product. Outside of troll-caught chinook and coho, the only other significant quantity of salmon marketed fresh seem to be the Copper River sockeye catch. This means that 97 percent of the harvest, roughly 707 of the 792 million lbs of salmon harvested in Alaska in 1985, would be more or less unaffected by the sales of pen-raised Atlantics. However, a significant portion of troll-caught chinooks and cohos from Southeastern Alaska is frozen and marketed to white tablecloth restaurants, which are one of the primary markets for fresh pen-raised Atlantic salmon. The 15 votes for substitutability between fresh Atlantic and frozen Pacific salmon should therefore not be discounted as unimportant. Nevertheless, the results seem to suggest that some of the concern about pen-raised salmon imports shown by Alaskan commercial salmon fishermen may be somewhat unwarranted.

Question 5

5. If your firm has bought and sold frozen, pen-raised Atlantic salmon, do you consider it to be a legitimate substitute for fresh or frozen wild Pacific salmon?

Product Type	Responses	
	Yes	No
Fresh	15	24
Frozen	13	24

This question may not be as important as Question 4 since the quantity of frozen pen-raised Atlantic imports does not rival the quantity of fresh Atlantic imports. In 1985, Norway exported just over 130,000 lbs of frozen pen-raised salmon compared to the 47 million lbs of fresh Atlantics. For this reason, fewer firms answered this question although interesting results have emerged from it.

Even though the majority of the respondents felt that frozen pen-raised Atlantics do not substitute for either fresh or frozen wild Pacific salmon, these results are not as conclusive as those of Question 4. There is a possibility of market competition between frozen Atlantic and Pacific salmon implied in the results. Therefore, an increase in imports of frozen Atlantics could affect the price of Pacific salmon.

The combined results of Questions 4 and 5 seem to indicate that distributors of pen-raised Atlantic salmon are conscious of seafood freshness and are impressed with the freshness of the pen-raised Atlantics. This observation is reinforced in Question 13.

Question 6

6. What year did your firm start buying and selling fresh pen-raised Atlantic salmon?

Year	Responses
1974	1
1979	2
1980	9
1981	9
1982	19
1983	8
1984	8
1985	2

This question analyzed the pattern of growth in the number of firms handling pen-raised salmon. The results are quite interesting. One firm started handling pen-raised Atlantic salmon as early as 1974. This date seems early and may be incorrect. The next year any of the respondents started was

1979. Nine started in both 1980 and 1981. In 1982, the largest number of respondents starting selling pen-raised salmon.

After 1982, however, the number of firms starting to buy and sell pen-raised salmon began to decrease. We had anticipated a steady increase, reflecting the increase in imports. U.S. imports of Norwegian pen-raised salmon were 90,076; 335,713; 721,476; and 1,155,752 lbs for 1982, 1983, 1984 and 1985, respectively. If the responses are indicative of the industry, we would expect that those firms already handling the pen-raised product experienced substantial sales increases. This could have resulted from exclusive contracts with producers and importers, or simply from the increases in sales within the existing markets.

Question 7

7. Please estimate your annual percent change (+ for increase and - for decrease) in sales of fresh, pen-raised Atlantic salmon for the following years:

+14.3 percent change from 1982 to 1983
+22.3 percent change from 1983 to 1984
+30.3 percent change from 1984 to 1985

This question was designed to find out the growth or decline in sales of those firms that have handled pen-raised salmon. A growth in sales and an increase in the number of firms mean that the market of pen-raised Atlantics is expanding.

Results of this question confirm that on average these companies experienced substantial growth in their business involving pen-raised Atlantic salmon. The annual rate of growth increased steadily from 1982 through 1985. It was thought that firms of different sizes might have experienced different growth rates. To find out, we divided the responses using the size categories established in Question 2 (Table 2).

Table 2. Increases in sales of fresh, pen-raised Atlantic salmon for firms of various sizes[1]

Period of Change	Percent Change		
	Small Firms	Medium Firms	Large Firms
1982 to 1983	11.3	12.9	23.3
1983 to 1984	20.8	21.2	26.5
1984 to 1985	33.6	26.4	23.3

[1] Small firm = less than $10 million in annual sales
Medium firm = $10 to $25 million in annual sales
Large firm = more than $25 million in annual sales

The smaller firms have grown the fastest only in the last year. Before that, the growth rates were directly related to the firm's size. We cannot determine if they have taken over a larger market share since we only know the percent increase and not the absolute amounts.

Question 8

8. Was your firm's decision to buy and sell fresh, pen-raised Atlantic salmon based on requests to distribute the product from:

Requests Generated By	Responses
Brokers or importers	26
Retailers	24
Yourselves	12
Fishermen (fish farmers)	5
Wholesalers	4
Customers	1
Resort, Country Club, Hotel	1

Question 8 was used to pinpoint who initiated the respondents' handling of pen-raised salmon. If the action was based on demand from customers, it indicates that demand for the product already existed. If the action was based on requests from producers or importers, it indicates that demand for the product was not yet formed.

The results show a fairly even split. From the supply side, 26 started handling pen-raised salmon based on suggestions from brokers or importers and five started upon suggestions from producers of pen-raised salmon. From the demand side, 26 started because of retail demand. This is the sum of the different types of customers mentioned. Also, 12 started handling the product on their own initiative and four started based on suggestions from wholesalers. The wholesalers could be either demand or supply initiated depending on the market level of the respondent.

In order to see how the market has evolved (whether it is supply or demand led), the responses to Question 6 were categorized accordingly. First, the possible responses to Question 11 were combined to make three general categories. Those that selected retailers, resorts, country clubs, hotels, and customers were combined to make the demand-initiated category. Those that selected brokers, importers or fish farmers were combined to make the supply-initiated category. The 12 who started handling pen-raised salmon on their own comprised the last category. The four respondents who started handling it because of requests from other wholesalers and retailers were left out because we could not determine whether they were supply- or demand-initiated.

Table 3. Comparison of years when companies began selling Atlantics and who requested the fish

Year	Demand initiated	Supply initiated	Self
1974	0	0	1
1979	1	1	1
1980	3	5	3
1981	3	7	2
1982	9	10	3
1983	5	5	2
1984	2	3	0
1985	2	0	0

We hypothesized that the producers, importers and brokers would need to promote a new product to the wholesalers, retailers and consumers. Once consumers were introduced to the product, then their requests would drive production and entry of new companies into the market. Although not conclusive, Table 3 shows that until 1982, more wholesalers started to handle pen-raised Atlantics because of broker and producer requests than because of consumer and retailer requests. After 1982 however, the market matured somewhat and more wholesalers entered the market because of requests from consumers and retailers.

Question 9

9. Which of the following best describes your firm's purchases of fresh, pen-raised Atlantic salmon?

When Purchased	Responses
Independent of the availability of fresh Pacific salmon	25
When fresh Pacific salmon is not available	18
In place of Pacific salmon for all markets	4
In place of Pacific salmon for the following markets:	5
Restaurants	4
Retail	4
Seafood Markets	4
Other wholesalers	4

This question attempts to verify whether the respondents actually substitute pen-raised salmon for wild Pacific salmon in any or all markets. It allows us to rank firms' degree of belief in the substitutability of these two

species of salmon, while the Question 4 solicited a firm's general opinion regarding substitutability.

Eighteen respondents purchase Atlantic salmon only when fresh Pacific salmon is not available and these firms seem to have a strong commitment to or preference for Pacific salmon. Because 49 of the 62 firms from Question 4 believe that fresh Atlantic salmon are substitutes for fresh Pacific salmon, some of these 18 firms believe that these two species are competing for consumers' dollars to some extent. These firms generally increase the availability of fresh salmon by offering fresh Atlantics when fresh Pacific salmon is not available. If this marketing practice is continued, the fresh Atlantic salmon will contribute toward consumers' demand for all fresh salmon by increasing their exposure to fresh salmon. When this is the case, pen-raised Atlantics can be regarded as a complement of Pacific wild salmon.

Twenty-five firms have purchased fresh Atlantic and Pacific salmon simultaneously, apparently in order to increase their line of products. These firms are more likely to substitute Atlantic for Pacific salmon than those in the first group, since they are willing to place the products on the market at the same time.

Five firms have substituted Atlantic salmon for Pacific salmon in certain markets. Four of them do so in their dealings with restaurants, retail seafood market and other wholesalers, respectively. These five firms, together with the next group of firms, are strong advocates of Atlantic salmon. The next group contains five respondents who have completely substituted Atlantic salmon for Pacific salmon.

In summary, 18 firms are committed to marketing Pacific salmon and 5 of them believe that the two salmon are substitutes; 25 firms not only believe in substitutability between these two salmon, but also market both salmon simultaneously; 9 firms strongly believe that Atlantic salmon are superior to Pacific salmon, at least in certain markets.

Question 10

10. Please estimate the average composition of your annual sales of fresh, pen-raised Atlantic salmon by category of retailers as a percent of the total.

Market	Percent of Total Annual Sales[1]
Restaurants	42.3
Other wholesalers	28.8
Retail seafood markets	19.1
Supermarkets	5.5
Others	4.7

[1] Percentages for the "average" respondent

Here we intend to verify the contention that the restaurant trade, particularly the white tablecloth segment, is the primary market for pen-raised Atlantic salmon. As the responses show, the average respondent sells 42.3 percent of his/her Atlantic salmon product to restaurants . The average distributor sells a large percentage of the product to other wholesalers. This would indicate that some of the respondents are brokers rather than wholesalers. Thus, this percentage is high not because many firms sold both to other wholesalers and retailers, but because a few firms sold only to wholesalers. The other major type of market was retail seafood. Many of these shops specialize in fresh seafood, and thus are naturally well-suited for the fresh Atlantic product. Although supermarkets do not currently account for a large portion of the total harvest sold, they are a market with potential that we expect will be targeted for expansion soon.

Question 11

11. Please estimate the average composition of your total annual sales of fresh, pen-raised Atlantic salmon by seasonal percent of total.

Season	Percentage of Total
Winter (Dec.-Feb.)	43.7
Summer (June-Aug.)	10.1
Spring (March-May)	23.1
Fall (Sept.-Nov.)	23.0

This question is designed to determine the seasonal variation of imports into the U.S. by requesting the percentage of composition by season. The response is consistent with the general pattern of Norwegian exports to the U.S. The mean responses confirm that the largest quantities were sold in the winter. The sales of pen-raised salmon dropped sharply to about 20 percent in the spring and then bottomed out at about 9 percent in the summer, when Pacific salmon begins to reach market. In the fall, the sales of pen-raised Atlantic salmon moved back up to their spring level.

Because Norwegian salmon imports have increased substantially and will likely continue this trend, the seasonal pattern in the supply of Norwegian Atlantics may vary. If distributors sense possible consumer resistance to high price and large volume in a particular season, they may alter their distribution pattern. In any event, we do not expect a big push in the sales of Atlantics during the Pacific salmon season. Fresh Atlantic salmon commands a high price mainly because of its quality advantage when the Pacific salmon season is closed. In order to confirm this, we asked a follow-up question.

Question 12

12. Does your firm plan to increase its distribution of fresh, pen-raised Atlantic salmon?

Yes	45
No	9

If yes, does your firm plan to?

Maintain current seasonal distribution pattern?	30
Concentrate more distribution during winter and spring?	12
Concentrate more distribution during summer and fall?	3

This question solicits distributors' opinion on the market condition for pen-raised Atlantics. Because the supply of pen-raised Atlantics will be increased, distributors will make their business decision based upon the strength of demand in each season. According to the results, 45 firms are optimistic about the market for Atlantic salmon and plan to increase their distribution. Nine firms do not plan to increase their distribution of Atlantic salmon. These firms are not necessarily pessimistic about the market for Atlantic salmon, they may have other difficulties (such as capital and capacity constraints) in increasing their distribution. In short, the market for Atlantic salmon will continue to grow.

It is interesting to note the direction of growth in terms of seasonal marketing pattern. Of the 45 firms that plan to increase their future distribution, 30 plan to maintain current seasonal marketing pattern. In economic terms, these 30 firms indicate an equilibrium in marketing pattern; that is, the demand price elasticity is roughly the same across the four seasons. In this case we would expect heavier competition between Atlantic and Pacific salmon. Twelve firms plan to increase the proportion of their sales during winter and spring. These firms believe that it is not worthwhile to compete directly with fresh Pacific salmon for the consumer's dollar. Again, in economic terms, these firms believe that the demand for Atlantic salmon in the summer and fall is more price elastic than in the winter and spring. In other words, the same proportional increase in all seasons will depress price more during summer and fall than in the spring and winter.

Only three firms plan to increase the proportion of their sales during summer and fall. These firms are either greatly impressed with the marketability of Atlantic salmon or they do not perceive a direct competition between the two species.

Questions 13 and 14

13. What advantages does the fresh, pen-raised Atlantic salmon have over the fresh, wild Pacific salmon?

Advantage	Responses
Year-round availability	28
Freshness	26
Consistency	19
Size	12
Price	11
Longer shelf life	5
None	4

14. What advantages does the fresh, wild Pacific salmon have over the fresh, pen-raised Atlantic salmon?

Advantage	Responses
Price	24
Flesh characteristics (color, firmness, less fat)	19
No advantage	8
Large fish	5
Volume	2
Ease of ordering	1
Never had any fresh Pacific salmon	1

The survey concluded with these two open-ended questions regarding the relative advantages of these two species of salmon. Question 13 solicits the distributors' opinions on the advantages enjoyed by the Atlantics. The advantages most often mentioned were the year-round availability and freshness or quality. Consistency also scored highly with 19 votes. It is not apparent whether they meant consistency of product availability or consistency in quality. Twelve firms enjoyed the ability to order fish of uniform size rather than just taking what they could get. Therefore, a better grading system may improve U.S. processors' business.

As mentioned, Atlantic salmon enjoys a price premium over its Pacific counterpart. Therefore, we were surprised, and do not know how to interpret, that 11 firms indicate a price advantage for Atlantic salmon. Five respondents mentioned the longer shelf-life of Atlantics. This is due to its rapid shipment (often within 24 hours) from producers to retailers. Finally, four respondents did not recognize any superiority of the Atlantic salmon over the Pacific salmon.

Question 14 asked what advantages fresh Pacific salmon possesses over the pen-raised Atlantics. Twenty-seven firms indicate that Pacific salmon has a price advantage. Seventeen firms out of this group listed price as the only advantage. The next most-mentioned advantage was flesh characteristics, including color, firmness and lower fat

content. As U.S. consumers become more health conscious, the Pacific salmon industry may want to use this advantage in sales promotion. Eight respondents did not recognize any advantage enjoyed by the Pacific salmon. Five felt that the ability to obtain large fish (greater than 12 lbs) was an advantage of Pacific salmon. Two felt that the ability to obtain a large volume of wild Pacific salmon was an advantage. One might expect that as worldwide production of pen-raised Atlantic salmon increases, this advantage enjoyed by Pacific salmon will not be sustained.

In summary, the most important point discovered in this survey is that the majority of wholesalers and distributors who handle pen-raised salmon feel that product only competes with fresh, wild Pacifics (Question 4). This may lessen the impact of pen-raised Atlantics on Alaskan fishermen, but may affect the Pacific Northwest and British Columbian salmon fisheries that sell a higher percentage of fish in fresh markets.

It also seems that the number of firms handling pen-raised Atlantics is still increasing but the growth is slowing, with each firm increasing its purchases of Atlantics (Questions 6 and 7). These firms expect to continue increasing these quantities in the near future, but will continue to concentrate at times of the year when wild fresh Pacific salmon is not available (Question 12).

SECTION II:
SURVEY RESULTS FROM FIRMS THAT DO NOT HANDLE PEN-RAISED SALMON

The second questionnaire was directed to those who do not handle pen-raised salmon. Fifty-seven firms responded to this part of the survey. Because these firms do not actually handle pen-raised salmon, many of these returned questionnaires are not as complete and thus are less informative.

Question 1

1. Does your firm distribute fresh or frozen Pacific salmon?

Yes	27
No	28
No answer	2

This question allows us to separate the respondents according to whether they have engaged in salmon marketing. By asking this question, we hope to detect any differences in answering the Question 2 by these two groups of distributors.

Question 2

2A. Has your firm considered or would it consider substituting fresh, pen-raised Atlantic salmon when both are available?

Yes	11
No	15

2B. What if fresh Pacific salmon were not available?

Yes	13
No	6

These questions are designed to find out distributors' readiness to market fresh pen-raised Atlantic salmon and their opinion regarding the substitutability of Atlantic salmon for Pacific salmon. For our purposes, these questions are meaningless for those who do not distribute Pacific salmon. Therefore, we only analyzed the results from distributors of Pacific salmon. Among those firms that distribute Pacific salmon, 11 would consider substituting Atlantic salmon for Pacific salmon when both are available, while 18 firms would do so when fresh Pacific salmon were not available. Of the same group of respondents, 15 would not substitute Atlantic salmon for Pacific salmon when both are available, while only six would not do so when fresh Pacific salmon were not available.

The results suggest that a substantial number of salmon distributors are considering marketing fresh Atlantic salmon. Therefore, we may expect a continuous growth in the number of distributors of Atlantic salmon in the near future. Since existing distributors of Atlantic salmon have experienced a growth in sales over time, we are likely to see a continuous increase in imports of pen-raised Atlantic salmon. It should be noted, however, that quite a few distributors of Pacific salmon are still committed to marketing their product. This is expected because it takes time for a new product to penetrate a well-established market.

Question 3

3A. Has your firm had requests from retailers to purchase pen-raised fresh Atlantic salmon?

Yes	5
No	42
No answer	3

3B. Has your firm had requests from brokers or importers to purchase their pen-raised fresh Atlantic salmon?

Yes	16
No	33
No answer	8

This set of questions is designed to find out whether the supply side or the demand side is more active in marketing pen-raised Atlantic salmon. Clearly, the suppliers are taking the initiative in marketing pen-raised Atlantic salmon. The results indicate that 21 firms have received and declined requests from either the demand or the supply side for marketing pen-raised salmon. From the previous question, we learn that quite a few firms are almost ready to market Atlantic salmon. Therefore, it is interesting to find out the reasons for not handling pen-raised Atlantic salmon. This is the rationale for asking the next set of questions.

Question 4

4A. If you answered "no" to both 3A and 3B, why has your firm decided not to purchase pen-raised Atlantic salmon?

Reason	Responses
Don't handle salmon	13
No demand	12
Prefer Pacific salmon	3
Handle only frozen salmon	2
Economically tied to Pacifics	2

Question 4 is an open-ended question and responses were summarized into groups. Because 42 firms have not received requests from the demand side, it is understandable that many perceive no demand for Atlantic salmon. Thirteen firms do not handle salmon and have not received requests for marketing salmon, therefore they have good reasons for not handling Atlantic salmon. Five firms either have a strong preference for or commitment to marketing Pacific salmon. Two firms handle frozen salmon only and one firm did not know much about pen-raised Atlantic salmon.

4B. If you answered "yes" to either 3A or 3B, why didn't your firm purchase pen-raised fresh Atlantic salmon?

Reasons	Responses
Prefer Pacific salmon	3
Price is too high	3
No request	3
Too busy	1

Of those respondents that had turned down requests to handle pen-raised Atlantic salmon, three did so because the price of Atlantic salmon is too high, and one is too busy to handle it. Three said that they did not handle Atlantic salmon due to no requests. These three respondents should not have answered this question. Because at least 16 firms have received requests for marketing Atlantic salmon and we only received seven reasonable responses, we therefore believe that information collected in this part is incomplete and less useful.

Question 5

5. Under what conditions might your firm consider distributing pen-raised Atlantic salmon?

Condition	Responses
None	8
If receive requests	7
If handle salmon	6
If do not get Pacific salmon	6
If available	3
If consistent supply available	3
If price comes down	1

Question 5 is open-ended and its results were summarized into groups. This question sought to uncover any changes in the market conditions required to induce firms to distribute pen-raised Atlantic salmon.

Eight firms indicate a strong loyalty to Pacific salmon, by stating that they would not handle salmon under any circumstances. The remainder of the firms indicate that if conditions change they would initiate the product in their line, another reason we might expect the number of firms handling pen-raised salmon to increase.

Question 6

6. Please place a check by the range of values in which your firm's total sales belong.

Range	Responses
Less than $10 million	25
$10 million to $25 million	6
Greater than $25 million	12

This question was also asked of firms that handled pen-raised salmon (Section I). We posted this question here in order to help determine if the size of firm affects responses. Fourteen firms chose not to answer this question. Of those that did, 25 are classified as small, 12 as medium and 6 as large. Compared with the respondents in Section I, the same percentage of small firms, a higher percentage of medium firms and a lower percentage of large firms participated in this part. Given the small number of respondents, these differences may not be significant.

Although not as informative as the other survey, these results indicate that the main reasons for not distributing pen-raised Atlantics are a lack of requests and a lack of knowledge of the pen-raised product. We might expect that as the production increases and the market matures, these reasons might diminish and we can expect to see continued new entrants in the business of distributing pen-raised Atlantic salmon.

CONCLUSION

In summary, it is likely that both the number of distributors and imports of pen-raised Atlantic salmon will continue to grow in the U.S. Furthermore, a substantial number of firms do not rule out substituting fresh Atlantic salmon for fresh Pacific salmon. Because about 97 percent of the salmon catch in Alaska is marketed frozen, the continuous growth of a fresh pen-raised Atlantic salmon market in the U.S. may immediately impact only a small portion of the Alaskan salmon industry. However, the Alaskan salmon industry should pay close attention to development of the Atlantic salmon market. The marketing relationship between Atlantic and Pacific salmon can change, especially when there is a glut in the supply of pen-raised Atlantic salmon. Therefore, research in this area should continue.

This survey used an indirect method to gain an understanding of future market growth in the pen-reared salmon market. The econometric study conducted in conjunction with this project should provide direct assessment of consumer and retailer attitudes about these salmon product forms. Again, because of the economic importance of salmon resources in Alaska and the rapid developments in producing and marketing pen-raised Atlantic salmon, future economic analysis of the salmon market is warranted.

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APPENDIX

Alaska Sea Grant College Program

Survey of Seafood Wholesalers Who Do Not Distribute Pen-Raised Salmon

1. Does your firm distribute fresh or frozen Pacific salmon? ___ yes ___ no

2.a. Has your firm considered or would it consider substituting fresh, pen-raised Atlantic salmon for fresh Pacific salmon when both are available? ___ yes ___ no

b. What if fresh Pacific salmon were not available? ___ yes ___ no

3.a. Has your firm had requests from retailers to purchase pen-raised fresh Atlantic salmon? ___ yes ___ no

b. Has your firm had requests from brokers or importers to purchase their pen-raised fresh Atlantic salmon? ___ yes ___ no

4.a. If you answered "no" to both 3(a) and 3(b), why has your firm decided not to purchase pen-raised Atlantic salmon?

b. If you answered "yes" to either 3(a) or 3(b), why didn't your firm purchase the pen-raised fresh Atlantic salmon?

5. Under what conditions might your firm consider distributing pen-raised Atlantic salmon?

6. Please place a check by the range of values in which your firm's total sales belong.
___ Less than $10 million ___ $10 million to $25 million ___ Greater than $25 million

Alaska Sea Grant College Program
Survey of Seafood Wholesalers Distributing Pen-Raised Salmon

1. Please designate which type(s) of pen-raised salmon your firm has distributed or currently distributes, by placing a check next to the appropriate product type(s).

___ Norwegian Atlantic ___ Scottish Atlantic ___ Other Atlantic
___ Domestic Atlantic ___ Pan-sized Coho

2. Please place a check by the range of values in which your firm's total sales belong.

___ Less than $10 million ___ $10 million to $25 million ___ Greater than $25 million

3. If your firm has bought and sold pan-sized, pen-raised Coho salmon, do you consider it a legitimate substitute for fresh or frozen wild Pacific salmon?

Fresh: ___ yes ___ no
Frozen: ___ yes ___ no

4. If your firm has bought and sold fresh, pen-raised Atlantic salmon, do you consider it to be a legitimate substitute for fresh or frozen wild Pacific salmon?

Fresh: ___ yes ___ no
Frozen: ___ yes ___ no

5. If your firm has bought and sold frozen, pen-raised Atlantic salmon, do you consider it to be a legitimate substitute for fresh or frozen wild Pacific salmon?

Fresh: ___ yes ___ no
Frozen: ___ yes ___ no

6. What year did your firm start buying and selling fresh, pen-raised Atlantic salmon?

_____

7. Please estimate your annual percent change (using + for increase, - for decrease) in sales of fresh, pen-raised Atlantic salmon for the following years:

___% Change from 1982 to 1983
___% Change from 1983 to 1984
___% Change from 1984 to 1985

8. Was your firm's decision to buy and sell fresh, pen-raised Atlantic salmon based on requests to distribute the product from:

___ Retailers ___ Brokers or Importers ___ Other (specify) _____

(continued)

9. Which of the following best describes your firm's purchases of fresh, pen-raised Atlantic salmon?

___ We purchase it only when fresh Pacific salmon is not available.

___ Our purchases of fresh, pen-raised Atlantic salmon are independent of the availability of fresh Pacific salmon.

___ We purchase it in place of Pacific salmon for all markets.

___ We purchase it in place of Pacific salmon for the following markets:

___ Restaurants ___ Retail seafood markets ___ Supermarkets ___ Other wholesalers

10. Please estimate the average composition of your total annual sales of fresh, pen-raised Atlantic salmon by category of retailers as a percent of the total. The total should equal 100%; please leave categories that do not apply blank.

___ Restaurants ___ Other wholesalers ___ Supermarkets

___ Retail seafood markets ___ Other (specify) _____

11. Please estimate the average composition of your total annual sales of fresh, pen-raised Atlantic salmon by seasonal percent of total. Total should equal 100%; please leave seasons that do not apply blank.

___ Winter (Dec., Jan., Feb.) ___ Summer (June, July, Aug.)

___ Spring (March, April, May) ___ Fall (Sept., Oct., Nov.)

12.a. Does your firm plan to increase its distribution of fresh, pen-raised Atlantic salmon?

___ yes ___ no

b. If yes, does your firm plan to (check one):

___ maintain current seasonal distribution patterns?

___ concentrate more distribution during winter and spring?

___ concentrate more distribution during summer and fall?

13. What advantages does the fresh, pen-raised Atlantic salmon have over the fresh, wild Pacific salmon?

14. What advantages does the fresh, wild Pacific salmon have over the fresh, pen-raised Atlantic salmon?

AN INQUIRY
INTO FINFISH AQUACULTURE
IN BRITISH COLUMBIA

REPORT AND RECOMMENDATIONS

Presented to the Government of British Columbia

by

David Gillespie, Chairman
B. C. Finfish Aquaculture Inquiry

December 12, 1986

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B.C. Finfish Aquaculture Inquiry

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LETTER OF TRANSMITTAL

December 12, 1986

Honourable Jack J. Kempf
Minister
Ministry of Forests and Lands
Legislative Buildings
Victoria, B.C.

Honourable John Savage
Minister
Ministry of Agriculture and Fisheries
Legislative Buildings
Victoria, B.C.

Dear Sir:

It is my pleasure to transmit my Report and Recommendations on Finfish Aquaculture in British Columbia, as commissioned by the Government of British Columbia on November 6, 1986.

Respectfully yours,

David W. Gillespie
Chairman

ACKNOWLEDGEMENTS

The Inquiry wishes to express its appreciation to the private citizens, interest groups, and government agencies who provided the information and support necessary to complete this report on finfish aquaculture. A special note of gratitude is due to those who responded to the challenge to prepare written submissions at short notice, and to those who made time available to attend and participate in the four public meetings held along the coast. The ability of the Inquiry to achieve its 30 day mandate is directly attributable to their efforts and is testament to the impact and interest that finfish aquaculture is generating in British Columbia.

1.0 PURPOSE AND SCOPE OF THE INQUIRY

1.1 TERMS OF REFERENCE

The Inquiry was officially established on November 6, 1986 with the appointment of David Gillespie as its chairman. The appointment was made by the Honourable Jack J. Kempf, Minister of Forests and Lands under authority of the provincial Land Act and in response to a moratorium on the issuance of finfish aquaculture tenures imposed by the Minister on October 31, 1986.

The terms of reference established by the Ministry of Forests and Lands provided for appointment of a single commissioner of inquiry, with secretarial services and support provided by the Ministry. The commissioner was to consult with appropriate government agencies and submit a report with recommendations to the Minister of Forests and Lands within 30 days of commencing the inquiry.

The report and recommendations were to be made on the following aspects of marine finfish aquaculture operations:

(a) Impact on commercial fishery operations, markets, and localized production-related facilities.
(b) Potential environmental impacts and effect on wild fish stocks.
(c) Impact and involvement of local government and interest groups.
(d) Government approval and monitoring procedures.

The terms of reference also identified specific tasks to be performed. These were to establish a process and schedule for review of concerns of key interest groups, hold meetings with interest groups in coastal communities, review background material provided by government agencies, summarize issues, and formulate recommendations to resolve these issues.

1.1 MORATORIUM ON CROWN LAND TENURES

The Inquiry was precipitated by a moratorium on the issuance of Crown land leases and licences of occupation for finfish aquaculture operations. This moratorium was imposed on October 31, 1986 for an indefinite period by the agency responsible for issuing Crown land tenures, the Ministry of Forests and Lands.

The moratorium is a result of concerns raised by the B.C. Fishery and Allied Workers Union (UFAWU). The UFAWU called for a moratorium to allow a full review of the impacts of the salmon farming industry, given the rapid increase in Crown land applications for finfish aquaculture during the past year.

The moratorium imposed by the Ministry of Forests and Lands applies to the issuance of leases and licenses of occupation for finfish aquaculture. The Ministry continues to accept applications for all tenure, including "Section 10" licences,[1] but does not adjudicate and issue leases or licences of occupation for the production of finfish until the lifting of the moratorium. Any verbal or written commitments to issue a tenure which were made prior to the moratorium may be honoured as legal contracts. Where the moratorium has severely jeopardized financial, legal, or production commitments of an applicant, the possibility exists for an exemption of the application from the moratorium by the Ministry.

From the initiation of the moratorium to December 5, 1986 the Ministry has accepted a further 31 applications for finfish aquaculture sites, 26 of which are Section 10 applications.

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[1] A licence issued under Section 10 of the Land Act, which permits an applicant to enter and occupy a site to conduct research and investigative studies for up to one year. The licence is not renewable or assignable, and does not authorize fish production.

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

2.0 THE INFORMATION GATHERING PROCESS

2.1 METHODS OF INQUIRY

The general approach to the Inquiry was established in the terms of reference (Section 1.1). Major decisions were required, however, on what process would be used to contact and consult the greatest possible number of interest groups along the coast, as well as to collect as much background information as possible in the short time available.

The Inquiry decided the best approach to be one of conducting a series of open public meetings in strategic coastal communities where both acquaculture and the commercial fishery are in evidence. These meetings would be supplemented by meetings with all government agencies involved in finfish aquaculture and commercial fisheries. Where time and scheduling would permit, the Chairman would also be available for meetings with individual citizens and interest groups. In addition, the opportunity to send a written submission to the Inquiry would also be made available for the information gathering period, ending November 30, 1986.

2.1.1 Stage One (Nov. 12 - Nov. 20)

The first few days of the Inquiry were spent in making logistical arrangements for the public meetings, advertising, and inviting all known interest groups to make presentations. Public hearings were scheduled for Parksville on November 21 (south and central Vancouver Island), Campbell River on November 24 (north Vancouver Island), Sechelt on November 26 (south coast) and Prince Rupert on November 26, 1986 (north and central coast). A public notice, outlining the Inquiry Terms of Reference and requesting submissions, was prepared and placed in all appropriate coastal community newspapers. In addition, 32 local government agencies and 45 private interest groups and associations representing all known areas and types of concern with finfish aquaculture were contacted and invited to make presentations. Provincial and federal agencies were also contacted formally with a request to arrange meetings and prepare position statements.

Meetings were held with private interest groups at their request, and with the provincial ministries of Environment and Parks, Forests and Lands, Agriculture and Fisheries, and Municipal Affairs.

On November 17, a news release announcing the dates and locations of the public meetings was distributed to the electronic media and to all newspapers along the coast. Staff began to prepare agendas for each public meeting in response to the many interest groups who began to declare their intent to present briefs at specific locations.

2.1.2 Stage Two (Nov. 21 - Nov. 28)

The second stage of the Inquiry was devoted to the four public meetings. An "information-style" meeting structure was used, in which all verbal presentations, questions to speakers and general comments were directed to the Chairman at specific allocated times during each session. Morning, afternoon, and evening sessions were scheduled for each meeting to allow full opportunity for the public to contribute to the information base.

A preliminary schedule of speakers was posted at the beginning of each meeting. Those who decided at the meeting to make a formal submission were added to the schedule as the day progressed. When gaps appeared in the schedule, they were used by the Chairman to entertain comments and discussion from the general audience, and to call for additional submissions. When time permitted, the public was given opportunity to ask questions about a presentation immediately following its delivery. All speakers were required to identify themselves and all of the proceedings were recorded.

This meeting structure proved to be highly educational and informative for both the Inquiry and the general public. It provided the necessary control to complete each session on time and with ample public participation. Most importantly, it prevented the development of "cross-floor" adversarial relationships among interest groups, often a characteristic of less-structured public meetings.

Meetings were also held during this period with the Canadian Coast Guard and the B.C. Salmon Farmers Association.

2.1.3 Stage Three (Nov. 29 - Dec. 2)

During Stage Three of the Inquiry, final meetings were held with key government agencies. The Chairman met with the Federal Department of Fisheries and Oceans and the Provincial Ministry of Economic Development. Two short meetings were also held to receive written submissions from interest groups unable to attend the previously scheduled public meetings. Finally, the Inquiry reviewed and collated the many written briefs and letters which had been mailed to the Vancouver Office in response to the call for written submissions.

2.1.4 Stage Four (Dec. 3 - Dec. 12)

Stage Four consisted of analyzing all the information obtained during the first three stages of the Inquiry, and formulating the final report and recommendations.

2.2 THE RESPONSE

2.2.1 General Response

The general response to the call for information was overwhelming, given the short time period available for preparation and delivery. A total of 258 submissions were received in the form of letters, formal briefs, and oral presentations at the public meetings. Many of the submissions were supplemented with background material, such as newspaper clippings, thesis dissertations, scientific journal articles, environmental studies, and plans, policies and procedures of various government agencies. These submissions came from local government, provincial government, consulting companies, commercial fishermen, salmon farmers, oyster growers, seaweed farmers, aviation companies, fish processing companies, construction companies, native groups, fish

and wildlife groups, marine recreationists, tow boat operators, environmental groups, upland owners, divers, and college students. Several citizens with no specific affiliation also made presentations at the public meetings.

Attendance at the public meetings was also high given the short notice provided. A total attendance of 387 was recorded from the registration book placed at the entrance to each meeting. Attendance was greatest at Sechelt, where 146 people sat through some part or all of the sessions. Campbell River attracted 110 people, while the Parksville and Prince Rupert meetings recorded 72 and 59 participants, respectively. (See Table 1)

2.1.2 Range of Interest

An indication of the range of interests affected by finfish aquaculture is evident in a review of the affiliation of participants at the public meetings. In total 18 percent of those attending the meetings were engaged in aquaculture, 11 percent in the commercial fishery, and 5 percent in related fishing activities. Seven percent of total attendance represented local government and 6 percent native groups. Private citizens represented 34 percent of the turnout.

With respect to specific interest areas, it is worth noting that local citizens interest was highest at Sechelt (46% of attendees) and Campbell River (32% of attendees). Native peoples representation was very high in Prince Rupert (27% of audience). The Sechelt meeting contained the highest proportion of commercial fisherman compared to other meetings; while at Campbell River the aquaculture industry had its greatest representation.

1.1.3 Government Response

The local, provincial, and federal agencies contacted were quick to respond to the opportunity to provide background information. In general, local government was much more willing to present a formal

position on finfish aquaculture than were provincial and federal agencies. The latter were prepared to provide background information and staff recommendations. Overall, 29 formal position statements were received from various levels of government.

2.3 EXPECTATIONS

A wide range of issues became evident during the Inquiry. Some are beyond the terms of reference and cannot be dealt with in this report. Expectations for their resolution have no doubt been raised, and consequently they form part of the information record in the event that a supplementary evaluation of the issues is undertaken by the various agencies involved in finfish aquaculture.

One of the most important expectations raised by the Inquiry is that the final report will be used to provide better public information about finfish aquaculture and establish better communication among the participating interests. To satisfy this expectation, a comprehensive review of issues has been made an integral part of the report.

2.4 INFORMATION RECORD

The Inquiry places great importance on the need to make available to the public its record of information. This approach is necessary not only to allow more detailed assessment of issues and recommendations by government, but also to alleviate concerns expressed by some members of the public that the "real" facts about finfish aquaculture are being hidden from public view. It is also considered an important way to meet the expectations for better public information and communication as mentioned in Section 2.3. This report therefore includes, as three appendices, the transcripts of public meetings, and all written submissions.

For matters of personal confidentiality, not all position statements from provincial government agencies are included. Background material relevant to those statements is provided, however.

TABLE 1

B.C. FINFISH AQUACULTURE INQUIRY
AFFILIATION AND ATTENDANCE AT PUBLIC MEETINGS

Location / Interest Affiliation / Meeting	PARKSVILLE (%)	CAMPBELL RIVER (%)	SECHELT (%)	PRINCE RUPERT (%)	TOTAL (%)
Government					
' Provincial	3 (4.2)	0	0	2 (3.4)	5 (1.3)
' Local	10 (13.8)	7 (6.4)	8 (5.5)	3 (5.1)	28 (7.2)
' Federal	2 (2.8)	3 (2.7)	0	3 (5.1)	8 (2.1)
Fishing Industry					
' Wild Fishery	7 (9.7)	8 (7.3)	22 (15.1)	5 (8.5)	42 (10.8)
' Aquaculture	15 (20.8)	29 (26.4)	17 (11.6)	7 (11.9)	68 (17.6)
' Other Related	4 (5.6)	6 (5.5)	8 (5.5)	1 (1.7)	19 (4.9)
Forest Industry	1 (1.4)	1 (0.9)	1 (0.7)	0	3 (0.8)
Other Bus./Industry[1]	4 (5.6)	5 (4.5)	9 (6.2)	2 (3.4)	20 (5.2)
Environmental GPS	2 (2.8)	3 (2.7)	3 (2.1)	0	8 (2.1)
Recreation	6 (8.3)	6 (5.5)	0	0	12 (3.1)
Native Groups	1 (1.4)	5 (4.5)	1 (0.7)	16 (27.1)	23 (5.9)
Private Citizens	14 (19.4)	35 (31.8)	67 (45.9)	15 (25.4)	131 (33.9)
Press/Media	3 (4.2)	2 (1.8)	10 (6.8)	5 (8.5)	20 (5.2)
MEETING TOTAL	72	110	146	59	387

[1] Includes construction, building supply, diving, consultants etc. and unidentified companies.

NOTE: These figures represent registered attendance. Some participants did not register.

3.0 THE MAJOR ISSUES

3.1 CENTRAL ISSUES

3.1.1 Extent of Government Support and Control

The extent of support and control of finfish aquaculture by all levels of government pervaded much of the Inquiry's review of major issues. The lack of a clear, comprehensive and integrated policy on aquaculture was identified by fish farming groups as a hindrance to the development of the industry. Some industry spokesmen believe that federal agencies are reluctant supporters of aquaculture because of traditional working relationships with the commercial fishery. In contrast, many of the commercial and sport fishery groups believe that the federal agencies are becoming too supportive of finfish aquaculture, and to the detriment of the Salmonid Enhancement Program. In particular, the diversion of SEP hatchery eggs to supply the aquaculture industry is seen as a direct indication of the withdrawal of federal support for the commercial fishery.

The "gold rush" image which now pervades the finfish aquaculture industry is viewed as another issue involving government support and control. Established farm interests are generally concerned that unbridled government enthusiasm and simple rules have led to speculative activities which jeopardize their own future expansions. In addition, the large number of applications has become a detriment to the whole industry due to adverse reactions among the commercial fishing industry and other interests. The fact that many of the sites are considered unlikely to be approved for farm use is not generally understood.

Several local government agencies who have successfully attracted aquaculture into their areas now identify the need for a more cautious level of support.

The extent of government control is also of concern. Most farm industry groups have called for a reduction in controls over business management, claiming the government's involvement should be limited to

land and environmental concerns. Government agencies have pointed out that government support to date has been limited and directed towards technology transfer, minor tax exemptions, business planning assistance and a small scale loan program. Other groups have called for increasing controls on foreign investment, marketing, and environmental alteration.

3.1.2 The Moratorium

The necessity and duration of the moratorium was frequently mentioned. The majority of interest groups, including most salmon farmers, welcomed the moratorium (and the resultant Inquiry) as a means of reviewing the industry's progress and problems and re-establishing its priorities. Several local governments questioned the apparent "about-face" of the provincial government after having spent considerable effort and funds to promote the industry in their respective regions.

Salmon farmers urged the moratorium be lifted immediately upon conclusion of the Inquiry to permit resumption of business planning and to avoid financial losses. Most native groups wanted the moratorium lifted to allow their own aquaculture activities to proceed; although a minority wanted it contingent on settlement of aboriginal land claims. The U.F.A.W.U. and other commercial fishery groups supported the settlement of land claims, along with completion of environmental impact studies and a more elaborate commission of inquiry, prior to lifting of the moratorium. The Islands Trust requested the moratorium be removed on a regional basis, contingent on completion of local government zoning for aquaculture.

3.1.3 Public Knowledge

Evident in discussions on all major issues was lack of public knowledge of the aquaculture industry and of existing government policies and programs.

Several farming interests identified the main benefit of the Inquiry as providing better understanding of fish farming. The placing of a mora-

torium on tenure approvals was itself the result of a lack of information on industry impacts. One local government submission termed salmon farming a "public relations disaster". Studies that would provide many answers to the concerns raised by commercial fishermen and other groups about marketing and environmental impacts are not all in general distribution and some submissions charged government with intentionally withholding their findings. On the other hand, the finfish farm industry was concerned that its economic benefits and potential were generally unknown, citing the estimated $150 million in annual revenue projected by 1995, and employment of nearly 3,500. The general public were unaware of existing approval procedures, the agencies involved, siting and diligent use requirements, bonding and other matters. Without such information, the image of rampant and uncontrollable development of fish farming has been easily spread.

Despite differences of opinion, every major interest group expressed a desire to cooperate and co-exist. The issue is to identify the circumstances under which these groups will be willing to do so.

3.1.4 Native Involvement

The question of native peoples involvement in aquaculture arose in discussion of all the basic issues being addressed by the Inquiry.

Most bands voiced support and enthusiasm for finfish aquaculture, and its potential for generating direct and indirect employment for their people in the small coastal communities of B.C. There is, however, a concern that native venture opportunities will be quickly lost as a result of a speculative rush of licence applications, overcapitalization, and high subsequent failure rates which will deter future financial support for native enterprise. Many bands are about to enter the industry at the encouragement of various federal reports which recognize the compatibility of fish farm operations with native skills and tradition. There is also concern about loss of native employment in the commercial fishery, and on the environmental effects of fish farming in their traditional harvest areas.

All bands derided the lack of consultation by the provincial lands agency concerning tenure applications fronting and adjacent to Indian reserves. Those bands which have recently made applications for provincial land tenure were also concerned that the aboriginal land claims dispute would prejudice the processing and approval of their applications, as well as prejudice the outcome of their claim to such lands.

3.2 MARKETING ISSUES

3.2.1 Pricing Impact of Farm Salmon

The commercial fishing industry has expressed major concern over the impact of farm salmon on the market price of wild salmon. Several briefs provided information on recent price declines due to competition from farmed salmon produced in Norway. The UFAWU expressed the concern that there would be an eventual head-on collision between B.C. farm salmon and the wild catch, with both industries suffering through drastic price declines. In contrast, the salmon farming groups believed that B.C. farm salmon will compete only minimally with B.C. wild salmon. Recent reports and studies presented by both federal and provincial agencies were cited as evidence that the recent price declines of wild catch are well within the range of price fluctuations experienced over the past two decades. It was further pointed out that only chinook and coho salmon prices were at issue, and these account for only 15-30% of the wild fish caught by B.C. fishermen. Several participants admitted that even with year-round competition, the worst that could happen would be a natural elimination of inefficient producers in both industries and lower consumer prices, neither of which would be undesirable.

3.2.2 Impact on Market Demand and Supply

The commercial fishery groups contended that the anticipated growth in B.C. farm salmon production will lead to market saturation and called for regulations to restrict such production, either through a ban on issuing of tenures or through production controls. It was pointed out

that in Norway, the government has instituted limits on the output of individual farms. The farm industry pointed to recent studies in world market trends which suggested that the increased availability of salmon due to fish farms is actually leading to increased consumption. It was also stated that B.C. farm salmon is being targeted on U.S. specialty markets for fresh fish, and not the canned or frozen fish markets where most of the wild catch competes. B.C. farm salmon is apparently being marketed in the winter months when frozen and fresh chinook and coho is generally unavailable. B.C. farm salmon producers would be foolish, according to one industry submission, to bother trying to compete head on with the fresh wild catch market when it can pursue a separate and more lucrative, expanding market elsewhere. The real marketing battle, it was suggested, will be between the various world suppliers of farm salmon.

3.2.3 Effect on Processing Facilities

A primary concern of commercial fishing industry spokesmen was the future effect of increased salmon farm production on existing processing facilities. The UFAWU expressed concerns that new plants would be built to process farm salmon, thereby aggravating the current overcapitalization and undermining employment at existing, underutilized facilities. It demanded a freeze on the issuance of new plants. The B.C. Fisheries Council, comprised of major fish processing companies in the province, indicated that current plants have sufficient physical capacity to accommodate the potential increase in farm salmon product for at least 5 years. However, the Council reported that a trend was beginning whereby many processing companies were joint venturing with fish farms to market their product, thereby using the excess capacity of existing plants. Government sources indicated that over 50% of farm salmon had recently been contracted for processing by the major unionized companies. Some companies were offering low interest loans to fish farms as an incentive for such contracts. The Prince Rupert Fisherman's Co-op was mentioned as being particularly progressive in its outlook, as it had begun its own salmon and trout farms to supply

its plants and offered various incentives to its members to become involved in fish farming.

3.2.4 Impact on Employment

Various commercial fishing interests also raised employment as a major issue, citing the large base of full time and part time jobs generated by the B.C. salmon fishery and its high wage levels. It expressed the view that the salmon farming industry would never generate this level of employment, and consequently should not be permitted to put the employment health of the salmon fishery in jeopardy. Comments were also made about the low wages paid to salmon farm workers. The salmon farming industry submissions also identified employment as an issue. A very large growth was projected in associated feed plants, plastics and equipment manufacturing, construction and other service industries. Many submissions were received in the Sechelt area confirming extensive increases in business due to finfish aquaculture activity. Several identified the prospects for increasing fishery jobs through fishing for non-commercial or underutilized wild fish to supply new feed plants.

3.2.5 Need for Marketing Strategy and Research

Need for a comprehensive market strategy for B.C. salmon products was identified as an issue to be dealt with by several government agencies, due to the increasing erosion of the commercial fishery share of the world salmon market. Trends in the B.C. fishery towards high labour rates, and increasing protectionism in the U.S.A. and other markets were also mentioned as reasons for initiating a strategy to identify new markets, new product lines, and higher quality and appearance of product from both industries. The Salmon Farmers Association pointed out that it had already commissioned studies on marketing strategies for its products, with financial support from government. Similarly the B.C. Fisheries Council was given a large 3 year grant by government to assist member companies in their export marketing activities. The

UFAWU however, identified its marketing strategies as ensuring a reduction in B.C. farm salmon and ensuring its proper labelling because of its reported inferior quality and presence of foreign substances. Submissions pointed to the fact that B.C. was one of the few areas in the wor capable of sustaining viable commercial wild fishery and farm salmon industries, and it should endeavour to market both products to provide a year round supply of fish to a wide range of consumer markets.

3.3 ENVIRONMENTAL ISSUES

3.3.1 Disease Transference

Transfer of fish diseases represented a major issue in the Inquiry. It concerned transmittal of disease between farms, and transmittal between farm fish and wild stock. The most critical issue was the importation of Atlantic salmon eggs, and with them the risk of outbreak of exotic diseases for which Pacific salmon have no natural immunity. The majority of commercial fishery, recreational sport fishery, wildlife, and environmental groups called for an immediate ban on egg importation, citing concerns of federal and provincial specialists, research studies, and reports of outbreaks introduced through similar methods in other countries. Salmon farmers currently involved with Atlantic salmon described the very elaborate egg screening, quarantine and effluent treatment conditions imposed by government as evidence of low risk. The federal and provincial agencies provided a draft agreement which proposes to end Atlantic egg importation by March of 1989, as evidence of their concerns about this disease risk. The Salmon Farmers Association indicated that it shared some of the concerns expressed about egg importation.

The other disease issue involved concerns by commercial fishery interests that farm fish are more susceptible to disease and will transmit such diseases to wild fish stock. The Salmon Farmers Association and government agencies, however provided recent studies to indicate that the risk of transmission of disease from farm to wild stock is minimal, and has never actually been reported. They argued that it was much

more likely that wild stocks would spread disease to farm stock since the farm eggs and smolts are treated and monitored for diseases while natural stock is not. An offshoot of this concern was the separation distance between farm sites, which has been set by the province as 0.3 kilometres to minimize the risk of disease transfer between farm operations. Many interest groups called for an increase in this distance, including the Salmon Farmers Association. There were also concerns raised about the disposal of dead fish and the effluent discharge from fish farms as potential sources of disease transference. Finally, the disease issue also raised concerns over the adequacy of disease diagnostic and veterinary services. Government has to date provided advice and assistance but has insufficient manpower to increase its commitment. It has been assumed the private sector would soon meet this challenge for more services. However, several briefs indicated a basic deficiency in training programs and laboratory services.

3.3.2 Genetic Alterations

The UFAWU and several other fisheries interest groups were concerned about possible escapement of farm stock. It was speculated that they might interbreed with wild salmon and produce undesirable genetic alterations affecting growth, size, quality and other factors. Also of concern was the possibility of escaped Atlantic salmon becoming established in the wild and out-competing native stock. However, government agencies pointed out that these situations were not likely to occur, and referenced the unsuccessful attempts by government during a 30 year period to deliberately establish Atlantic salmon to the B.C. coast. Salmon farmers reported that most "escapements" tend to congregate around the nets in any case, or get eaten by predators.

3.3.3 Predator Control

Control of predators was raised as an issue by a number of environmental organizations and individuals from recreational and fishery interests. The basic concern was that fish farmers were destroying river otters, eagles, herons, seals and various other wild creatures

attempting to obtain a free meal. Despite provincial regulations prohibiting the shooting or entrapment of some of these animals, there was insufficient enforcement capability by fish and wildlife officials. Many farm operators, however, spoke of different approaches they were using to discourage predators, such as false bottom nets, screens, and electric shock. A number of submissions, however, called for a review and identification of appropriate predator control methods.

3.3.4 Impact on Water Quality and Marine Environment

A large number of interest groups expressed concern about potential damage to water quality and the marine environment created by finfish aquaculture. Many cited such effects as buildup of sediments on the sea bed, increased water cloudiness, increased algae growth, mortality of bottom creatures and plants, and destruction or reduced growth of nearby shellfish beds. The sources of these pollution factors were identified as excess fish feed falling through net pens, human waste disposal from living quarters, water current reductions by net pens, and blood and offal from cleaning and preparation of fish for market. These problems were to be encountered where the chosen farm sites have poor tidal flushing, shallow depth, and relatively high nutrient and sediment loads. Several studies performed in Europe and in Puget Sound, Washington were used to reference these problems as expected outcomes of combining improper farm practices with inadequate sites. Several examples were given of locations where site approvals had been made by the provincial Lands agency despite warnings by the DFO of inadequate natural conditions. Many groups called for monitoring of sites and long term studies to properly assess impact. The Oyster Growers Association called for a wide separation between fish farms and oyster farms until more could be found out about the effects on oyster growth. The farm industry acknowledged these potential problems but emphasized that it is in the farmer's own self-interest to minimize such impacts to maintain a healthy growing environment for his fish. It similarly recognized the need for proper site selection and testing. Most farmers already provided extensive monitoring of water quality for culture conditions, while some reported being involved in

specific studies with federal agencies to gauge impact around their sites. The industry also pointed to technological solutions to these potential risks, including bottom sediment vacuums or dispersal fans, and the planting of certain seaweeds to use excess nutrients in the water. Fish farmers also submitted that aquatic life beneath their pens was actually increasing, and that oyster growth was enhanced by nutrients from fish farms. Government agencies also referenced the Puget Sound study and others to indicate that the major environmental impact appears to be on the seabed beneath the farm site and dependent on site specific characteristics. They also reported a recent study in the Sechelt Inlet, which concluded that at present production levels, salmon farms have little effect on surrounding water quality.

3.1.3 Use of Toxicants and Pharmaceuticals

Major concerns were raised about the effects of toxicants, antibiotics and hormones on human health and the food chain. The UFAWU identified a number of studies implicating the toxicant tributyltin (TBT) as a human health risk, through its concentration in the flesh of farm salmon and shellfish. The Oyster Growers Association and the UFAWU called for a ban on this toxicant, used as a net pen antifoulant dip. Other submissions merely called for greater awareness of its hazards by fish farmers and the use of alternative antifoulants. Some farms indicated they had stopped using TBT antifoulant for this reason. Government agencies indicated that the main source of antifoulants is from pen construction materials, and that construction standards were being considered for net pens to eliminate use of potentially harmful substances. They also reported recent studies which suggest TBT accumulations can be effectively dealt with. Federal agencies lamented the fact that despite stringent fish inspection standards, the lack of manpower and a close testing laboratory reduced the frequency of periodic checks on toxicant levels in farm fish.

The use of antibiotics was also identified as a problem by several groups, with concerns expressed that excessive quantities were being used to combat pathogens in farm fish, and which might lead to development of antibiotic resistant bacteria that could find their way into

the food chain. Government provided comments from a major study indicating that there is little likelihood of these problems occurring since the substances are water soluble and quickly diluted. Other submissions from a professional pharmacologist indicated that antibiotics are metabolized by the fish. Work was also cited which showed a low chance that antibiotic-treated fish food would contaminate nearby shellfish.

Discussion also took place on hormones used to manipulate the sex of fish for brood stock. While several interest groups were concerned about hormonal concentrations in fish and effects on humans, the farming industry indicated that there was no scientific evidence to show any harmful effect. It was also pointed out that farm fish have fewer hormones in their system when marketed than do wild fish.

3.3.6 Health and Safety of Farm Workers

Several people identified occupational concerns related to the working environment. A professional diver provided a lengthy discussion of inadequacies of fish farms in providing safe diving conditions and dealing with diving accidents. The lack of coverage by regulations, and the lack of proper net pen diver training were also considered problems. The UFAWU pointed to a number of recent diving accidents on farms, and was concerned that the risks would increase with the growth of the industry. The major aquaculture associations indicated their concerns about such deficiencies, and stated they have been working on standards. Some companies reported having their own safety committees for employees. A submission from a major finfish company also discussed the lack of safety standards on fish farms, including guard rails, personal flotation devices, emergency medical aid, and requirements for handling of chemicals and pharmaceuticals.

3.4 AGENCY APPROVAL ISSUES

3.4.1 Proliferation and Abuse of Section 10 Licenses

The Inquiry found Section 10 licences to be very contentious. The very large number of these licences issued in the past year was of major concern to all parties involved in the Inquiry, including the established aquaculture industry. A general misunderstanding of their intent and limitations was identified by provincial agencies as a reason for their unpopularity. Some instances of abuse were also identified in which licence holders began illegal farming operations on these sites with no subsequent remedial measures taken by government. Established operators were concerned that licences were being used for financial gain through speculation, and as means of tying up sites to prevent competition. Submissions dealing with Section 10 applications either recommended a halt to their use or a means of reducing their attractiveness. Limits on the number issued to an individual, increases in their cost, and bonds were called for. Bond amounts from $500 to $10,000 were suggested as a means of deterring speculation.

3.4.2 Control of Foreign Investment

Foreign investment in B.C. finfish aquaculture was identified as a major concern, even though it was not actually within the Inquiry terms of reference. The commercial fishery associations argued that it is not in the best interests of B.C. to have foreign control of the salmon farming industry because of the likelihood of export of jobs and profits. They requested strict controls to prevent foreign corporations from taking over B.C. farms and related industries. They also urged government to buy out such foreign investment where it exists today. However, the aquaculture industry and certain government agencies pointed to the necessity of foreign money to offset the reluctance of Canadian financial institutions to provide loans. They argued that foreign capital and expertise is necessary to establish the industry but will soon decline in importance as companies begin obtaining funds through stock issues, and as Canadian investors gain more confidence.

It was also pointed out that most of the foreign investment is through equity financing, whereby partnerships are established with existing farm owner-operators, rather than through takeovers and creation of subsidiary companies. In the service industry, such as feed plants and equipment, Norwegians were reported to have established some subsidiary companies, but competing Canadian ventures were on the increase. One submission from fish farm interests pointed out that there were no controls on the sale of fish boats.

3.4.3 Inadequate Consultation With Interest Groups

Many concerns were expressed over consultation of interest groups in the aquaculture approval process. Many groups expressed dissatisfaction with the application referral process, either because the time available to provide comments is too short (30 days) or because their interests are not included in the process. Such groups as native bands, recreation associations and fish and wildlife clubs identified the need for prior consultation. Others stated that because of scattered membership, constitutional needs and other factors they needed more time for meaningful input. This comment was supported by several provincial and federal agencies that participated in the referral process. The aquaculture interests observed that the short referral period was necessary to keep processing time delays to a minimum. Another related concern was the ineffectiveness of the required advertising of application notices in informing the general public. Some groups argued that in many areas of application there are no effective ways to advertise, and requested that either the applicant or the government seek to inform the public by letter. Several local governments and residents suggested that prior notification and consultation by the applicant would be beneficial to him in properly designing his operations for public acceptance.

3.4.4 Local Government Involvement

The majority of local government agencies heard from were concerned over their degree of influence and role in the approval system. Agencies with heavily populated districts were concerned that they were

given insufficient time or opportunities in the referral process to consult with advisory planning groups or landowners adjacent to proposed aquaculture sites. Their stated preference was for participation, rather than information in referrals and approvals. Many did not have zoning in place to adequately regulate aquaculture operations or to address its impact on local services and adjacent zones. Salmon farmers, however, had mixed responses to this issue. Some welcomed greater local government involvement to educate the public on the benefits of their operations and gain the security of local support. Others were more cautious, pointing to the delays that would be encountered and the ability of local politicians to be influenced by local resident groups with personal rather than community interests in mind.

3.4.3 Length and Complexity of Approval System

The finfish aquaculture industry identified the approval system as a source of frustration. The high number of agencies involved in site approval, business licensing, fish production plans, hatchery effluent discharge, transfer of live fish, inspection of fish going to market, navigation permits, and other requirements was seen as a major source of frustration. Several groups identified the need to establish a "single window" agency responsible for coordinating all agency approvals, while other submissions reported that the existing framework of approvals was adequate but needed to be streamlined.

Also of concern was the fact that the federal Department of Fisheries and Oceans (DFO) requires an aquaculture licence in addition to provincial approvals, and that many of its requirements were a duplication of those obtained from provincial agencies. In contrast, many submissions, including those from organized interest groups, pointed to a lack of right provincial regulations and approvals. Many groups were obviously unaware of existing provincial requirements, but generally cognizant of DFO siting requirements for locating salmon farms near shellfish beds, spawning streams, harbours and docks, and commercial fishing, recreational and native food fisheries. Several examples of applications approved by the provincial Lands agency in disregard for DFO guidelines were raised by various interest groups.

3.4.6 Production Plans and Diligent Use Enforcement

Salmon farmers were concerned that the existing fish farm production plans were too onerous and are responsible for major delays in the approval system (up to six months). Their association argued for its replacement by a performance contract which commits the farmer to a certain level of performance. They indicated that the current requirements for costing information, husbandry strategies and production harvesting strategies are inconsistent with the entrepreneurial spirit that government has encouraged in the industry. Several government agencies also believed its focus should return to ensuring proper site selection and management, while others thought such information necessary to monitor industry production and to ensure farm operations are properly planned. The general public interest tended to focus on "diligent", or proper site use. Several concerns were expressed that the basis of diligent use should be maintenance of site environmental quality. The infrequency of site inspection to check on diligent use was also mentioned, with a general concern that the approval agencies were too busy dealing with the backlog of plans to be able to conduct field inspections. Another concern was that existing farm operators who need to make major changes to approved production plans cannot get priority attention for these changes. As a result, they are forced to operate in contravention of the original diligent use standards of their lease.

3.4.7 Inadequate Rental and Bonding Requirements

Many comments were received from commercial fishery spokesmen and several other interest groups about low rental of Crown land. Government agencies readily admitted that the annual rental charged for finfish farms was considerably less than for other commercial or agriculture uses of public land, including shellfish operations. They recommended a review of the rental structure with the intent of increasing rental, and proposed a number of alternate methods. In addition, several groups called for establishment of bonds to allow government to pay for site clean up in the event of environmental problems or termination of a finfish operation, especially given the potential for damage

and the often remote location of sites. Several submissions suggested that a portion of rentals and bonds be allocated for research studies on finfish environmental effects.

3.5 LAND AND RESOURCE USER CONFLICT ISSUES

3.5.1 Need for Coastal Planning Studies

A consistent comment during the Inquiry was the need for coastal planning studies. This comment was made by all affected groups, including recreational boaters, commercial fishermen, and government agencies. Groups showed maps outlining their key interest areas and offered to participate in planning. Specific approaches to the way planning should be done were also suggested. Some desired planning for the entire coastline, while others preferred to work on specific priority areas. The Campbell River area was identified because of commercial fishery and recreational boating concerns, while the Islands Trust area was recommended due to settlement patterns, shellfish resources and recreational resources. Calls were also made for a more comprehensive planning approach in the Sechelt Inlet, due to potential impact on shellfish aquaculture operations as well as environmental limitations. Salmon farmers tended to focus their comments on indirect planning measures, such as site separation guidelines.

3.5.2 Loss of Anchorage and Access

The loss of anchorage was identified as a major problem. Marine towing companies, commercial net fishermen, and recreational boating groups expressed concerns that the coastline would soon be devoid of open anchorages for emergency and recreational use. Recreational boaters mentioned encountering blocked access to favourite bays and public beaches. One submission reported of fish farmers having roped off entire bays and occasionally firing warning shots to discourage access. Where boaters had chosen to anchor near fish farms, they reported encountering noise and general loss of pleasurable experience. Several

groups were concerned about the potential loss of park and recreational area shoreline to aquaculture, particularly in Desolation Sound. In contrast, farm operators spoke of their concerns about boater noise, fuel slicks, and discharge of human wastes. Several did, however, mention the positive relations they have built up with boaters by offering fish, farm tours, mooring buoys and emergency aid.

3.5.3 Upland Owner Impact

Several local residents spoke of concerns about declining property values due to the imposition of a fish farm along their view frontage. There were problems identified regarding generator noise, lights, loss of private boat moorage, water pollution, and aesthetic value deterioration where farms were adjacent to homes. Several local municipalities indicated that the farms were benefitting local residents indirectly through greater tax revenue and increased employment. Some submissions also believed that in most contentious areas of concern the landowners were seasonal residents and not appreciative of such benefits. Opinions were also shared that upland resident reaction was based primarily on fear of change. The aquaculture industry was concerned that studies done with over emphasis on adjacent residential owner concerns would drive the industry into remote and uneconomical settings, such as was the case with a recently completed guide to applicants in the Sechelt area.

3.5.4 Physical Obstructions to Fishery and Navigation

Several presentations to the Inquiry expressed concerns regarding the physical impact of fish farm sites. At least 4 examples were given by commercial fishery spokesmen of licences issued in traditional gill netting and seine netting grounds. Even if these licences might not result in farms, they were worried since there could certainly be impact on net dragging operations through installation of site monitoring equipment. Such occurrences were seen as evidence of disregard by provincial agencies for the commercial fishing fleet. A related concern was the navigational obstruction of fish farms, as feared by

representatives of the tow boat industry and recreational boaters. It was pointed out by the industry that Coast Guard permits are required to ensure navigation is not impaired, and that farms are required to place caution buoys within their vicinity. Coast Guard staff stated they were sufficiently concerned about the proliferation of site applications to be now considering more detailed permitting requirements.

3.3.5 Size and Spacing of Farms

Several resident groups, environmental interests and local government agencies wanted to see controls placed on the spacing or density of fish farms along the coastline and even within bays. Their concerns involved needs for reduction in concentrations of noise, environmental pollution, and aesthetics. Proposals for distance separations of up to 3 kilometres were made. Size limits on individual farms were also suggested as important to minimize such effects, and recent size restrictions imposed by the State of Washington were given as examples. Farm operators expressed concern over these suggestions, pointing out that many companies operate several farm sites and require closeness for economical reasons. Restrictions on area occupied by a farm could, they argued, lead to excessive crowding and stressing of fish, and result in increased fish mortality. It was also mentioned as preferable for a farm to have a relatively large area for "fallow" purposes to permit pen rotation.

3.3.6 Effects on Recreational and Tourism Industry

A number of submissions identified a major concern that the proliferation of fish farms would ultimately erode the tourism industry as related to recreational boating, sports fishing and commercial fish guiding. Statistics outlining the revenue and employment of this tourism activity were presented to show its significance compared to aquaculture. It was argued that environmental deterioration, reduced visual attractiveness, and disease-related reductions in the wild salmon population would all contribute to the decline in this industry. Aquaculturists believe that recreation and tourism would actually

benefit due to the attraction of touring farms. They also stated that increased demand by their industry for boats, motors, plastics and other equipment commonly manufactured by recreational related companies would increase employment in the recreation and tourism industries.

3.5.7 Involvement of Fishermen in Farm Industry

A central issue was the opportunity for commercial fishermen and shoreworkers to become involved in the aquaculture industry. Several submissions identified Norwegian government programs designed to allow fishermen to offset their short income earning period with fish farm employment. The Prince Rupert Fishermens Co-op was cited for its attempt to encourage fishermen in this fashion through loans and technical training. The greater safety and efficiency of farming rather than chasing fish was frequently mentioned as evidence of the desirability of increased farm involvement. Fishermen, however, found the concept unacceptable for philosophical reasons, stating a preference for being "high seas hunters" rather than farmers living, in their opinion, a boring and isolated existence. Some identified the low wages of farm work as a major factor, while many submissions pointed to the very large capital outlay required to start a fish farm and the difficulty of obtaining loans. The fallacy of believing that "ma and pa" operations could ever develop with the large investment now required was also mentioned, and generally confirmed by existing farm operators. In addition, the heavy commitment to fishing through investment in equipment, licences and vessels was also identified by fishermen as a major factor working against their entry into the aquaculture industry.

4.0 RECOMMENDATIONS TO GOVERNMENT

4.1 GOVERNMENT SUPPORT

4.1.1 The provincial government should continue its support for the finfish aquaculture industry.

British Columbia has demonstrable competitive advantages over other countries in attracting and developing a world-scale finfish aquaculture industry. It is important to the economic growth and diversification of the province that government continue its support of the industry in key stages of development. The 70 currently operating salmon farms already represent a direct capital investment of $75 million, employ 375 people directly and annually spend an estimated $50 million on services and supplies. Aquaculture holds the promise of expanding employment, increasing capital investment in B.C., revitalizing economically depressed communities, and strengthening the commercial fishery sector as a whole. The Province should seize this opportunity to generate additional capital, employment, and business activity along the coast.

4.1.2 The provincial government should develop a provincial aquaculture policy which clarifies provincial direction, agency roles, and the responsibilities of both government and the private sector for the industry.

The lack of a strong provincial statement is viewed as detrimental to orderly and efficient growth of the industry. Development of such a policy should provide better understanding between government and the industry, reduced likelihood of competition between programs of different agencies, and better coordination of government activities. It is also viewed as necessary to ensure that environmental, land use, social and economic factors are identified as critical components of growth and regulation of the industry. Inclusion of policy on these issues of concern will help alleviate public concerns over lack of controls, and lack of protection of the public resource. It would also serve to off-

set creation of the image of an uncontrolled, "gold rush" in aquaculture, which has been responsible for generating considerable misunderstanding and suspicion about provincial government objectives. This policy should be developed by the provincial lead agency and formally adopted by all pertinent ministries.

4.1.3 **The provincial government should establish an aquaculture advisory council from key agencies and interest groups.**

The Inquiry supports the recent provincial government call for an aquaculture advisory council. This group will be able to provide an industry perspective on resolution of issues, government program priorities, interagency agreements, and provincial policies. Direct involvement of the industry is considered critical for the development of finfish aquaculture, and should ease its adjustment to changes in government regulation and support as it continues to evolve. The Inquiry believes that other key resource user groups should also be members of this council. Representation by commercial fishery groups, native groups, recreational groups, and the Fisheries Council of B.C. would ensure that future industry development is in harmony with these interests.

4.1.4 **The provincial government should continue to encourage private sector initiatives as the basis for growth and development of the finfish aquaculture industry.**

The B.C. finfish aquaculture industry has to date developed with very limited direct funding. The provincial government has provided some financial assistance programs; while both federal and provincial agencies have provided support in marketing, research, egg supply, disease and diagnostic services, and other critical areas of the industry during its initial stages of development. Evidence suggests that the industry is rapidly attracting the expertise and capital to provide its own servicing needs without the necessity of long-range government involvement. Controls on foreign investment, vertical integration and other elements of a free enterprise system in this industry are inconsistent with the treatment of other industries in British Columbia.

4.1.5 The provincial government should proceed immediately to establish a master agreement with the federal government respecting approvals, regulation, monitoring and servicing of the finfish aquaculture industry.

Both provincial and federal agencies are involved in regulation, approvals, monitoring, marketing, and promotion of the industry. To assist in the streamlining of industry approvals, assure protection of wild fish stocks and monitor the environment, the two levels of government should coordinate their efforts. This agreement is also needed to reduce incidences of agency friction and establish clearly in the public mind specific responsibilities and jurisdictions. The Inquiry believes that such an agreement should promote the development of "subsidiary" agreements between specific agencies on particular issues, such as referrals and site monitoring. One agency in each government level should be designated the lead agency to work with others in developing the master agreement. Federal agencies should include Department of Fisheries and Oceans, Environmental Protection Service, the Coast Guard, and Indian Affairs.

4.1.6 The provincial government should support greater cooperation with local government in promotion, planning and approval of finfish aquaculture.

Cooperation between both levels of government is important for political, economic and social reasons. Local government is the first line of approach when local residents object to a proposed fish farming operation. Unfortunately many local governments are unable to direct the proposal to more socially-acceptable locations. In other instances, proposals are poorly advertised or referrals are made with inadequate opportunity for local citizen comment. In some locations along the coast, local governments are eager to attract this development but lack the resources and expertise. Provincial cooperation should include funding for promotion and planning of aquaculture, provision of model by-laws, and participation by provincial resource agencies in local planning. It should also include the opportunity for better consultation with local government and a commitment for greater

consideration of local government concerns in the tenure approval process.

4.1.7 **The provincial government should affirm and maintain its commitment to the federal-provincial Salmonid Enhancement Program, Phase 2.**

The Salmonid Enhancement Program is very important to the commercial and sport fishing industry as a supply of wild salmon stock. It is similarly of great importance to the salmon farming industry at this time as a source of eggs for brood stock and marketable fish. Phase 2 of the program is designed to establish additional wild stock hatcheries in B.C. Continued support of the Salmonid Enhancement Program is necessary to assure prosperity of all segments of the B.C. fishery. A statement of continued provincial support should include a commitment to provide SEP funding, provincial land for site requirements, and to procedures and policies of government agencies preventing degradation of enhancement watersheds.

4.1.8 **The provincial government should lift the current moratorium on the adjudication of applications for finfish aquaculture sites.**

The information made available to the Inquiry fails to adequately substantiate maintaining the October 31, 1986 moratorium. The Inquiry believes that the recommendations contained in this report, if implemented, will alleviate most of the problems attributed to fish farming and establish mechanisms for alleviating the others.

A larger or lengthier commission of Inquiry would certainly have generated more detailed scientific submissions and more information on market impacts and resource conflicts. It is doubtful, however, that the outcome of this report would have been substantially different. The moratorium should be lifted in conjunction with initiation of the studies and policy changes recommended in this report.

4.2 INFORMATION AND EDUCATION

4.2.1 The provincial government should expand its public information programs to provide a broader range of services and information access.

Public information on finfish aquaculture and its potential impacts is both limited in scope and availability. While a number of government agencies have developed brochures on specific topics, these have been directed to specific user groups and largely written in reaction to problems. These publications tend to be distributed in areas only after aquaculture concerns have surfaced and not before. It is also important for the provincial government to increase its circulation of information to a much wider segment of the population, including schools, libraries, municipal halls, and interest groups.

Public access to research reports acquired by government is also suggested. This can be done through the industry newsletter published by government and by distributing summaries of findings to the many interest groups affected by, or interested in the results of these marketing, environmental, or land use studies. The government should also seek to increase public awareness of the aquaculture resource centres that it has helped establish. Such information and education programs should be rationalized as part of a broader extension services function by the Ministry of Agriculture and Fisheries.

4.2.2 The provincial government should encourage a formal communication link between the commercial wild fishery and finfish aquaculture associations.

Increased awareness and understanding between commercial fishermen and salmon farmers is a desirable method of reducing friction. The results of this inquiry will certainly increase group awareness but will be less effective in promoting understanding. The provincial government is urged to create opportunities for formal exchange of interests among these groups by involving both in future planning studies, advisory

councils, seminars, conferences, and other activities of mutual interest sponsored by government. Through such learning processes the two groups may be able to minimize philosophical differences and work to the benefit of the entire B.C. seafood industry.

4.3 NATIVE INVOLVEMENT

4.3.1 The provincial government should endorse federal initiatives to increase native involvement in finfish aquaculture development.

Finfish aquaculture provides a rare economic development opportunity for native bands. They are, however, disadvantaged with respect to ability to obtain the necessary venture capital, job training, farm management expertise, marketing and support services. The federal government, which has prime jurisdiction over native affairs, should be encouraged to develop programs to assist native bands in overcoming these disadvantages. The provincial government should seek ways of involving native bands in its aquaculture assistance and extension programs.

4.3.2 The provincial government should encourage the finfish aquaculture industry to involve native peoples in the industry.

Native communities provide several potential advantages to aquaculture developments. In remote areas they will offer a stable and readily available source of farm labour. Joint venture developments on indian reserves may offer tax advantages as well as the potential for accessing federal funds related to manpower training and native economic development. Several farm operations have realized these advantages and are including natives in their employment plans. The Salmon Farmers Association should establish a policy to promote native interaction and utilization and encourage their participation in the industry and in its association.

4.3.3 Current aboriginal land claim negotiations should not influence government policies and procedures respecting issuance of finfish aquaculture tenures.

The current dispute over aboriginal land claims threatens to disrupt the opportunities of native bands to become involved in the aquaculture industry. The provincial government should ensure that aquaculture applications by native bands are dealt with using the same process and time periods that govern the review and adjudication of any other application. Tenure documents issued to native groups should also be no different in substance than those issued to other applicants. Conversely, native groups cannot expect the province to abrogate its current jurisdictional responsibilities for land tenure as a result of this Inquiry, and must be prepared to obtain legal tenure from the province in order to initiate aquaculture development. It would be irresponsible of either party to use the land claims issue to the detriment of future economic development of native communities.

4.3.4 **The provincial government should recognize native bands as legitimate interest groups in the land referral and tenure process.**

The Inquiry does not support the native group call for control on tenures within an 8 kilometre radius of Indian reserves, due to the implications for the aboriginal land claims position. Native bands nevertheless deserve equal treatment with other interest groups when applications are made in the vicinity of reserves. Referral of finfish aquaculture applications should be made to native bands when proposed sites are adjacent to, or within 3 kilometres of the boundary reserve. Referrals will be useful not only to allow an identification of potential resource conflicts, but also to allow the band to discuss with the applicant the possibilities of native involvement in the aquaculture operation.

4.4 FISH MARKETING AND PROCESSING

4.4.1 **The provincial government should continue to rely upon market forces to dictate farm and wild salmon prices.**

The Inquiry believes that the increased production of B.C. farm salmon will enhance the economic health of the total fisheries industry of the

West Coast. Government efforts to eliminate or minimize fish farm "competition" through marketing controls, production limits, or other mechanisms, would have little effect on prices of wild chinook and coho, since competition will be derived from foreign sources of farmed salmon on the world market. B.C. farm salmon products have not been demonstrated to affect wild salmon prices to date, and should be able to avoid price influences in the future by concentrating on specialty markets in the USA in which the major wild catch product does not compete.

4.4.2 **The provincial government should support a strategy for the integrated marketing of B.C. farm and wild salmon products.**

Improved marketing of B.C. salmon is the most desirable course of action to strengthen both finfish aquaculture and commercial fishery industries. New markets should be explored, as well as new ways of packaging and new types of salmon product. More efficient marketing and quality improvement is also required. Products should be directed to different markets at different times of the year, and distinctly identified as B.C. products. The government can support such a strategy through financial assistance, trade missions, and technology transfer. Government should also work with industry to monitor downstream market impact of this strategy on salmon prices to gauge the degree of compatability of wild and farm products in the market place.

4.4.3 **The provincial government should promote use by the aquaculture industry of existing processing plants and infrastructure developed for the wild fishery.**

The Inquiry believes the current trend among existing farm operators to process their product through existing plants, and the increased joint venturing and contracting between existing processing companies and fish farms will strengthen the fishing industry in B.C. and should be encouraged. Government promotion should include review of regulations governing the on-farm processing of salmon, transport of live salmon to plants, and inspection and grading of processed products both on and off-farm.

4.3 MARINE ENVIRONMENT

4.3.1 The provincial government should increase its support for research and studies on the potential long-term effects of salmon farming on the marine biological and physical environment.

Studies performed to date do not confirm the fears expressed over the effects of fish farming on the marine environment. Available studies identify the major impact as alteration of the local seabed due to the build up of organic waste from fish pens. The Inquiry believes that studies should be initiated in selected areas to develop an improved information base on this subject. In particular, studies should be performed on the effects of fish farms on shellfish and other bottom dwellers, and upon water quality. These studies will prove as important to the industry in identifying potential problems as they will to the general public. Support should come through form of grants to independent research facilities and universities as well as through government staff investigations.

4.3.2 The provincial government should establish a mandatory environmental monitoring and data gathering system for each aquaculture site and surrounding area, the results of which should be submitted on a regular basis for review of changes in environmental quality.

Environmental monitoring represents a major deficiency in the regulation of finfish aquaculture. While most finfish aquaculture operations maintain a monitoring system, the logical focus is on-site growing conditions. Monitoring of on and near-site environmental conditions should become a standard requirement of aquaculture tenures, with the measurements to be recorded and regularly submitted for government review. The Environment ministry should establish the parameters to be measured, acceptable standards for these parameters, and methods of measurement and recording. The parameters should be those commonly used to assess changes in marine environmental conditions and also those of value for monitoring of the finfish growth environment. This data will be of value in studies of long-term environmental changes and

can also be used to determine whether or not an operation should be moved. Inherent in this requirement is the necessity for government to establish standards which divide acceptable conditions from unacceptable.

4.5.3 **The provincial government should end the importation of Atlantic salmon eggs.**

The continued importation of Atlantic salmon eggs extends the risk of introducing European diseases to wild stocks, with consequent impacts on the fishing industry. This risk exists despite the severe screening, quarantine and effluent treatment standards imposed by government on egg imports. A draft federal-provincial agreement confirms these rigid standards and calls for an end to egg importation in March, 1989. While supporting most of the agreement, the Inquiry believes importation should be maintained only for the time necessary for the industry to meet existing purchase commitments. Brood stock is now or will shortly be producing eggs to supply West Coast farms. Provided that small volume imports are occasionally permitted for genetic improvement, a fall-1987 closure is considered realistic. The two governments are urged to ratify their agreement with amendments as noted above. This reduction does, however, place greater importance on the need for government to maintain its commitment to supply surplus chinook and coho eggs to the aquaculture industry.

4.5.4 **The provincial government should continue the use of a distance guideline to separate fish farms, and should apply this guideline to separate fish farms from shellfish aquaculture operations.**

Transfer of native diseases between fish farms should continue to be minimized to reduce the potential for crop losses to aquaculturists. The Inquiry believes that the current 0.8 kilometre distance used to separate fish farms should be increased to at least 3 kilometres, and that the guideline be similarly applied to separate existing oyster farms from proposed fish farms. Any decision to reduce this distance

for a new farm should be based on specific site factors, such as flushing and depth characteristics, and not on the preference of the established operator. This recommendation does not rule out the possibility of growing salmon and oysters in the same farm operation, but serves to protect existing farms from new ones.

4.3.5 **The provincial government should establish, in conjunction with industry, environmental practices for fish farms addressing aesthetic considerations, disposal of dead fish and human waste, predator control, and efficient feeding practices.**

A variety of on-farm operating practices have the potential for damaging effects on the local marine environment and its enjoyment by other users. Although most existing farm operators are very conscious of maintaining sound environmental practices they should be documented and distributed to encourage their application on the farm and change public perceptions. It is suggested that a handbook be prepared in consultation with the industry and made available to aquaculturists and the public through government aquaculture extension services.

4.3.6 **Government should increase its research, health inspection and testing activities with respect to the impact of toxicants, hormones and antibiotics used in finfish aquaculture on the environment and the human food chain.**

As with most cultured food products, farm fish are exposed to a number of chemicals designed to manipulate growth and maintain health. The findings of several recent studies indicate no human health implications with the possible exception of the toxicant TBT, used as an antifoulant for net pens. Investigative research and testing is required to provide more information on the type, degree and severity of risks as a basis for eliminating them. At present, stringent provincial and federal legislation is in place to govern the testing and inspection of fish products for the presence of toxic materials, hormones and antibiotics. However, evidence suggests that inspection activity is very

limited due to staff shortages. Testing is also infrequent due to the remoteness of federal testing facilities. Both of these activities should be increased.

4.5.7 **Government and industry should support the development and operation of an aquaculture research centre as a focus for environmental studies, disease research, fish testing and diagnostic services.**

The controversy over potential environmental impacts of finfish aquaculture has underlined the importance of research studies and testing. Research needs have been identified in almost every specific area of environmental concern addressed by this report. Staff and funding levels in government have not kept pace with growth of the industry. While private sector initiatives in research have been commendable, they have focused on developmental aspects of fish culture rather than environmental effects. Government should expand its responsibility for research on those aspects of fish culture affecting other marine resources and seek to provide the testing and monitoring services for public benefit as described in Recommendation 4.5.6.

4.5.8 **Government should encourage establishment of standards for finfish aquaculture equipment to remove the potential for accumulation of toxicants in farm fish products.**

The toxicant tributyltin (TBT) is a current concern at this time. Since the source of most toxicants in fish flesh is specific plastics and paint used in net pen structures, the provincial government should encourage the appropriate federal board to establish legally enforceable standards for finfish aquaculture pens and other containment devices. These standards should eliminate the use of toxicants which may affect human health through concentrations in fish and shellfish. Government should also request a full review by the federal Department of Agriculture of TBT health impacts. In the meantime, the province should discourage the use of TBT as part of its extension and information services program (see Recommendation 4.5.5).

4.5.3 The provincial government should undertake a review of the occupational environment of finfish aquaculture operations to ensure appropriate regulations for occupational health and safety are in place.

The Inquiry believes that attention must be focused towards impacts of finfish aquaculture on the working environment of its employees. A review of existing labour regulations applicable to finfish aquaculture is appropriate given the projected increase in farms and farm workers, and should include requirements for diver training and rescue, personal flotation devices, hand rail systems, emergency medical services, and proper handling of chemicals and pharmaceuticals.

4.6 USER CONFLICTS AND SITING

4.6.1 The provincial government should initiate a program of coastal resource identification studies for use in directing aquaculture applications away from major resource and user conflict areas.

The importance of multiple use of coastal waters and the diversity of resource users must be acknowledged. While the application referral process of government attempts to consider such factors it creates considerable uncertainty among competing site users about the identification and protection of their interests. Planning studies are urgently required to minimize this uncertainty. The most appropriate course of action at this time is to initiate studies that will identify sites of high value for other important coastal interests and which should be reserved from aquaculture activities. Identification of these sites will allow government to direct aquaculture proposals to areas where physical impact on other users will be lessened. Specific siting within these remaining areas can then be determined on the basis of environmental factors.

4.6.2 Coastal resource identification studies should be initiated immediately for the Campbell River - Johnstone Strait, Islands Trust, and Sechelt Inlet areas with direct involvement of all resource user groups in those areas.

Three particular areas of the coast require priority attention for completion of coastal resource studies. These were identified on the basis of areas of conflict apparent in written and oral submissions to the Inquiry, and on the areas of high aquaculture growth projections as identified through the mapping of Section 10 licence applications. The studies for areas of lower priority can be initiated under less pressing circumstances. The quality and success of these studies will depend on the degree to which all recognized interests are involved. Government should review the information record of this Inquiry to identify interest groups in the priority study areas. They will include commercial fishery unions, tow boat operators, recreational boaters, aquaculture associations, native groups and local government. Such studies should aim for completion within a 10 week time frame, given the need to maintain confidence in the finfish aquaculture industry and the fact that many groups have already mapped their high interest areas.

4.6.3 **The provincial government should discontinue issuance of aquaculture tenures adjacent to provincial parks and recreation areas.**

Maintenance of natural shorelines fronting provincial parks and recreation areas is considered important for aesthetics, anchorage, and a satisfactory recreational experience. The potential aquaculture sites along the coast line are sufficiently great that the provincial government should feel no obligation to authorize finfish aquaculture adjacent to park and recreation areas. While there are no finfish aquaculture operations in such areas at present, they are no doubt attractive due to absence of adjacent residents and other potential sources of conflict or competition. A statement from government on this matter will ease considerably the concerns of the public.

4.6.4 **Local governments should be encouraged to develop or refine local zoning bylaws to address finfish aquaculture operations within their boundaries.**

The Inquiry believes that approval of aquaculture locations should remain a provincial resource allocation decision. However, zoning is a

major tool available to local government to ensure aquaculture operations are compatible with adjacent uses. Local zoning for aquaculture is highly desirable in the more heavily populated areas of the coast, and should be encouraged through provincial technical assistance and grants. Zoning should emphasize restrictions on operating conditions, aesthetics, servicing and other items of community importance and consider the economic implications of such restrictions on the proposed fish farms.

4.5.5 **The provincial government should utilize a minimum distance separation guideline for fish farms in populated coastal areas as a means of reducing impact on upland owners and other resource users.**

In most cases fish farms are located a sufficient distance offshore to avoid impact on riparian rights of upland owners and navigational rights of boaters. However, concerns exist in some areas over visual impact and reductions in property values due to increasing concentrations of farms along the coastline. To address these concerns the Inquiry considers it appropriate to establish a distance separation between farms. To date, distance separation relates to concerns over disease transference between farms. However, the concept is also valuable for use in establishing a crude development density in selected coastal areas, in the absence of detailed site investigation or resource user information. The distance should coincide with that established for disease as in Recommendation 4.5.4.

4.5.6 **The aquaculture industry should be encouraged to institute a program to provide anchorage, access, and emergency assistance to other coastal resource users.**

Coastal resource identification studies will not entirely negate the requirements of other coastal resource users for access to previously undeveloped bays, coves and beach areas. It is in the best interests of fish farmers to offer safe anchorage, emergency medical and mechanical assistance, and other services to boaters under controlled conditions. A "friendly cove" program could be developed among the aquacul-

ture associations which provides standard identification signs and outlines basic services available from participating farms. Government could assist through navigation chart identification and through information and extension services aimed at public and commercial boaters.

4.7 REFERRALS AND ADVERTISING

4.7.1 The provincial government should continue its use of the interagency referral system as a primary tool for conflict resolution.

The referral system for approval of land applications is important to government as a primary planning tool to identify land use concerns of various interest groups. It is also of value in identifying site limitations and establishing special management provisions to be attached to the legal occupation of the land. The referral system should therefore continue to play an integral part in the finfish aquaculture approval process. Within areas where coastal resource identification studies are in place, it will be more appropriate to give greater weight to referral comments dealing with environmental characteristics of proposed sites and special management considerations rather than user conflicts.

4.7.2 The provincial government should expand its list of referral groups, increase the time available for response, and establish subsequent notification practices for finfish aquaculture referrals.

The provincial Lands agency should reduce the discretion available in selecting interest groups to participate in its referral process and establish a broader list of standard interest groups to be consulted. These should include commercial fishery groups, native bands, oyster growers, and recreational boating interests. The information record of this Inquiry should assist in identifying such groups. The time available for meaningful comment on applications should also be extended. The Inquiry believes that a sixty day referral period is necessary, given the increased involvement of groups whose comments are made difficult to assemble as a result of remote locations, commitments to

full communication, or broad membership distribution. The notification practices of government are also in need of change to ensure that the referral groups are informed of the outcome of the review process for inventory and planning purposes.

4.7.3 **The provincial lands agency should establish an agreement with federal agencies respecting siting of tenures, information requirements, documentation of concerns, and importance given to referral comments.**

The overlapping site approval requirements between the provincial and federal agencies is a source of frustration to the aquaculture industry, and deleterious to public confidence in the ability of government to provide adequate development safeguards. The Inquiry believes that the Department of Fisheries and Oceans (DFO) must be an integral part of the provincial referral system in order to assist in streamlining the approvals procedure. DFO approval of a site should be required prior to the issuance of tenure by the provincial Lands agency. An agreement will be necessary to establish this relationship and to reconcile requirements of both agencies for growing sites and hatcheries. It is also required to determine the degree of substantiation that is acceptable to the provincial government as a basis for site rejection. This agreement should be a subsidiary to any master agreement on finfish aquaculture established between the provincial and federal government as per Recommendation 4.1.3.

4.7.4 **The provincial lands agency should review its practices involving advertising and notification for prospective finfish aquaculture operations.**

The lack of adequate public notification of finfish aquaculture applications should be remedied by the Ministry of Forests and Lands. Current requirements should be reviewed to ensure that notification reaches residents adjacent to the site, especially where such residents are poorly served by the print media. Telephone, letter or other communication services may be required to offset the lack of notification. Where rezoning is required, or where no zoning is in place, an

applicant should also be required to notify local residents and local government of his intentions, as a means of activating discussion. Such notification will be of value to the applicant in site and facility planning as well as in determining the likelihood of local government cooperation.

4.7.5 **The provincial lands agency should place greater emphasis on local government input to the finfish aquaculture referral process.**

The degree to which local government referral comments influence provincial decisions on aquaculture should be clearly identified in government policy. The relevance of local government comments has generally been minimized by the lack of time available to respond to the referrals. Extension of the referral period to 60 days should assist in lending more weight by providing local government the opportunity to obtain additional information. Local governments should use the additional time to refer the applications to local advisory committees or to affected adjacent landowners for input, as a means of increasing the impact of their recommendations.

4.8 PRODUCTION PLANS AND DILIGENT USE

4.8.1 **The provincial government should remove requirements for cost, husbandry, production and harvest strategies from its fish farm production plan.**

The Inquiry believes the involvement of government in finfish aquaculture is more appropriately directed to the protection and proper management of public resources, rather than to private businesses and privately-owned fish. Removal of costing information, husbandry strategies, production and harvest strategies from existing production plans is needed to return the government focus to resource management, and to assist in streamlining the approval process. Increased government field extension services, and the need to obtain business financing should ensure that the prospective aquaculturist is cognizant of these requirements. Site characteristics, locational information, and

schedules of improvements should constitute the main elements of the plan for site management.

4.3.2 The provincial government should establish minimum fish production levels and environmental quality standards for use in measuring diligent use, and increase its site monitoring and inspection activities.

Standards are required to allow government to determine whether or not a finfish aquaculture operation is making appropriate use of a tenured site. A minimum production level of fish is the simplest and most appropriate measure of diligent use from a development perspective. Standards should be prepared on the basis of current knowledge of fish mortality and growth rates by species at different ages, and combined with an applicant's schedule of net pen improvements to establish annual production levels for each year of operation on a site. From a protection perspective, diligent use should be measured according to changes in site environment as measured against standards proposed as per Recommendation 4.3.2. Failure to maintain environmental standards or to achieve fish production levels should be a basis for tenure cancellation. The existing level of site inspection must also be increased to enforce diligent use.

4.3.3 Production plans for site and improvement locations should be expanded to include the demarcation of public use and access requirements.

The production plan approved by government becomes a legally enforceable component of the lease or licence tenure. It therefore provides an opportunity to legally incorporate desirable forms of access and assistance to other users. The site map and location of improvement submitted in a plan should be required to indicate provisions for emergency or overnight anchorage, access channels to public beach, and riparian access channels for upland owners where applicable. These requirements are appropriate to promote cooperation between private finfish aquaculture and public interests along the coastline.

4.8.4 **The production plan process should establish a priority system to accommodate review and approval of significant plan revisions necessitated by disease outbreak, tenure assignments, and other factors influencing tenured operations.**

The policy of requiring approval of alterations to existing production plans is basically sound but causes difficulty as a result of the existing backlog of production plans in the review process. Government should give priority to review of modifications required for existing farms. This practice should not be used to expedite the plans of farms which are in illegal occupation of sites, but rather to accommodate problems or requirements of existing tenured farms.

4.9 LAND TENURE

4.9.1 **The provincial government should continue its use of Section 10 of the Land Act to authorize site investigations for finfish aquaculture.**

The Section 10 licence is an appropriate form of tenure for the finfish aquaculture industry. It provides the opportunity to conduct site research and investigation without committing government to subsequent approval of a fish farm. Unfortunately its use has been largely responsible for the "gold rush" image created in the public mind and has been abused in some areas by establishment of unauthorized improvements and fish production. To offset this negative image and more accurately reflect its nature, the Section 10 should be renamed (eg. "investigative permit"). In addition, government should begin to increase its surveillance of these permits and cancel them upon discovery of abuse.

4.9.2 **The provincial government should require a commitment bond to accompany all finfish aquaculture applications.**

A commitment bond is recommended as a means of minimizing the ability of applicants to tie up potential sites for speculative or competition reducing purposes. As the name implies, this bond should establish the

commitment of an applicant to seriously pursue his aquaculture interests. The Inquiry believes that such a bond should also be used to provide a source of funding for joint government-industry research on aquaculture development and environmental effects. Consequently the bond should be levied for all types of finfish tenure applications. Government should implement a system of refunds and partial refunds for the bond, which ensures that each application generates some level of support for research on the basis of success in the approval process. With this bond system in place, it may be unnecessary for government to retain an arbitrary ceiling on the number of sites which can be applied for by one applicant.

4.3.3 **The provincial government should revise its rental rates and clean-up bond requirements for finfish aquaculture tenures.**

Inadequate rentals and clean-up bonds are a recognized weakness in existing government policy. The maximum rental of $200 per year is insufficient compensation to government for private use of Crown land. The Inquiry recommends a new rental structure be established, consistent with other approaches used by the provincial government. Clean-up bonding should also be required as a condition of tenure. Government should require deposit of a bond to cover clean up expenses in the event of cancellation or abandonment of the site tenure. The bond should be accessible to provincial and federal agencies responsible for rehabilitation of such sites.

4.3.4 **The provincial government should review and expand its legal tenure documents for finfish aquaculture.**

This report recommends a shift in the regulation process towards provision of environmental safeguards, consideration of other user interests, and conflict avoidance. Such items should be incorporated as legally enforceable provisions of leases and licences issued for finfish aquaculture operations. They include special provisions for mandatory site monitoring and reporting, aesthetic and visual standards, and demarcation of tenure area. The identification of naviga-

tion and access channels and emergency anchorage should also be included as per Recommendation 4.8.3.

4.10 PROVINCIAL AGENCY APPROVAL SYSTEM

4.10.1 The present provincial agency approval framework should be maintained.

The Inquiry believes that the finfish aquaculture approval system should continue to evolve within the existing framework of legislative responsibilities. Establishment of a "single window" agency would, unless accompanied by a major legislative overhaul, result in one additional level of contact, further time requirements, and major staff reallocation. To be effective, the single window agency would have to be a neutral rather than an advocate agency. The consolidation of legislative requirements affecting aquaculture siting and approval (eg. an Aquaculture Act) would create anomalies and inconsistencies among remaining programs of the affected agencies. The Inquiry suggests that agencies involved in the existing process should continue to work together using operational agreements and other mechanisms to achieve their objectives. Policies and procedures should be constantly reappraised to ensure they continue to encourage orderly development of the industry and safeguard the public interest.

4.10.2 The role of the Ministry of Agriculture and Fisheries as lead provincial agency should be clarified and focussed.

The role of lead agency is presently blurred by the heavy involvement of the Ministry of Agriculture and Fisheries in production plan approvals. As such it is often perceived as a support agency for the Ministry of Forests and Lands, which is responsible for approval of land tenure. Absence of a major field extension and information services program also diminishes the public perception of Agriculture and Fisheries as the lead aquaculture agency. To clarify its role, the Ministry should reallocate its aquaculture resources to satisfy ever-increasing needs for extension services to fish farmers, information to the public, and research support to both industry and environ-

mental monitoring agencies as per recommendations in Section 4.2. In addition it should begin a central inventory service for up-to-date information on tenures, land interests, land conflicts, and coastal resource inventory data of value to future aquaculture planning and development.

4.11 REPORT IMPLEMENTATION

4.11.1 Due to the broad scope of the Inquiry terms of reference, the report on finfish aquaculture in B.C. should be reviewed by all provincial government ministries with responsibilities for implementation of its recommendations.

4.11.2 The implementation of recommendations by individual agencies should be done in a coordinated manner and over as short a time period as possible to minimize disruption to the finfish aquaculture industry and to prevent speculative activity.

4.11.3 Adjustments to the government approval process and the preparation of coastal resource identification studies should be performed over the same time frame.

4.11.4 In fairness to those tenures caught in the government moratorium, finfish site applications filed before October 31, 1986 should be allowed to proceed under existing policies and procedures. Those received after the October 31 moratorium should be subject to new policies, procedures, and resource study restrictions as they fall into place.

4.11.5 Given the many similarities and the efficiency of a single policy framework, the recommendations of the Inquiry on finfish aquaculture should be considered by government for their application and relevance to other forms of commercial aquaculture.

RECOMMENDED INTERIM GUIDELINES

FOR THE

MANAGEMENT OF SALMON

NET-PEN CULTURE IN PUGET SOUND

Prepared for:

Washington Department of Ecology in conjunction with the Departments of Fisheries, Agriculture and Natural Resources

Prepared by:

Science Applications International Corporation

DECEMBER 1986

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FINAL REPORT

RECOMMENDED INTERIM GUIDELINES FOR THE MANAGEMENT OF SALMON NET-PEN CULTURE IN PUGET SOUND

December 30, 1986

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DEPARTMENT OF ECOLOGY

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February, 1987

To Local Government, State Agencies, Citizens, Culturists and Others Concerned with Salmon Pen Siting:

The Department of Ecology is pleased to release the final report "Recommended Interim Guidelines for the Management of Salmon Net Pen Culture". The guidelines and procedures were developed by Dr. Donald Weston of Science Applications International Corporation in close consultation with staff and management of the Department of Fisheries, the Department of Natural Resources, and the Department of Agriculture. The guidelines are based on a previous study by Dr. Weston entitled "The Environmental Effects of Floating Mariculture in Puget Sound". In order to best apply the information from that work, Ecology contracted for the current report to identify siting and operational guidelines for use in reviewing salmon net pen proposals in Puget Sound.

In addition to consultations among the four state agencies, input was solicited and received from numerous scientific authorities, environmental groups, tribes, industry representatives, local government, and other interested groups and individuals. Ecology believes these siting and operational guidelines are based on the best information currently available. The guidelines provide criteria for selection of culture sites, husbandry practices, monitoring programs and state reporting requirements, which mitigate most anticipated adverse environmental effects. Projects that meet these guidelines are expected to result in minimal impacts to water quality, bottom sediments and critical habitats. The guidelines do not address issues such as aesthetic impacts or navigation conflicts that also must be considered during the permitting process.

The guidelines are not designed to be adopted state regulations. They are intended to be used by decision-making agencies as guidance for the interpretation and application of existing policy and regulations. As such, they will be valuable to culturists, local government, state agencies, citizens and all those with interest in the net pen culture industry. The department appreciates the concern and effort of all those who contributed to these recommendations.

Sincerely,

Andrea Beatty Riniker

Andrea Beatty Riniker
Director

ABR:bh

Enclosure

cc: Joseph J. Blum, Director
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GUIDELINE SUMMARY

PURPOSE AND SCOPE

The recommended interim guidelines are intended to provide a basis for a coordinated agency approach to the management of salmon net-pen culture in Puget Sound until completion of the programmatic Environmental Impact Statement (EIS). The goal of the guidelines is to avoid significant adverse environmental effects from net-pen operations permitted prior to completion of the programmatic EIS. This objective is pursued through a combination of recommendations for project siting, operational practices, and an annual monitoring program. It is the opinion of state agencies that those facilities sited and operated in accordance with these guidelines will result in little or no adverse environmental effects within those areas of potential impact addressed by the guidelines. It is anticipated that both state environmental managers and local authorities will rely heavily upon these guidelines in their review of culture applications and in their assessment of the potential environmental effects of these operations. The guidelines are not intended to replace existing regulations, master programs or local ordinances. The Department of Natural Resources Commissioner's Order of September 9, 1986 will be reviewed by DNR in light of these guidelines, and modification of the order will be given consideration.

These guidelines address net-pen operations which have not yet been permitted. They do not apply to projects already in operation or permitted unless these facilites undergo significant expansion or modification of their original permit specifications. In this case the expansion or modification may be evaluated for consistency with these guidelines.

The guidelines address all net-pen operations in which salmon are grown with the intent to harvest and market the fish upon attainment of sufficient size. The guidelines do not apply to net-pen operations in which salmon are held exclusively for delayed release to enhance wild stocks.

The geographic areas in which these guidelines apply include Puget Sound, the Strait of Juan de Fuca, the Strait of Georgia.

These guidelines are intended to provide siting and operational criteria until a programmatic EIS for salmon net-pen culture can be completed. These recommendations will then be reviewed for adequacy, revised as necessary, and adopted as part of a state management plan for the salmon net-pen industry.

The interim guidelines are generic in nature. It has not been possible to consider all potential site-specific variables. Thus, the guidelines are intended to be flexible and do not eliminate the need for careful case-by-case review of permit applications. It is anticipated that site-specific conditions may require the guidelines to be made more restrictive or relaxed on a case-by-case basis. If a given project is made subject to restrictions or requirements not specified in these guidelines, state and/or local officials, if requested, should provide the applicant with an explanation of the environmental reasons for doing so. If relaxation of these guidelines is requested, it should be the responsibility of the applicant to demonstrate that deviation from these guidelines can be made with minimal environmental effect.

The guidelines have been developed entirely with the goal of environmental protection, and do not address social, economic, aesthetic or water/land use conflicts which must also be given consideration on a case-by-case basis.

GUIDELINES

1. Accumulation of feed and feces under the net-pens is minimized by guidelines which consider the size of the operation, the depth of water beneath the net-pens and the mean current velocity as measured mid-way between the bottom of the net-pens and the sea floor. Net-pen operations have been divided into size classes I through III. Depending on the size class of the operation, the minimum depth recommended beneath the net-pens ranges from 20 to 60 feet (Figure 1).

2. The habitats listed in Table 1 are considered to be of special significance and are therefore afforded an additional margin of protection from the potential accumulation of feed and feces. If these habitats are present in depths of 75 feet or less, net-pens should not be located over these habitats, within 300 feet in the direction(s) of prevailing tidal currents, or within 150 feet in any other direction. The Washington Department of Fisheries will have responsibility for the designation of and assessment of impacts on plant, invertebrate and fish habitats of special significance.

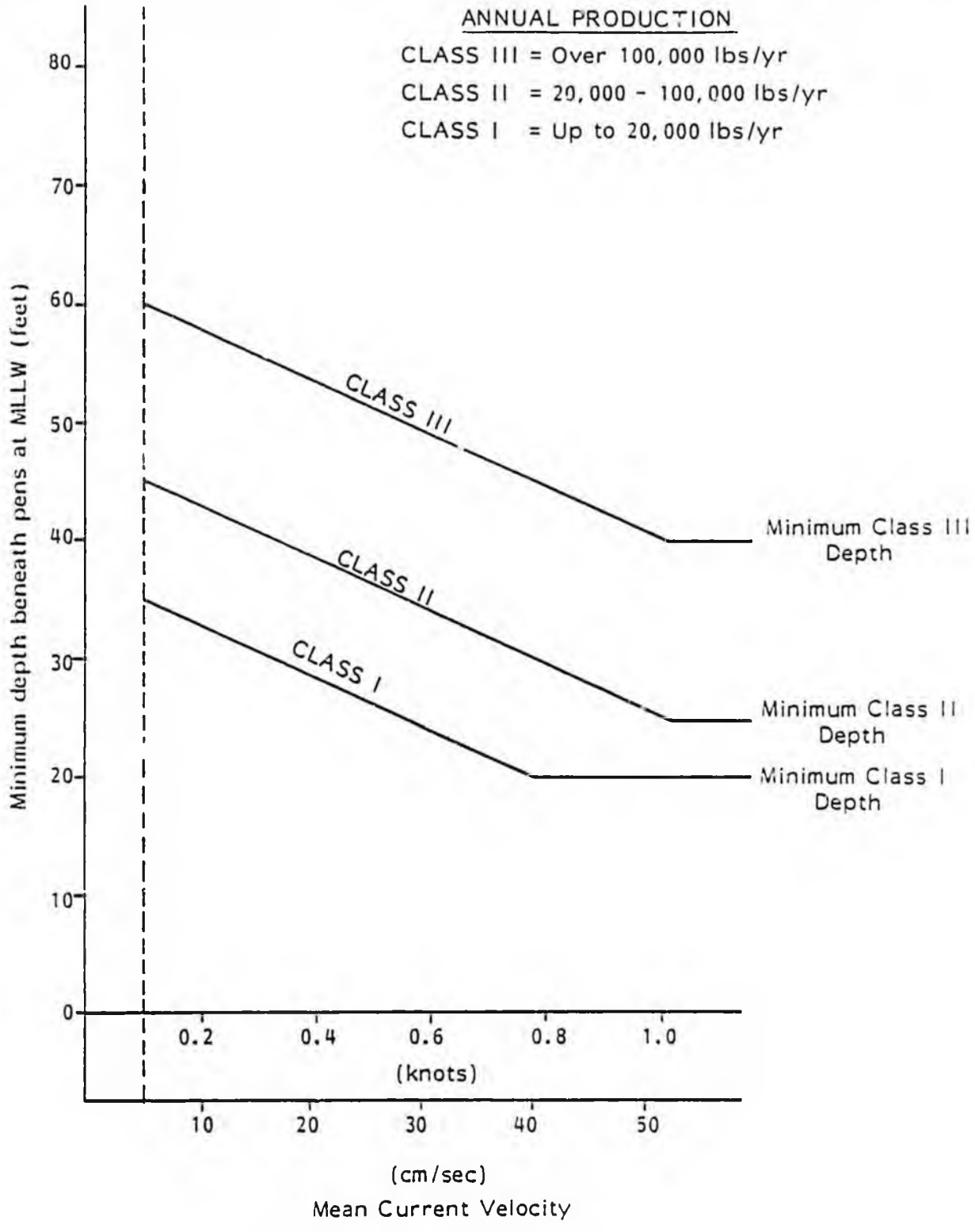

Figure 1

MINIMUM DEPTH AND CURRENT GUIDELINES
FOR NET-PEN SITING

Table 1

HABITATS OF SPECIAL SIGNIFICANCE

- Eelgrass (Zostera marina) beds having densities exceeding 13 turions (i.e., "shoots") per 0.25 m^2 in summer or 10 turions per 0.25 m^2 in winter. These densities should be based on 20 random 0.25 m^2 quadrat samples taken in the eelgrass bed. In addition to the density criteria above, culture should not be permissible if more than 10% of the samples exceed 20 turions per 0.25 m^2. These guidelines are those used by the Washington Department of Fisheries (WDF) in defining areas unacceptable for hardshell clam harvesting (DNR/WDF, 1981).

- Kelp beds (i.e., dense beds of attached macroalgae, especially bull kelp, Nereocystis luetkeana).

- Rocky reef habitats (high profile rock outcrops colonized by organisms such as hydroids, macroalgae, abalone, sea urchins, sea anemones, starfish, and other attached organisms).

- Geoduck (Panope abrupta) populations with densities exceeding 0.4 animals per m^2. This density is the criterion used by state agencies to define major geoduck beds (DNR/WDF, 1985).

- Hardshell clam populations with densities exceeding 1.2 kg (2.5 lbs) per m^2. This density is that required for hardshell clam harvest (DNR/WDF, 1981).

- Habitats having significant populations of, or which are important to the feeding, reproduction or other life stages of Dungeness crabs (Cancer magister), herring (Clupea), lingcod/greenling (Hexagrammidae), true cod (Gaddidae), soles and flounders (Pleuronectiformes), rock fishes (Scorpaenidae), cabezone and other large sculpins (Cottidae), or sea perch (Embiotocidae). The occurrence of these species in a potential culture area does not necessarily exclude it from development. The determination of whether the site is of special significance to these species will be determined by WDF on a case-by-case basis.

- Wildlife refuges and habitats of endangered or threatened species. (A 300 foot separation from net-pens is recommended regardless of current direction).

- Other habitats of special significance, regardless of depth, as determined on a case-by-case basis.

3. Net-pens should not be located within 1500 feet of bird and mammalian habitats of special significance including seal and sea lion haulout area, seabird nesting sites or colonies, and areas specifically identified as critical for feeding or migration of birds and mammals. The Washington Department of Game will be responsible for the designation of habitats of special significance for birds and mammals.

4. Siting guidelines have been developed to minimize the likelihood that net-pen culture will adversely affect water quality or contribute significantly to phytoplankton productivity in any given area. Culture is not recommended in areas with chronic water quality problems. On the basis of this approach guidelines have been developed as shown in Figure 2 and Table 2 and as summarized below:

   - Recommended limits are placed on the maximum fish production within specified geographic areas for most of southern Puget Sound, the Port Orchard area, Whidbey Basin, northern Hood Canal, Sequim Bay and Discovery Bay. These production limits range from 50,000 lbs/yr in Sequim Bay to 5,900,000 lbs/yr in Skagit Bay. There are no restrictions on whether the production allotment for a given area is utilized by a single operation or divided among several smaller operations, provided that culture density does not exceed more than 1,000,000 lbs annual production per square nautical mile (defined as a square area having dimensions of 6076 feet on all sides).

   - Budd Inlet, Holmes Harbor and Hood Canal south of Hazel Point are areas of special concern because of chronic low dissolved oxygen at depth and persistent nitrogen depletion in surface waters. Net-pen culture, therefore, is not recommended unless the applicant can demonstrate that: 1) respiration and biochemical oxygen demand (BOD) will not significantly depress dissolved oxygen concentrations; and 2) nutrient input attributable to net-pen culture will not affect the frequency, extent, intensity or duration of phytoplankton blooms.

   - There are no water quality-based limits on the number of net pen operations in the Strait of Juan de Fuca, the Strait of Georgia, San Juan Islands, Main Basin of Puget Sound, and the southern Sound in the area of Anderson Island, Nisqually Reach and Tacoma Narrows. Culture density, however, should not exceed 1,000,000 lbs annual production per square nautical mile. More stringent production limits may be imposed in some instances to protect water quality in specific embayments.

5. Unpelletized wet feed (i.e., minced fish or shellfish) should not be used in net-pen culture.

6. If predator control is necessary, non-lethal predator control measures should be used against both bird and mammalian predators. Predator control methods must comply with appropriate federal and state rules, and the pen operator shall possess all necessary permits.

7. Tributyltin should not be used as an antifouling agent on the nets. The use of other antifouling agents should be reviewed on a case-by-case basis by state environmental management agencies. Any antifoulant use should be reported to the Washington Department of Ecology.

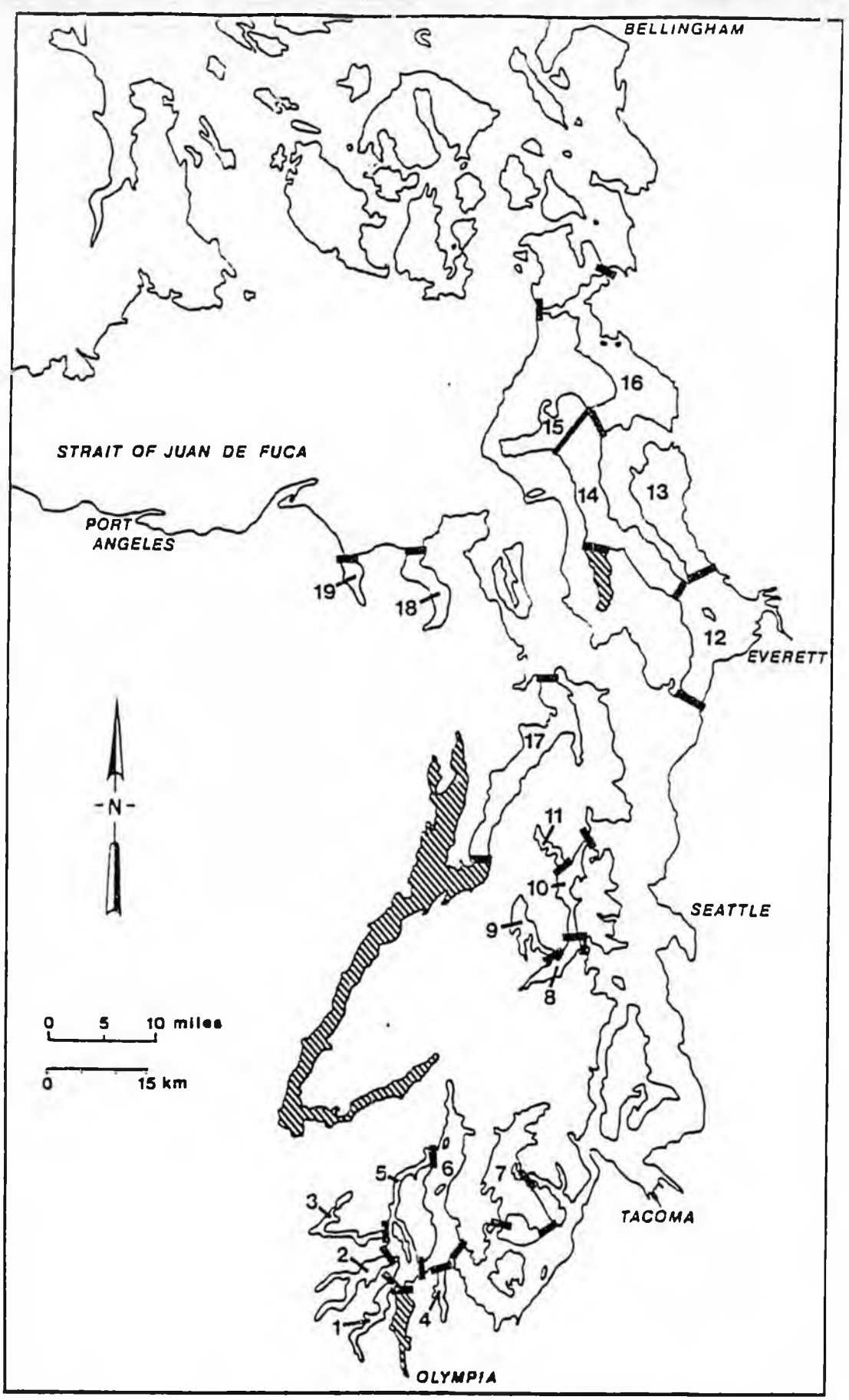

Figure 2. SUB-DIVISIONS OF PUGET SOUND USED IN ESTABLISHING THE WATER QUALITY GUIDELINES. CROSS-HATCHING DENOTES AREAS OF SPECIAL CONCERN.

Table 2

WATER QUALITY GUIDELINES

Area	Description	Maximum Annual Salmon production (thousand lbs/yr)
1	Eld Inlet	190
2	Totten and Skookum Inlets	190
3	Hammersley Inlet and Oakland Bay	240
4	Henderson Inlet	80
5	Squaxin, Peale and Pickering Passage	680
6	Dana Passage and Case Inlet	980
7	Carr Inlet	1100
8	Sinclair Inlet	190
9	Dyes Inlet	460
10	Port Orchard	260
11	Liberty Bay	120
12	Possession Sound	3200
13	Port Susan	1100
14	Saratoga Passage	2000
15	Penn Cove and Crescent Harbor	730
16	Skagit Bay	5900
17	Northern Hood Canal	1900
18	Discovery Bay	540
19	Sequim Bay	50

The following are areas of special concern in which culture is not recommended unless the applicant can demonstrate that culture will not result in adverse environmental effects:

- Budd Inlet
- Holmes Harbor
- Hood Canal south of Hazel Point

The interim guidelines place no limits on the number of net-pen operations or total allowable production in the following areas:

- Strait of Juan de Fuca
- Strait of Georgia
- San Juan Islands
- Main Basin of Puget Sound
- Southern Puget Sound in the vicinity of Tacoma Narrows, Nisqually Reach and Anderson Island

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[1] See Figure 2 for the location of the areas and McLellan (1954) for the precise geographic boundaries.

8. Only antibiotics licensed by the Food and Drug Administration shall be used, and these should be used only on a short-term basis for disease treatment or disease prevention. Antibiotics should not be used prophylactically on a long-term basis. The Washington Department of Fisheries should be notified of all antibiotic usage at the time of treatment, and should be informed of the disease or condition being treated and the antibiotic used.

9. Transfer of live fish or their reproductive products within the state or their importation into state shall be done in accordance with all applicable state and federal standards.

10. To facilitate environmental review, applications for culture should be accompanied by an operations plan which is to be submitted to the Department of Natural Resources (DNR) for distribution to other agencies. This plan should include projections for: (1) improvements at site (e.g., pens, log booms) and their relationship to natural features (e.g. bathymetry, shorelines); (2) pen number, size and configuration; (3) schedule of development and maintenance; (4) species cultured; (5) fish size at harvest; (6) annual production; (7) pounds of fish on hand througnout the year; (8) average and maximum stocking density; (9) source of eggs and smolts; (10) type of feed used; (11) feeding method; (12) chemical use (e.g., antibiotics); (13) predator control measures; and (14) antifoulant use.

11. A site characterization survey should be performed prior to permit application. This survey includes: (1) a bathymetric survey; (2) a hydrographic survey; and (3) a diver survey of biological resources to be done in the period April through September. The applicant is strongly encouraged to consult with state and local officials prior to permit application and in designing the site characterization survey. The initial state contact should be made with the Washington State Department of Agriculture, and this agency will facilitate additional contacts with the Departments of Fisheries, Ecology, Natural Resources, Game and Parks and Recreation.

12. A benthic baseline survey consisting of sediment chemistry and benthic infauna sampling should be performed by all operations with an anticipated annual production in excess of 100,000 lbs. The baseline survey should be conducted after net-pen installation, but before stocking with fish.

13. An annual summer diver survey should be performed by all operations with an anticipated annual production in excess of 20,000 lbs. For those operations growing in excess of 100,000 lbs per year, annual summer monitoring should also include: (1) sediment chemistry and infauna sampling; (2) water quality sampling; and (3) a hydrographic survey.

BACKGROUND INFORMATION AND DISCUSSION FOR THE INTERIM GUIDELINES

1.0 INTRODUCTION

The net-pen culture of salmon is expanding throughout the world including Puget Sound. This growth is creating additional management responsibilities for state and local agencies. At both the state and local level there is a need for a coordinated approach to environmental review and regulation of this relatively new industry. These interim guidelines are intended to provide a basis for such a coordinated approach until completion of the programmatic Environmental Impact Statement (EIS) for the salmon net-pen industry.

The goal of the guidelines is to avoid significant adverse environmental effects from net-pen operations permitted prior to completion of the programmatic EIS. The recently completed review, "The Environmental Effects of Floating Mariculture in Puget Sound" (Weston, 1986), and many other studies have demonstrated that the environmental effects of net-pen culture are highly dependent upon siting and operational practices. Therefore, the goal of the guidelines is pursued through a combination of recommendations for project siting and operational practices, as well as a recommended protocol for annual monitoring. Although environmental protection is the primary goal, these interim guidelines have been developed to meet two secondary goals. First, it is anticipated that the guidelines will lessen the burden of environmental review at the county level. These guidelines should assist local government review of permit applications under the Shoreline Management Act and the State Environmental Policy Act. Secondly, it is also anticipated that these guidelines will assist the industry in application for new sites, and facilitate permitting of operations in sites which meet these guidelines. The permitting of sites which do not meet the guidelines is likely to be a more difficult process and will place the burden of proof on the applicant to demonstrate that culture can be conducted with minimal environmental affect.

As the term "interim guidelines" implies, this document is intended to provide guidance to state and local authorities responsible for the regulation of salmon net-pen culture. These recommendations for siting, operation and monitoring are intended to be flexible, and do not eliminate the need for careful case-by-case review of permit applications. The interim guidelines are, by necessity, generic in nature. It is therefore anticipated that site-specific

conditions may require that these guidelines be made more restrictive or relaxed occasionally on a case-by-case basis. Departures from these guidelines, however, are expected to be relatively rare. If a given project is made subject to restrictions or requirements not specified in these guidelines, state and/or local officials should provide the applicant, if requested, with an explanation of the environmental reasons for doing so. If relaxation of these guidelines is requested, it is the responsibility of the applicant to demonstrate that deviation from these guidelines can be made with minimal environmental effect.

These guidelines are formulated to minimize possible effects of net-pen operation on habitats of special significance as well as sediment and water quality. They do not address considerations of aesthetics, navigation or water/land use conflicts. These and similar issues are best considered at the county level on a case-by-case basis.

The guidelines apply to all net-pen operations in which salmon are grown with the intent to harvest and market the fish upon attainment of sufficient size. The guidelines do not apply to net-pen operations in which salmon are held primarily for research purposes because these facilities are typically of very small size and thus have a reduced potential for environmental effects. The guidelines do not apply to delayed release facilities used for enhancement of wild stocks. There are three reasons for this exclusion. First, fish are held in the delayed release facilities only for a period of four to six months, thus reducing the potential for effects such as feed and feces accumulation under the pens. Secondly, fish are not in the pens during the summer months when water quality concerns are the greatest. Finally, only commercial operations growing fish to a marketable size show significant growth potential in the near future in Puget Sound. Rapid growth of delayed release operations is not anticipated, thus the issue will be deferred to consideration in the programmatic EIS.

The interim guidelines are to be used in the permitting and management of net-pen operations in Puget Sound, the Strait of Juan de Fuca and the Strait of Georgia. They apply to net-pen operations which have not yet been permit-

ted, and do not apply to projects already in operation or permitted unless these facilities undergo significant expansion of modification of their original permit specifications. In this case, the expansion or modification may be evaluated for consistency with these guidelines.

2.0 DEPTH AND CURRENT GUIDELINES

The net-pen culture of salmon generates substantial amounts of excess feed and feces which ultimately settle to the sea floor. The amount of feed and fecal material generated will depend on the level of production of the operation, and the fate of the material will depend principally upon the depth and water currents at the site. These guidelines consider current velocity and facility production in conjunction with water depth.

The objectives of the guidelines are: (1) to minimize the rate of accumulation of feed and feces on the bottom; and (2) to minimize biological changes in benthic communities caused by culture activities. The guidelines consider both depth and current in an attempt to insure that feed and feces are dispersed over a broad enough area to minimize chemical and biological changes in the sediment. If net-pens are sited in accordance with the guidelines, the depth and lateral extent of visible accumulation of feed and feces should be considerably reduced from that currently reported under existing net-pens. There may be subtle and localized changes in sediment chemistry, or enhancement of species tolerant of organic enrichment. The potential for complete absence of macrofauna or the accumulation of thick mats of feed and feces that have been previously reported will be significantly reduced.

It should be emphasized that these guidelines represent the one of the few attempts anywhere in the world to minimize feed and feces accumulation by establishing depth criteria for siting, and the only effort to incorporate current velocity and facility production. Data that would allow exact determination of the combinations of depth and current required for adequate dispersal are, for the most part, lacking. In addition, few data exist on the assimilative capacity of the benthos. The interim criteria draw upon all available data, but rely heavily on scientific judgment. It is clear that more data are needed. The anticipated programmatic EIS will evaluate the effectiveness of these depth and current guidelines, and permit later refinement if necessary. The annual monitoring program recommended by these guidelines (Section 7.0) will, in part, serve to provide the data needed for this evaluation.

The variables of water depth current and operation size all interact to determine the extent of feed and feces accumulation on the bottom. The interim depth and current guidelines recognize this interaction in the siting of net-pen operations. The guidelines are displayed graphically in Figure 3. It is evident from this figure that recommendations for water depth and current velocity are dependent upon the size of the operation: the greater the annual production of the facility, the greater must be the water depth and/or current velocity. Net-pen operations are divided into three size classes as follows:

Class I:

- Operations with a production capacity of up to 20,000 pounds/year.

Class II:

- Operations with a production capacity in excess of 20,000 pounds/year, but no greater than 100,000 pounds/year.

Class III:

- Operations with a production capacity in excess of 100,000 pounds/year.

Figure 3 illustrates depth and current guidelines for each operational class. At any given current velocity, the minimum recommended depth beneath the pens is specified. Since these guidelines attempt to maximize the dispersal of feed and feces as they settle from the net-pens, current velocity should be measured mid-way between the bottom of the net-pens and the sea floor as described in Section 6.1. Surface current velocity is not an appropriate substitute. The guidelines are based on mean rather than maximum current velocity. A minimum mean current velocity of 0.1 knots (5 cm/sec) is recommended. At sites with a mean current velocity below this value, currents will not be adequate to insure dispersal of solid wastes, and no culture should be permitted.

The depth of concern has been defined as the distance from the bottom of the net-pens to the sea floor rather than total water depth. In application of the guidelines to a net-pen complex on a sloping bottom, the depth of concern is the smallest depth under any of the net-pens, and this value is to be used

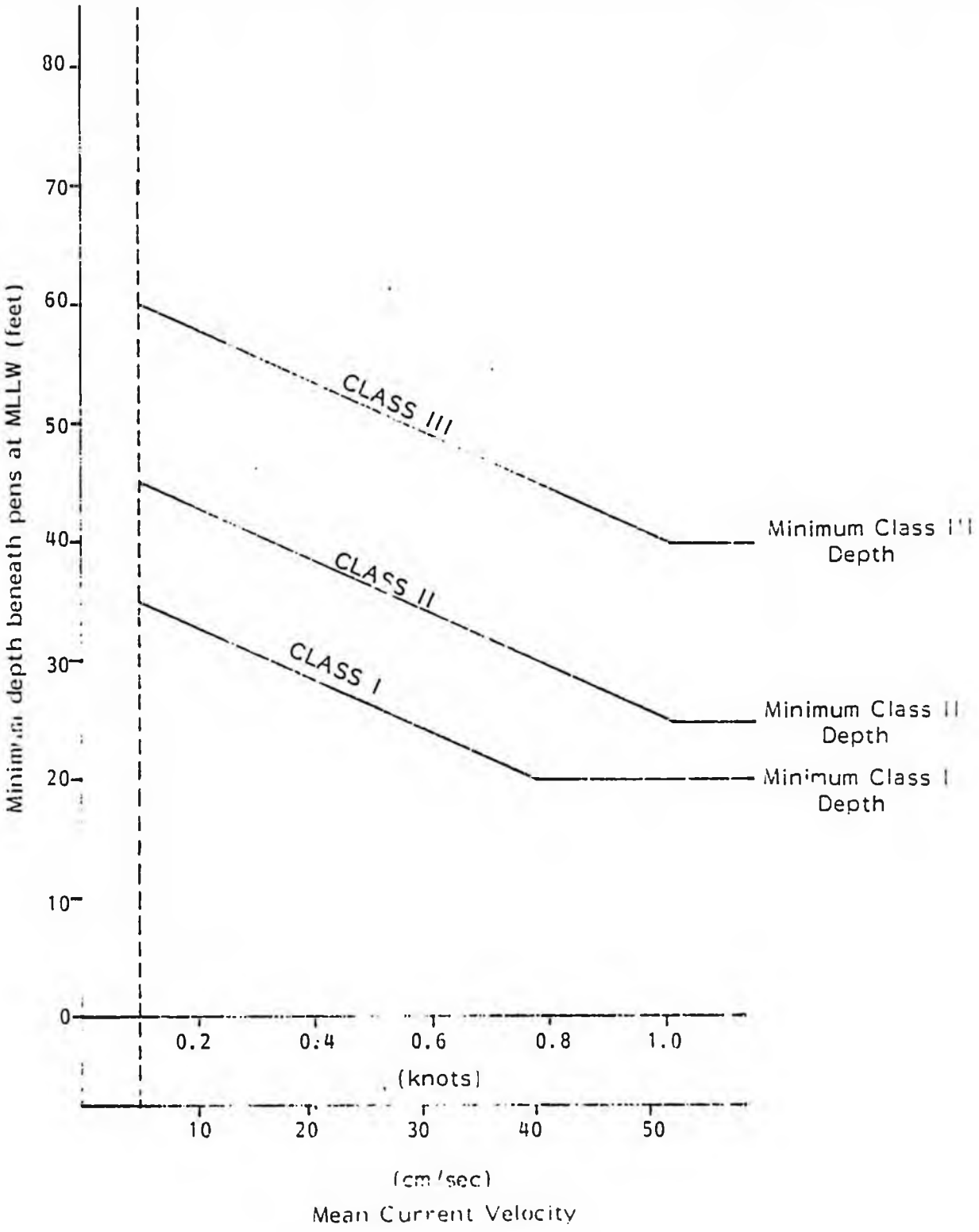

Figure 3

MINIMUM DEPTH AND CURRENT GUIDELINES
FOR NET-PEN SITING
(See text for explanation of Class I, II, and III
operations and for definition of mean current velocity)

in determining compliance with the guidelines. Depths are based on mean lower low water (MLLW). MLLW is the chart datum employed on nautical charts, thus simplifiying application of the guidelines.

Pen configuration is also a significant factor in determining the depth and lateral extent of solids accumulation beneath a net-pen facility. Pens oriented in a row parallel to the prevailing current will tend to cause the greatest depth of solids accumulation per unit area, but may affect the least amount of bottom area. Pens oriented perpendicular to the prevailing current may affect a greater area of bottom, but may have the least accumulation per unit area. The guidelines do not specifically address pen configuration because it will be extremely operation-specific, and because of the limitations in sedimentation models which currently do not allow prediction of an optimal design. For those operations which meet the depth and current guidelines, however, pen configuration may ultimately prove to be an important consideration in further mitigating effects. This issue will require further consideration in the programmatic EIS.

3.0 HABITATS OF SPECIAL SIGNIFICANCE

Net-pens should not be located where their siting or the accumulation of excess feed and feces are likely to adversely affect habitats important to commercial or sport fisheries, that are of critical ecological importance, or that are especially sensitive to degradation by culture activities. These habitats should be afforded protection over and above the depth and current guidelines discussed in Section 2.0. The habitats of special significance are listed in Table 3. The Washington Department of Fisheries (WDF) will have responsibility for the designation of and assessment of impacts on plant, invertebrate and fish habitats of special significance. The WDF has considerable existing data concerning habitats of special significance for foodfish and shellfish, and is able to provide available information or comments in this regard.

It is recommended that net-pens not be sited within 300 feet from habitats of special significance located in the direction(s) of prevailing tidal currents. A 150-foot separation is recommended in all other directions. These distances are to be measured laterally from the net-pen perimeter. A review of the literature (Weston, 1986) found that visible accumulation of feed and feces or changes in sediment chemistry was generally reported to extend to distance from the net-pens of 100 feet or less. The greatest reported distance of visible accumulation was 150 feet from the net-pens. A separation of 300 feet in the direction(s) of prevailing currents should provide an additional margin of protection.

Habitats of special significance are, by definition, herein limited to water depths of 75 feet or less at mean lower low water (MLLW). Except in special cases (Item 8 of Table 3), no habitat restrictions are placed on net-pens if water depths within a 300-foot distance are in excess of 75 feet. For example, the occurrence of dense geoduck beds within 300 feet from a proposed net-pen site in the direction of prevailing current is sufficient to exclude that site from consideration if the beds are in a depth of 75 feet or less. These geoduck beds will not ordinarily be of concern in siting if they are at a depth greater than 75 feet. The 75-foot limitation to habitats of special significance has been established principally because of the reduced likelihood of feed and feces bottom accumulation at greater depths. For many of the

Table 3

HABITATS OF SPECIAL SIGNIFICANCE

1. Eelgrass (Zostera marina) beds having densities exceeding 13 turions (i.e., "shoots") per 0.25 m^2 in summer or 10 turions per 0.25 m^2 in winter. These densities should be based on 20 random 0.25 m^2 quadrat samples taken in the eelgrass bed. In addition to the density criteria above, culture should not be permissible if more than 10% of the samples exceed 20 turions per 0.25 m^2. These guidelines are those used by the Washington Department of Fisheries (WDF) in defining areas unacceptable for hardshell clam harvesting (DNR/WDF, 1981).

2. Kelp beds (i.e., dense beds of attached macroalgae, especially bull kelp, Nereocystis luetkeana).

3. Rocky reef habitats (high profile rock outcrops colonized by organisms such as hydroids, macroalgae, abalone, sea urchins, sea anemones, starfish, and other attached organisms).

4. Geoduck (Panope abrupta) populations with densities exceeding 0.4 animals per m^2. This density is the criterion used by state agencies to define major geoduck beds (DNR/WDF, 1985).

5. Hardshell clam populations with densities exceeding 1.2 kg (2.5 lbs) per m^2. This density is that required for hardshell clam harvest (DNR/WDF, 1981).

6. Habitats having significant populations of, or which are important to the feeding, reproduction or other life stages of Dungeness crabs (Cancer magister), herring (Clupea), lingcod/greenling (Hexagrammidae), true cod (Gaddidae), soles and flounders (Pleuronectiformes), rock fishes (Scorpaenidae), cabezone and other large sculpins (Cottidae), or sea perch (Embiotocidae). The occurrence of these species in a potential culture area does not necessarily exclude it from development. The determination of whether the site is of special significance to these species will be determined by WDF on a case-by-case basis.

7. Wildlife refuges and habitats of endangered or threatened species. (A 300 foot separation from net-pens is recommended regardless of current direction).

8. Other habitats of special significance, regardless of depth, as determined on a case-by-case basis.

habitats of special significance, the 75-foot depth limitation is of little consequence for these habitats are found only in much shallower water (e.g., eelgrass, kelp, herring spawning areas).

Net-pens should not be sited within 1500 feet of habitats of special significance as identified by the Washington Department of Game (WDG). These include seal and sea lion haulout areas, seabird nesting sites or colonies, and areas specifically identified as critical for feeding or migration of birds and mammals. It is not clear what effects, if any, net-pen operations would have on these species or habitats, however, the intent of this guideline is to reduce the likelihood of interactions between net-pen operations and these species, and thus reduce the need for predator control measures. WDG will have the responsibility for the designation of mammal and bird habitats of special significance.

4.0 WATER QUALITY GUIDELINES

The primary objective of the water quality guidelines is to minimize any potential effect of net-pen activities on phytoplankton productivity (i.e., initiate or sustain blooms). Secondarily, the guidelines attempt to prevent the input of feed and feces with a high biochemical oxygen demand (BOD) in areas which have chronically low dissolved oxygen concentrations. The guidelines address only incidentally potential toxic effects that result from the accumulation of metabolites (principally ammonia) or the respiratory depletion of oxygen in the water passing directly through the culture structure. Salmon are very sensitive to both elevated ammonia concentrations and low dissolved oxygen, and thus, the size of the operation is likely to be self-limiting with respect to toxic effects. In addition, net-pen operations of the size typical of Puget Sound are unlikely to cause increases in ammonia concentrations to the point where toxicity would become a concern (Weston, 1986).

A general overview of the water quality interim guidelines is shown in Table 4 and Figure 4. Net-pen culture is not recommended in Budd Inlet, Holmes Harbor or Hood Canal south of Hazel Point unless the applicant can demonstrate culture can be conducted without significant environmental effects. In the Main Basin of Puget Sound, portions of the southern Sound (Anderson Island, Tacoma Narrows and Nisqually Reach), the Strait of Juan de Fuca, the San Juan Islands and the Strait of Georgia the guidelines establish no water quality-based limitations on the number of net-pen operations, although the density of culture should not exceed more than 1 million pounds annual production within one square nautical mile (hereafter defined as a square area having the dimensions of 6076 feet on all sides). Much of the remainder of Puget Sound has been sub-divided into areas numbered 1 through 19 based primarily on the sub-divisions of Puget Sound used by McLellan (1954). In each of these sub-divisions, a maximum annual salmon production has been recommended. The guidelines place no restrictions on how the maximum production is distributed among operations. A single operation may utilize the production allotment for a sub-division, or the production allotment may be divided among several smaller operations. However, the annual production density should not exceed 1 million pounds per square nautical mile.

Table 4

WATER QUALITY GUIDELINES

Area[1]	Description	Maximum Annual Salmon production (thousand lbs/yr)
1	Eld Inlet	190
2	Totten and Skookum Inlets	190
3	Hammersley Inlet and Oakland Bay	240
4	Henderson Inlet	80
5	Squaxin, Peale and Pickering Passage	680
6	Dana Passage and Case Inlet	980
7	Carr Inlet	1100
8	Sinclair Inlet	190
9	Dyes Inlet	460
10	Port Orchard	260
11	Liberty Bay	120
12	Possession Sound	3200
13	Port Susan	1100
14	Saratoga Passage	2000
15	Penn Cove and Crescent Harbor	730
16	Skagit Bay	5900
17	Northern Hood Canal	1900
18	Discovery Bay	540
19	Sequim Bay	50

The following are areas of special concern in which culture is not recommended unless the applicant can demonstrate that culture will not result in adverse environmental effects:

- Budd Inlet
- Holmes Harbor
- Hood Canal south of Hazel Point

The interim guidelines place no limits on the number of net-pen operations or total allowable production in the following areas:

- Strait of Juan de Fuca
- Strait of Georgia
- San Juan Islands
- Main Basin of Puget Sound
- Southern Puget Sound in the vicinity of Tacoma Narrows, Nisqually Reach and Anderson Island

[1]See Figure 4 for the location of the areas and McLellan (1954) for the precise geographic boundaries.

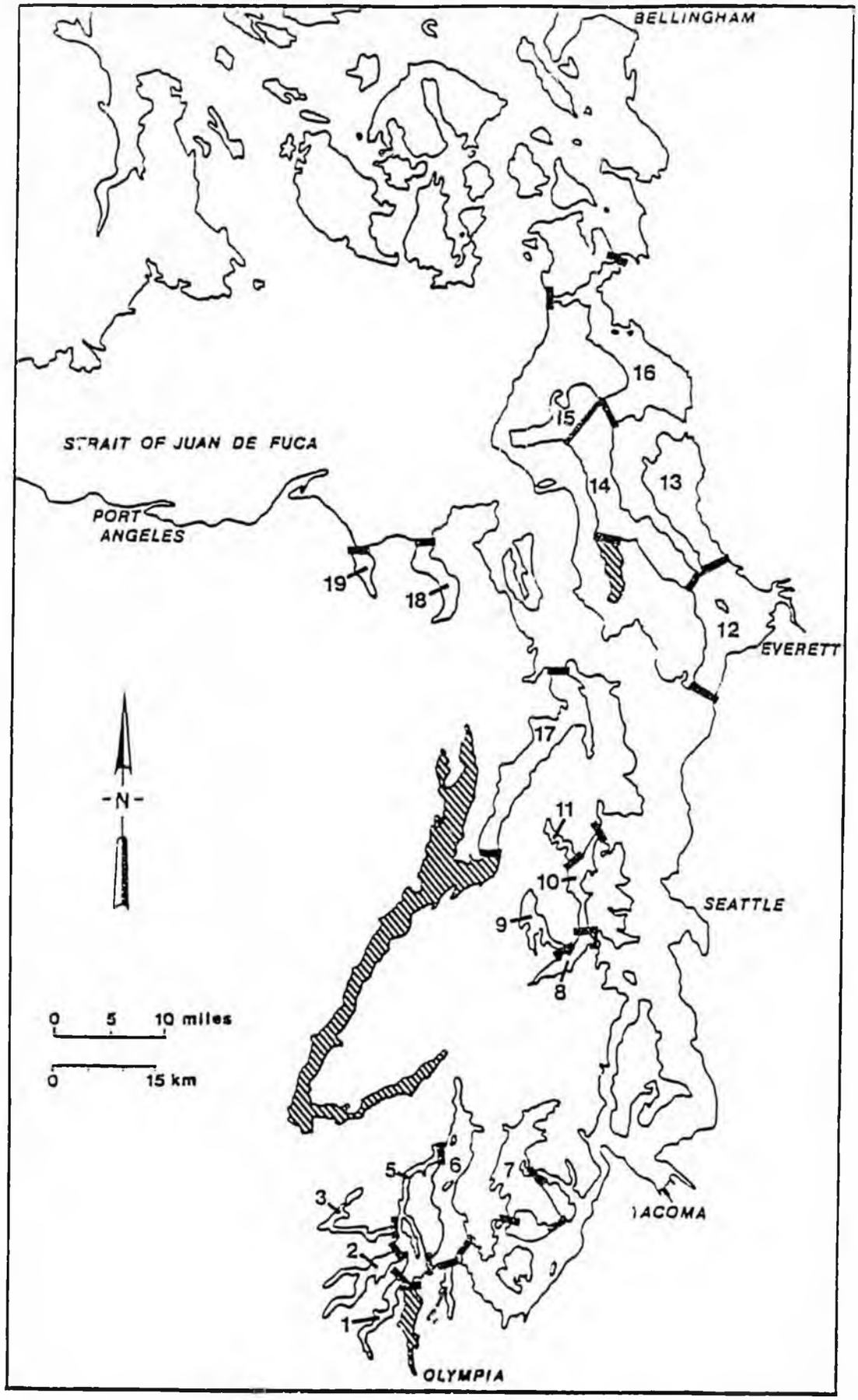

Figure 4. SUB-DIVISIONS OF PUGET SOUND USED IN ESTABLISHING THE WATER QUALITY GUIDELINES. CROSS-HATCHING DENOTES AREAS OF SPECIAL CONCERN.

To understand the basis for the water quality guidelines, existing water quality conditions throughout Puget Sound must be examined. Figures 5 through 7 illustrate dissolved oxygen and nitrogen concentrations throughout the Sound based on the Department of Ecology water quality monitoring data. Ecology monitoring stations are sampled monthly from April through November. Samples are collected at depths of 0, 33 and, if the water is of sufficient depth, at 98 ft. (corresponding to 0, 10 and 30 m). Data collected from April 1981 through November 1985 (approximately 40 sampling events) were used in development of these guidelines.

Figure 5 illustrates the percentage of observations with less than 5 mg/l dissolved oxygen in samples collected at a depth of 33 ft.. Two areas, Budd Inlet and the extreme southern end of Hood Canal, had chronically low dissolved oxygen concentrations at depths of 33 ft. Dissolved oxygen concentrations less than 5 mg/l were regularly reported at depths of 98 ft. in Hood Canal northwards to, and including, Dabob Bay (Figure 6). In Holmes Harbor dissolved oxygen concentrations less than 5 mg/l were observed in 15% of the samples.

Figure 7 illustrates the frequency with which nitrogen concentrations (sum of ammonia, nitrite and nitrate) drop below 0.1 mg/l. In Puget Sound nitrogen concentrations below this value suggest that nitrogen may limit phytoplankton growth, and that the addition of nitrogen by net-pen culture could increase primary productivity. The highest frequency of nitrogen limitation was observed in Hood Canal northwards to and including Dabob Bay. Nitrogen depletion below 0.1 mg/l was also observed at a frequency greater than 60% in Holmes Harbor, Budd Inlet, Totten Inlet, Port Orchard and Liberty Bay. In the Strait of Juan de Fuca, the San Juan Islands and the Main Basin of Puget Sound nitrogen was rarely limiting to phytoplankton growth.

The data displayed in Figures 5 through 7 were used to determine the maximum intensity of culture recommended in any given area under these interim guidelines. The conclusions drawn from the Ecology water quality monitoring data set were also compared and verified with readily available published data (Collias, et al., 1974; Friebertshauser, et al., 1971). It should, however, be recognized that the data search conducted for the interim guidelines was by

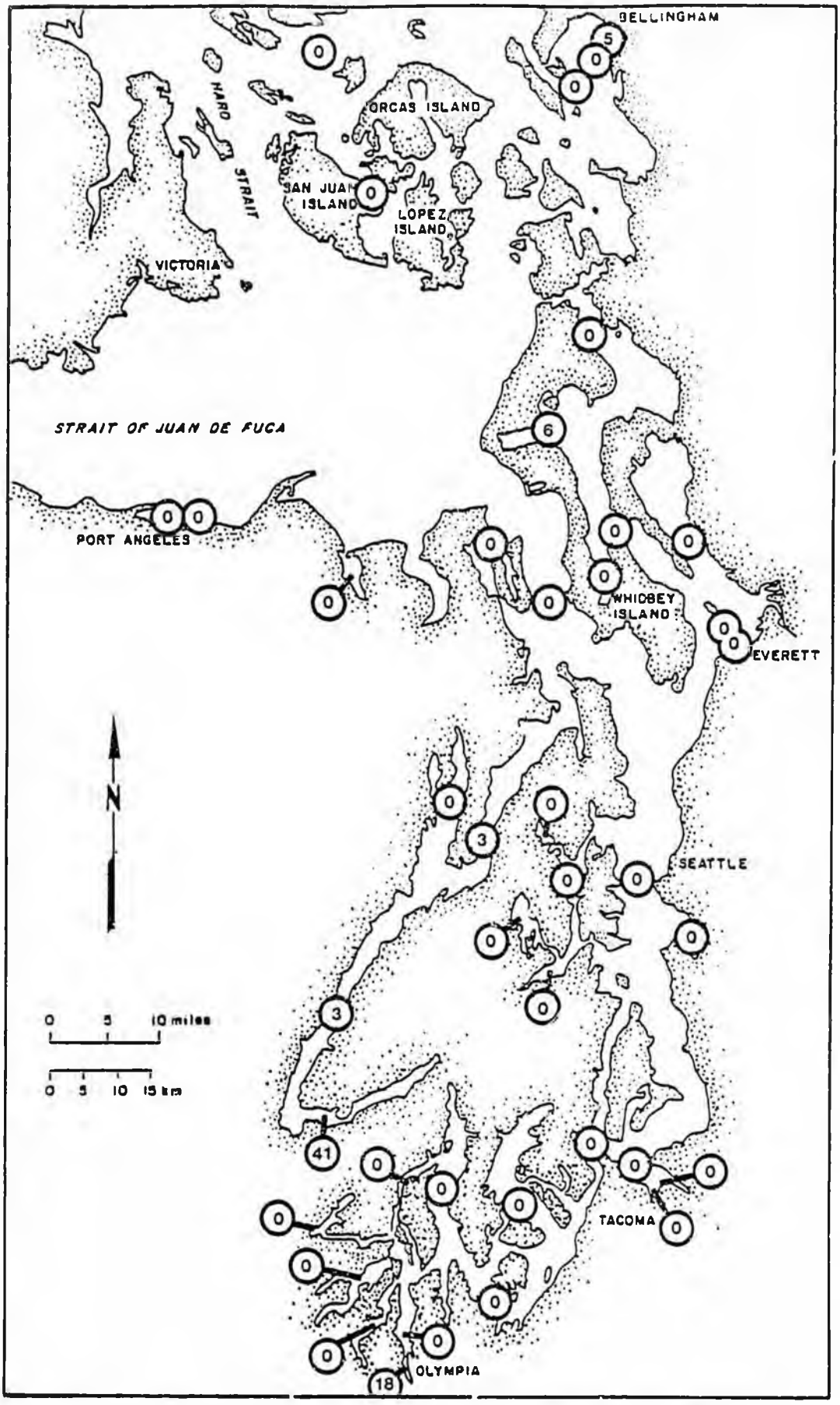

Figure 5. PERCENTAGE OF OBSERVATIONS WITH < 5 mg/ℓ OXYGEN AT A DEPTH OF 33 ft (n=35-40)

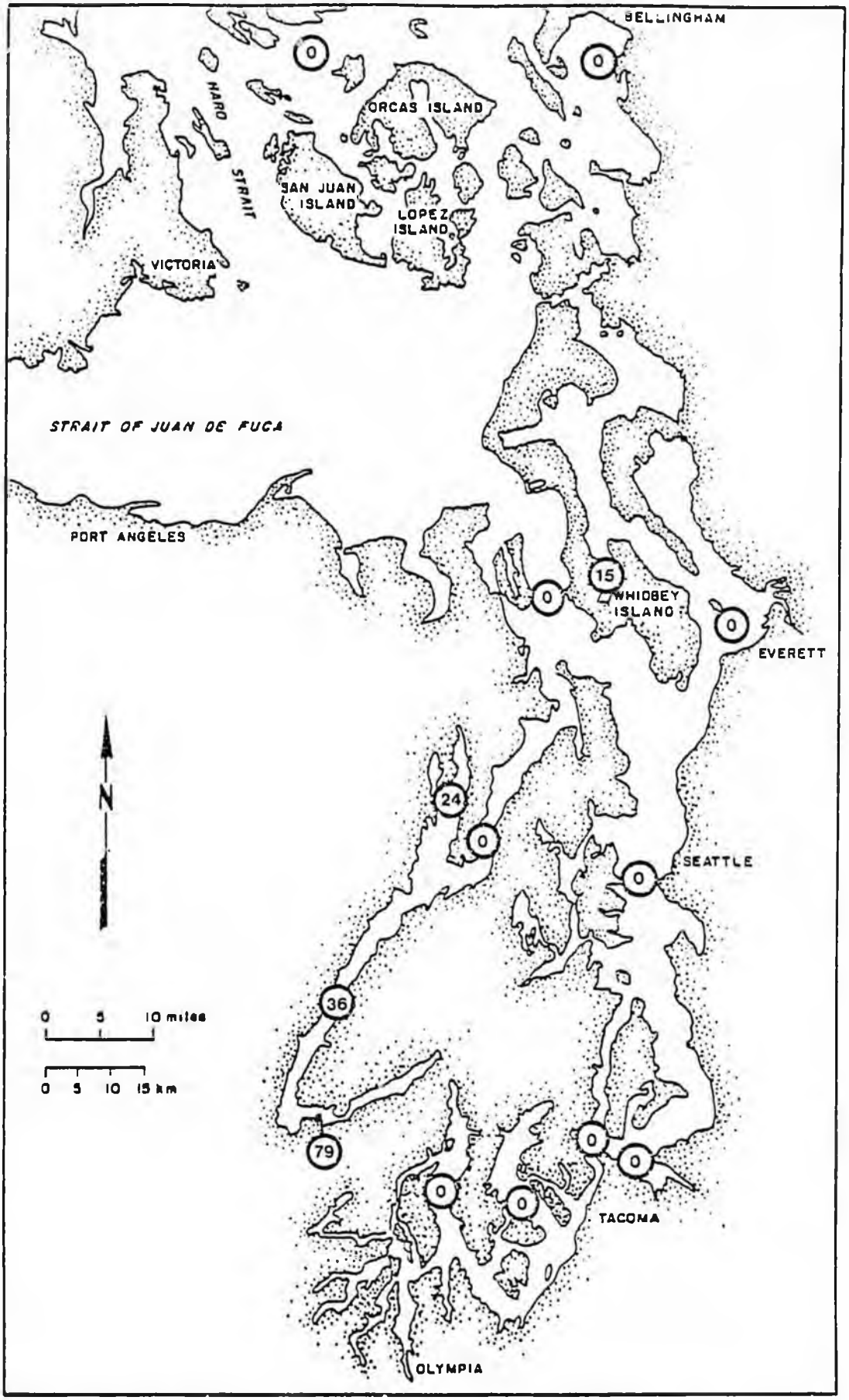

Figure 6. PERCENTAGE OF OBSERVATIONS WITH < 5 mg/ℓ OXYGEN AT A DEPTH OF 98 ft (n=35-40)

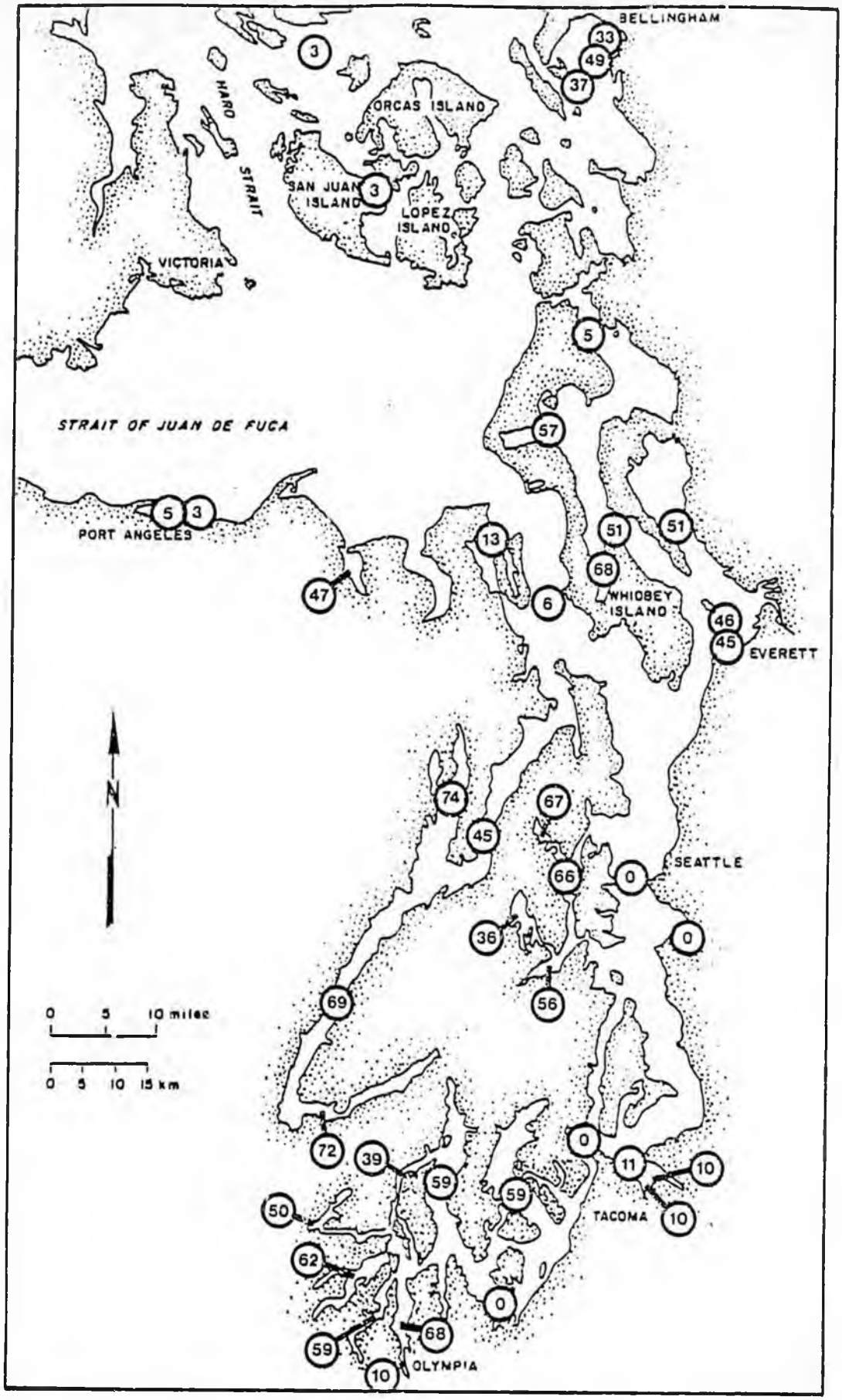

Figure 7. PERCENTAGE OF OBSERVATIONS WITH LESS THAN 0.1 mg/ℓ NITROGEN IN SURFACE WATERS (n=35-40)

no means exhaustive. Much additional data from site-specific studies could not be utilized because of the limited time available for development of the interim guidelines. As this site-specific information becomes available, there may be justification to either relax these guidelines or make them more restrictive on a case-by-case basis. Assessment of additional data through the programmatic EIS process may also result in changes in the intensity of culture permissible in any given area. Given that the interim guidelines are based on a limited data set, a deliberately conservative approach has been used in their formulation.

The maximum recommended intensity of culture in any given area has been based on the frequency of oxygen depletion and nitrogen limitation in that area. Budd Inlet, Holmes Harbor and Hood Canal south of Hazel Point appear to have chronic oxygen depletion at depth and persistent nitrogen limitation in surface waters. In view of the existing poor water quality in these areas, any application for culture should be given careful scrutiny as to the potential environmental consequences. Culture is not recommended in these areas unless the applicant can demonstrate: 1) respiration and BOD will not significantly reduce dissolved oxygen concentrations; and 2) input of additional nutrients will not affect the frequency, extent, intensity or duration of phytoplankton blooms. The exclusion of much of Hood Canal is generally consistent with Washington Department of Ecology policy pertaining to municipal wastewater discharges to this water body. Since 1972 Ecology has required secondary treatment of all wastewater discharges to Hood Canal, and currently requires tertiary treatment (Bollen, unpub.; M. Palko, WDOE, pers. comm.). Although Ecology policy applies to all of Hood Canal, persistent oxygen and nitrogen depletion in the area north of Hazel Point were not evident in the data set reviewed for the interim guidelines. This area, therefore, has not been excluded from net-pen culture under these guidelines.

Areas where oxygen depletion or nitrogen limitation were observed infrequently include the the southern Sound in the area of Anderson Island, Tacoma Narrows and Nisqually Reach, the Main Basin of Puget Sound, the Strait of Juan de Fuca, San Juan Islands and the Strait of Georgia. In these areas, phytoplankton productivity is generally governed by factors other than nitrogen availability; thus the input of additional nitrogen from net-pen culture should not

stimulate additional phytoplankton growth. In addition, dissolved oxygen concentrations are rarely, if ever, reduced to biologically limiting levels. Inputs of nutrients and BOD associated with net-pen operation probably would not have measurable biological consequences, although site-specific conditions should be assessed on a case-by-case basis. These areas are also likely to be well-flushed with little opportunity for a nutrient enriched or oxygen depleted water mass to maintain its integrity for an appreciable length of time. Therefore, the interim guidelines place no water quality-based restrictions on the number of net-pen culture operations in these areas. However, in order to avoid excessive culture in a very localized area, it is recommended that the density of culture not exceed 1 million pounds annual production per square nautical mile. More stringent productin limits may be imposed in some instances to protect water quality in specific embayments.

In the remainder of Puget Sound (most of the southern Sound, Port Orchard area, Whidbey Basin, northern Hood Canal, Sequim and Discovery Bays) recommended limits are placed on the maximum production of fish in any given region. The 1 million pounds annual production per square nautical mile applies in these areas as well. The approach taken in development of these guidelines allows net-pens to increase by a very small percentage the natural flux of nitrogen into the embayment that occurs with each tidal cycle. The natural tidal flux of nitrogen into the embayment is determined and net-pens are allowed to increase this flux by 1%. The weight of cultured fish that would produce this 1% increase is the maximum recommended production for the embayment. Each area of Puget Sound will have some capacity to assimilate additionial nitrogen input. This assimilative capacity will, however, vary in each area, and in no case is there a means to predict, a priori, what this assimilative capacity may be. Lacking these data, the 1% increase has been specified throughout Puget Sound as an increase of small enough magnitude that it should be adequately protective.

The sub-divisions in the water quality guidelines are shown in Figure 4 and in general are based on those of McLellan (1954). In most cases the boundaries used by McLellan have been adapted without modifications since there is clear geomorphologic and hydrographic justification (e.g., Eld Inlet, Dyes Inlet and Sequim Bay). A number of McLellan's subdivisions have been grouped if there

was no apparent hydrographic reason for maintaining their distinction (e.g., three of McLellan's subdivisions grouped to form the Port Orchard sub-division of the interim guidelines).

Determination of the natural tidal nitrogen flux in a given area begins with calculation of the "half-life" of water in the area:

$$0.50 = e^{(-\frac{\Delta v}{v} \cdot T \cdot R)}$$

where 0.50 represents removal of half the initial water volume, Δv is the intertidal volume, v is the total volume of the embayment, T is the number of tidal cycles and R is the refluxing coefficient (a value of 0.5 was used). The equation is solved for T and then this solution is substituted in:

$$E = \frac{0.5v}{T}$$

where E represents the effective intertidal volume. Multiplying E by the nitrogen concentration of the water (measured at the surface in these calculations) yields the natural tidal nitrogen flux. A 1% increase in this flux from net-pen culture is then calculated. A more detailed discussion of the approach can not be presented here, but further explanation of some elements can be found in URS (1986). The calculations for each embayment are presented in Table 5, and further details on the approach are presented in the notes which follow Table 5.

Table 5

CALCULATIONS FOR WATER QUALITY GUIDELINES[1]

Area	Description	Total Volume (10^{12} ℓ)	Δv/v	T	Effective Intertidal Volume (10^{11} ℓ)	Nitrogen Concentration (mg/ℓ)	Tidal Nitrogen Flux (10^{6} g)	Fish Production (10^{3} lbs/yr)
1	Eld Inlet	0.130	0.455	3.05	0.213	0.049	1.04	190
2	Totten and Skookum Inlets	0.168	0.536	2.59	0.324	0.032	1.04	190
3	Hammersley Inlet and Oakland Bay	0.0519	0.840	1.65	0.157	0.083	1.30	240
4	Henderson Inlet	0.0426	0.558	2.48	0.0859	0.049	0.421	80
5	Squaxin, Peale and Pickering Passage	0.481	0.309	4.49	0.236	0.070	3.75	680
6	Dana Passage and Case Inlet	2.22	0.143	9.69	1.15	0.047	5.41	980
7	Carr Inlet	4.44	0.085	16.4	1.35	0.046	6.21	1100
8	Sinclair Inlet	0.375	0.124	11.2	0.167	0.063	1.05	190
9	Dyes Inlet	0.204	0.313	4.43	0.230	0.11	2.53	460
10	Port Orchard	0.431	0.194	7.14	0.302	0.048	1.45	260
11	Liberty Bay	0.0387	0.577	2.40	0.0806	0.079	0.637	120
12	Possession Sound	12.6	0.039	35.6	1.77	0.10	17.7	3200
13	Port Susan	4.36	0.068	20.4	1.07	0.059	6.31	1100
14	Saratoga Passage	8.75	0.049	28.1	1.56	0.072	11.2	2000
15	Penn Cove and Crescent Harbor	0.829	0.207	6.70	0.619	0.065	4.02	730
16	Skagit Bay	0.881	0.407	3.40	1.30	0.25	32.5	5900
17	Northern Hood Canal	5.04	0.064	21.6	1.17	0.089	10.4	1900
18	Discovery Bay	0.465	0.067	20.7	0.112	0.267[2]	2.99	540
19	Sequim Bay	0.0845	0.128	9.98	0.0423	0.066	0.279	50

[1] See explanatory notes for Table 5 on following page.

[2] Ecology does not maintain a water quality monitoring station in Discovery Bay as they do in all other areas listed. Therefore the nitrogen concentration is based on the June 1986 survey of the bay by Rensel (unpub. data).

Explanatory notes for Table 5

- Tidal flushing is treated as an exponential decay process. "New" water is introduced into the embayment on the flood tide. The ebb tide removes some portion of the "new" water as well as some portion of the "old" water. Over successive tidal cycles the intertidal volume consists of a greater and greater proportion of "new" water and a lesser and lesser proportion of "old" water. The effective tidal volume has been calculated by determining the number of tidal cycles required to remove 50 percent of the "old" water, and then determining the average volume of "old" water removed per tide.

- The calculations allow for refluxing; some portion of the water entering on the flood tide is the same water which left on the previous ebb tide. The refluxing coefficient will vary with each embayment, but a generalized estimate has been established at 0.5 for all interim guideline calculations.

- Intertidal and total volumes have been determined from the data of McLellan (1954). This source also provides the precise geographic boundaries that define the sub-divisions.

- Nitrogen concentrations are based on mean surface concentrations at each Ecology water quality monitoring station during the summer months (June through September) over the past five years (1981 through 1985).

- The quantity of nitrogen released into the environment by net-pen culture has been based on data from Ackefors and Södergren (1985), Penczak et al. (1982) and Warrer-Hansen (1982). These authors reported values ranging from 83 to 100 g N/kg fish produced/yr. This rate of nitrogen production has been expressed as 0.055 g N/ lb. fish produced/tidal cycle in the interim guideline calculations.

5.0 MISCELLANEOUS GUIDELINES

1. Feed should be provided to the fish in a pelletized form. Unpelletized wet feed (i.e., minced fish or shellfish) should not be used in net-pen culture. The amount of uningested feed is several times greater for unpelletized wet feed than for either pelletized dry or moist feed (Ackefors and Södergren, 1985).

2. If predator control measures are necessary, non-lethal methods should be used against both bird and mammalian predators. The use of predator control measures is contingent upon receipt of appropriate National Marine Fisheries Service and U.S. Fish and Wildlife Service permits and must be conducted in accordance with permit restrictions and pertinent state requirements.

3. The use of tributyltin (TBT) as an antifouling agent should not be used on either the net-pens or the surrounding predator control nets. Studies have shown TBT to be exceptionally toxic to shellfish larvae (Hall and Pinkney, 1985). The National Marine Fisheries Service has also shown that fish held in TBT-treated nets tend to accumulate residues of the chemical in their tissues (Short and Thrower, 1986). Although no public health risk has been demonstrated for TBT residues in food fish, the cessation of its usage would appear prudent. It should be noted that there is currently no known use of TBT in Puget Sound net-pen culture. The use of other antifouling agents is not precluded under the guidelines, but proposed antifoulants should be evaluated by state agencies on a case-by-case basis. Antifoulant use should be reported to the Washington Department of Ecology.

4. Only antibiotics licensed by the Food and Drug Administration (FDA) for use in food fish shall be used. At the present time, FDA-approved antibiotics are limited to oxytetracycline (Terramycin), sulfamerizine and Romet 30. These substances should be used as sparingly as possible as required for disease treatment, or only on a short-term basis for disease prevention. Antibiotics should not be used prophylactically on a long-term basis. The WDF chief pathologist should be notified of antibiotic usage at time of treatment and should be provided information on the disease or condition being treated and the antibiotic used.

5. Transfer of live fish or their reproductive products within the state or their introduction into state waters shall be in accordance with applicable federal standards (Title 50) and state laws, rules, and policies (e.g., RCW 75.08.080, 75.08.285, 75.08.295; WAC 220-20-039, 220-20-040, 220-69-300, 220-76-015; WDF Policy 82-1). Depending on the point of origin and the species being transferred or introduced, the culturist may be required to obtain a transfer or importation permit, provide a Fish Health Inspection Report, provide a health history of the stock and hatchery, surface disinfect eggs, or hold fish in a quarantine facility. The state importation and transfer requirements may be modified in the near future by rules currently being adopted under the Aquaculture Disease Control Law (RCW 75.58).

6. Applications for culture must be accompanied by an operations plan which is to be submitted to and approved by DNR. This plan should include projections for:

- Improvements at site (e.g., pens, log booms) and their relationship to natural features (e.g. bathymetry, shorelines);
- Pen number, size and configuration;
- Schedule of development and maintenance;
- Fish species cultured;
- Size at harvest;
- Annual production;
- Pounds of fish on hand throughout the year;
- Average and maximum stocking density;
- Source of eggs and smolts;
- Feed type used;
- Method of feeding;
- Use of chemicals (e.g., antibiotics);
- Predator control measures;
- Antifoulant use.

6.0 ENVIRONMENTAL SURVEYS

Before a site can be developed for net-pen culture, an applicant must acquire numerous local, state, and federal permits. The permits, licenses, or approvals generally required include a Substantial Development Permit (local), SEPA (local), Aquaculture License and Permit (WDF), Seed Stock Importation Permit (WDF), Hydraulics Project Approval (WDF), Marine Lands Lease (DNR), Coastal Zone Certification (WDOE), Shoreline Conditional Use or Variance (WDOE), and Section 10/404 Permit (COE).

Many of these permits address water or land use conflicts which range far beyond the biological effects considered by these guidelines. However, the effect of development on the marine environment is a major consideration, therefore certain site-specific information is required for permit review. In order to assess the suitability of a site for net-pen culture and to evaluate the extent of environmental effects after initiation of culture, several environmental surveys should be performed at net-pen operations. These surveys include a site characterization survey, a baseline survey, and annual monitoring. The components of each of these surveys are summarized in Table 6 and discussed in detail in Sections 6.1 through 6.3.

6.1 SITE CHARACTERIZATION SURVEY

A site characterization survey should be performed prior to permit application. This survey would serve two principal functions. The primary purpose would be to provide state and local governments with the information necessary to evaluate the potential extent of environmental effects. Although not its primary intent, the site characterization survey will also provide the applicant with information critical to determining the suitability of the site for culture. A site characterization survey is composed of four principal elements: (1) initial consultation with state and local government; (2) a bathymetric survey; (3) a hydrographic survey; and (4) a diver survey.

CONSULATION WITH STATE AND LOCAL GOVERNMENT

After selecting a potential culture site, but prior to performing the site characterization field survey, the prospective applicant should contact state

Table 6

RECOMMENDED ENVIRONMENTAL SURVEYS FOR
PUGET SOUND NET-PEN CULTURE

	Site Characterization Survey	Baseline Survey	Annual Monitoring
Class I Facilities	• Recommended consultation with state and local authorities • Bathymetric survey • Hydrographic survey - Current velocity and direction • Diver survey	• None	• None
Class II Facilities	• Recommended consultation with state and local authorities • Bathymetric survey • Hydrographic survey - Current velocity and direction • Diver survey	• None	• Benthic survey - Diver survey
Class III Facilities	• Recommended consultation with state and local authorities • Bathymetric survey • Hydrographic survey - Current velocity and direction - Drogue tracking - Vertical hydrographic profiling • Diver survey	• Sediment chemistry sampling • Benthic infauna sampling	• Benthic survey[1] - Diver survey - Sediment chemistry - Benthic infauna • Water quality sampling • Current velocity and direction

[1] Replaced by baseline survey during first year of facility operation

resource management agencies (Departments of Ecology, Fisheries, Natural Resources, Game and Parks and Recreation), federal and local officials (the shoreline administrator). Initial contact should be made with the Department of Agriculture, and this agency will then facilitate consultations with all other appropriate state agencies. These consultations cannot be required of the applicant, but are highly recommended to provide state and local officials with an opportunity to comment on the potential site at an early stage in the planning process. Resource management agencies may be able to identify nearby habitats of special significance (Section 3.0) or existing conditions (e.g., water quality problems) that would make the site unacceptable for development. County officials may be able to identify major use conflicts that would significantly reduce the probability of permit approval. Other government agencies or tribes may also need to be contacted if the potential site is likely to affect land or resources under their jurisdiction.

One of the principal purposes of these consultations is to determine the proximity of the potential site to habitats of special significance. WDF staff may be aware of nearby critical spawning areas or major shellfish beds. WDG staff should be able to identify haulout areas for seals and sea lions, seabird nesting sites and colonies, and critical feeding areas and migration routes for both seabirds and marine mammals. WDG maintains a Wildlife Data System which can be accessed to obtain informaiton on endangered, threatened, sensitive, or monitor species.

State and local government officials should be given an opportunity to comment on the proposed field surveys (i.e., bathymetric, hydrographic and diver surveys). The survey content should be determined in consultation with those agencies having permit authority. The survey protocol described below is intended to provide the information necessary for permit review by a standardized and cost-effective method. This protocol should be adequate in most instances, but there may be certain site-specific concerns that would require minor modification of the generic protocol. For example, the diver survey may be modified to devote particular attention to areas of special concern. Departure from this protocol should be allowed only with strong justification, and modifications should generally result in the collection of more, rather than less, data.

BATHYMETRIC SURVEY

A bathymetric survey should be performed in order to apply the guidelines pertaining to depth and current (Section 2.0) and to identify the presence of any bathymetric features which might affect bottom accumulation of excess feed and fecal material (e.g., depressions). The area of concern is the seabed directly under the net-pens and within 300 feet of the net-pen perimeter. Multiple fathometer transects should be established with a density and spacing so as to adequately characterize the bathymetry under and around the pens. The position of the transects will depend upon the intended pen configuration. Figure 8 provides a recommended survey design given a rectangular net-pen configuration. The bathymetric survey report should note the period during the tidal cycle when the survey was made, and it should relate the measured depths to MLLW (mean lower low water).

HYDROGRAPHIC SURVEY

Information on current velocities and directions is necessary to apply the depth and current guidelines (Section 2.0) and to predict the dilution and dispersion of excess feed and wastes. The hydrographic survey should include: (1) current velocity and direction; (2) drogue tracking; and (3) vertical profiles of temperature, salinity and dissolved oxygen. Class I and II facilities, as defined in Section 2.0, should not be required to perform the drogue tracking and vertical hydrographic profiling studies because of their small size and reduced potential for water quality degradation.

Current velocity and direction - Current velocity and direction should be monitored at the center of the potential net-pen site. Both near-surface and mid-depth measurements should be made. The near surface measurements should be taken at a depth of 6 feet (corresponding to one-half the depth of typical net-pens). The mid-depth measurements should be taken mid-way between the maximum depth of the proposed net-pens and the sea floor. At both depths current velocity and direction should be monitored throughout one complete tidal cycle (one flood tide, one ebb tide). A minimum of ten measurements evenly spaced throughout the tidal cycle should be made at each depth. For purposes of applying the depth and current guidelines, "mean current" is determined by an arithmetic average of these ten or more measurements. The measurements

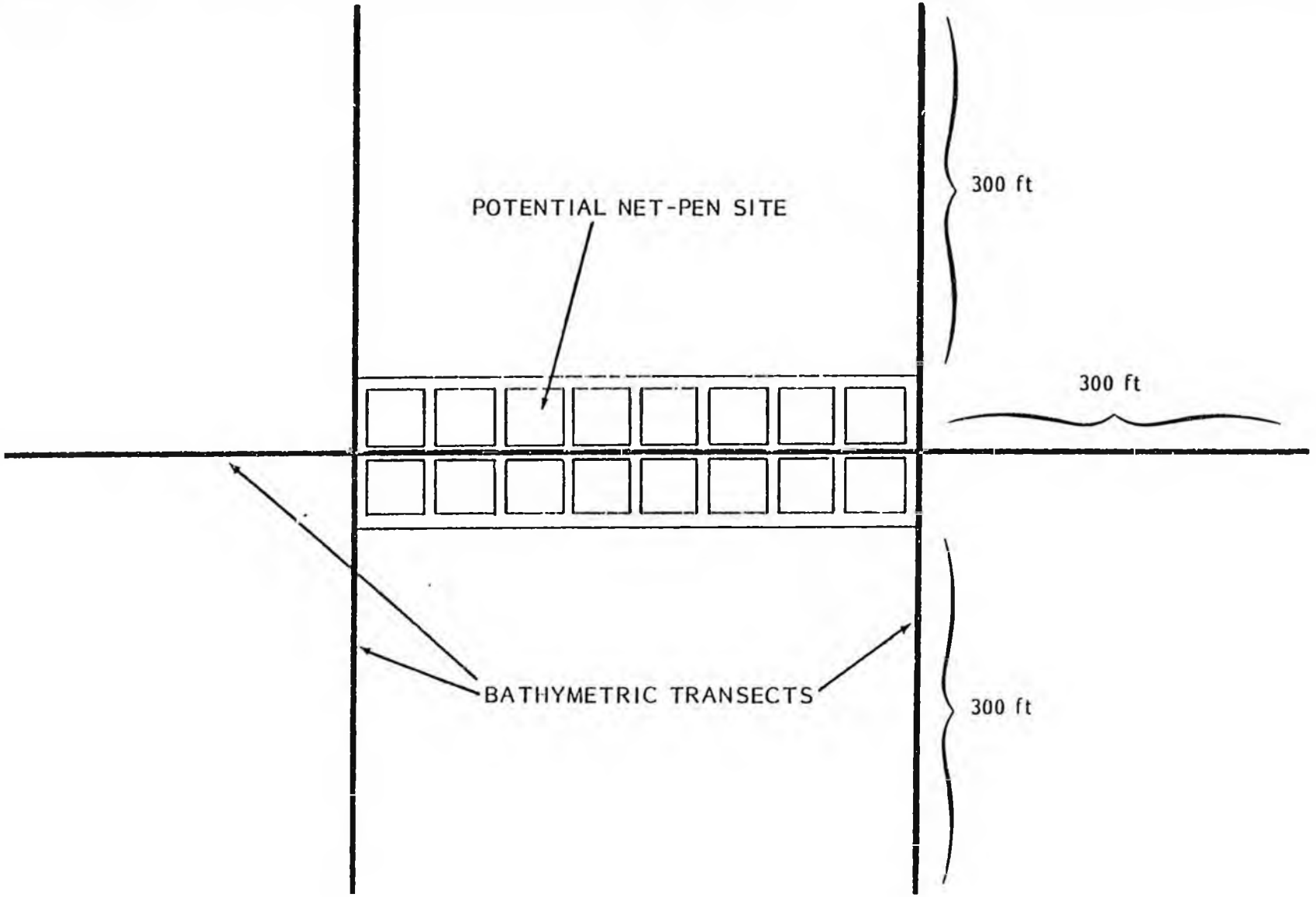

Figure 8. RECOMMENDED BATHYMETRIC SURVEY TRANSECTS FOR SITE CHARACTERIZATION

should be made during a period of "average" tides, and should not be representative of either extreme neap or extreme spring tides. The report of results should note any conditions (e.g., weather, extreme tidal range) that might make the data unrepresentative of "typical" conditions. If the prospective applicant believes the data do not reflect "typical" tidal currents and direction, resampling may be done, but all data collected should be used in determining a mean velocity.

Drogue tracking - Drogue tracking should be performed to estimate the potential fate of particulate material, and the potential for eddy circulation (i.e., the same parcel of water is repeatedly cycled through the area of the net-pen). Two drogues should be released from the center of the potential net-pen site. One should be set at a depth of 6 feet. The second drogue should be set at a depth mid-way between the bottom of the potential net-pens and the sea floor. The trajectory of these drogues should be followed for as long as daylight permits, and not less than 8 hours. The drogues may be reset at the original release site during this 8-hour period if they are transported beyond a practical tracking range.

Salinity, temperature, and dissolved oxygen profiles - Vertical profiles of salinity, temperature, and dissolved oxygen may be used to evaluate the intensity of water column stratification, a factor important both from the standpoints of environmental protection and the health of the cultured fish. Prospective applicants should provide any existing information on the site from such sources as the Ecology water quality monitoring network, Collias, et al. (1974), Friebertshauser, et al. (1971) and other site-specific studies. The prospective applicant should also take measurements of temperature, salinity and dissolved oxygen throughout the water column at the center of the potential site during the hydrographic survey. Measurements should be made at depths of 1, 10, 20, 30 feet, and at 30 foot intervals thereafter. The deepest measurement should be made 3 feet above the sea floor.

DIVER SURVEY

The diver survey is primarily intended to determine if habitats of special significance (Section 3.0) are present in the vicinity. Since many of the habitats of special significance would be readily visible only in the spring

and summer months (e.g. geoduck beds), the diver survey should be performed during April through September. The requirements for a diver survey during site characterization depend on the water depths in the vicinity of the site. No diver survey should be required if the area within 300 feet of the potential site is greater than 75 feet deep. A diver survey is required if water depth (MLLW) at the site or within a 300 foot radius of the potential location is less than or equal to 75 feet. If any portion of the area within 300 feet of the potential net-pens is in depths of 75 feet or less, it is potentially subject to accumulation of feed and fecal material, and therefore should be surveyed by a diver, even if the net-pens will be located over a site that is deeper than 75 feet. The design of the diver survey should be formulated in consultation with state and local government officials. WDF will take the lead role for the state in design of this survey. The number and spacing of the transects will depend on the particular site and should be established during these consultations. As a general guide, if all or most of the area is 75 feet or shallower, then 3 to 5 transects, each 200 feet long, should be surveyed per acre of pen. A larger pen complex would require additional transects; fewer transects would be required if most of the area is in depths greater than 75 feet. A diver should traverse the area making observations on substrate type, presence/absence of Beggiatoa mats and the density of geoducks and hardshell clams, eelgrass, kelp, demersal fish, crabs, and other large invertebrates. If eelgrass is present, counts of turion density in 0.25 m^2 quadrats are required to determine compliance with guidelines pertaining to habitats of special significance. Geoduck and hardshell clam density should be estimated by counts along transects. The abundance of other invertebrates and fishes should be noted by descriptors such as "rare," "common," etc.

REPORT PREPARATION

The results of the bathymetric, hydrographic and diver surveys should be assembled in a site characterization report to be submitted to Departments of Ecology, Fisheries, Game, Natural Resources and the county shoreline administrator. The site characterization report should include a figure of the proposed net-pen site in plan view at a scale of 200 feet or less to the inch. The figure should show nearby landmarks, the size and configuration of the proposed net-pens, bathymetric contours and the position of the diver transects. The report should also include identification of habitats of special

significance in the vicinity as determined in consultation with state agencies and the applicant's own surveys. The report should be a summary, analysis and interpretation of the data. The report should include, for example, a sectional view of the bathymetric profiles. A figure of the drogue trajectories should be also be included. The benthic survey should be described in narrative form with quantitative data provided when required or available.

6.2 BASELINE SURVEY

The baseline survey is intended to characterize bottom conditions at the net-pen site, before they could potentially be altered by culture activities. Sediment chemistry and benthic infaunal sampling were not included in the site characterization survey because of an anticipated uncertainty in the precise net-pen location and the difficulty of relocating samples without the aid of a moored net-pen as a position reference. Therefore, a baseline benthic survey should be required after emplacement of the net-pens, but before stocking the pens with fish. This survey should include sediment chemistry and benthic infauna sampling and may also include a diver survey if required by state resource management agencies or the county shoreline administrator. The baseline survey should be required for Class III operations, as defined in Section 2.0, but should not be required of Class I and II operations.

Stations should be established along a transect on the "downcurrent" side of the pens as determined by the prevailing currents (as measured at the mid-depth station in the site characterization survey). Stations should be established along this transect beginning directly under the perimeter of the net-pens and extending away from the net-pens at distances of 20, 50, 100, and 200 feet in the direction of prevailing currents. Each site should be sampled by three replicate diver cores or three replicate grab or box corer samples from which sub-cores are removed. Cores should be collected for analysis of total organic carbon, total Kjeldahl nitrogen and grain size distribution (median phi, percent gravel, sand, silt/clay). Cores should be inserted to a depth of two inches in the sediment. Care should be taken to insure that the core is representative of the undisturbed sediment column. Transparent cores should be used so that the redox potential discontinuity (RPD) depth can be noted and recorded. The position of the RPD is reflected by change in sedi-

ment color form brown to black. Each core should be homogenized for analysis, but the replicates should be treated as distinct samples and not pooled prior to analysis.

Benthic infauna samples may be collected either by a diver using a core sampler having an area of at least 0.01 m^2 or by a grab or box corer having an area of at least 0.1 m^2. The same stations sampled for sediment chemistry (0, 20, 50, 100 and 200 feet from the net-pens) should be sampled for benthic infauna. Three replicate samples should be collected at each site. The same grab/box corer samples used for sediment chemistry should be used for benthic infaunal analysis provided no more than one-quarter of the surface of each sample has been removed for sediment chemistry sampling. Each benthic infauna sample should be sieved on a 0.5 mm screen or nested 1.0 and 0.5 mm screens. All macrofaunal organisms retained on the screen(s) should be identified to the lowest practical taxonomic level, generally species.

The results of the baseline benthic survey should be assembled in a report consistent with the report guidelines provided for the site characterization survey (Section 6.1) and the annual monitoring (Section 6.3). The baseline report should be submitted to DNR, and this agency will take responsibility for distribution to other appropriate state and local authorities.

6.3 ANNUAL MONITORING

The annual monitoring program is designed to serve two purposes. First, it is intended to monitor potential changes in water and sediment quality resulting from culture acitivities. Secondly, it is intended as a data gathering effort in support of the programmatic EIS. As additional data are obtained on the environmental effects of salmon net-pen culture, the annual monitoring protocol may be substantially revised. It is also possible that monitoring at some culture sites may be curtailed or eliminated entirely if little or no measurable effect on environmental quality is found after several years of operation. The determination to curtail or eliminate monitoring at any site will be made after agency review of survey results. However, no schedule for "phasing out" of the monitoring program at any site has been provided at this time since the interim guidelines are intended only for short-term application.

The annual monitoring progam consists of three principal elements: (1) a benthic survey; (2) water quality sampling; and (3) a hydrographic survey. Class I facilities should be exempted from annual monitoring. Class II facilities should be required to conduct only a diver survey.

BENTHIC SURVEY

The benthic survey is intended to assess the extent of solids accumulation on the bottom in the vicinity of the culture operation and the biological effect of this accumulation. The survey consists of diver observations and sampling of sediment chemistry and benthic infauna. During the first year of facility operation, the benthic sampling conducted during the baseline survey should suffice in place of the annual monitoring benthic survey. Thereafter, the benthic survey as described below should be conducted annually.

Diver observations should be made if the net-pen or any portion of the bottom within 300 feet of the site is at a water depth of 75 feet or less. Four transects, each at least 200 feet in length, should be established as illustrated in Figure 9. The transects should be extended if feed or feces accumulation is visible 200 feet from the pens. Additional transects may be required to survey habitats or resources of special concern. Some transects may be shortened or eliminated entirely if they would require the diver to operate in depths greater than 75 feet. If any portion of the area within 300 feet of the net-pens is in depths of 75 feet or less, it should be surveyed even if the net-pens are located in depths greater than 75 feet.

One of the principal objectives of the diver survey is to document the depth and lateral extent of solids accumulation. The diver should estimate the depth of feed and feces accumulation at 20-foot intervals along each transect, and should note the greatest distance from the net-pens that visible accumulation is present. The diver should also note the presence/absence of Beggiatoa mats and estimate densities of demersal fish, crabs and other invertebrates. The annual monitoring benthic survey for Class III operations should also include collection of sediment chemistry and benthic infauna samples. The station location and sampling protocol should be exactly as described in the baseline benthic survey (Section 6.2).

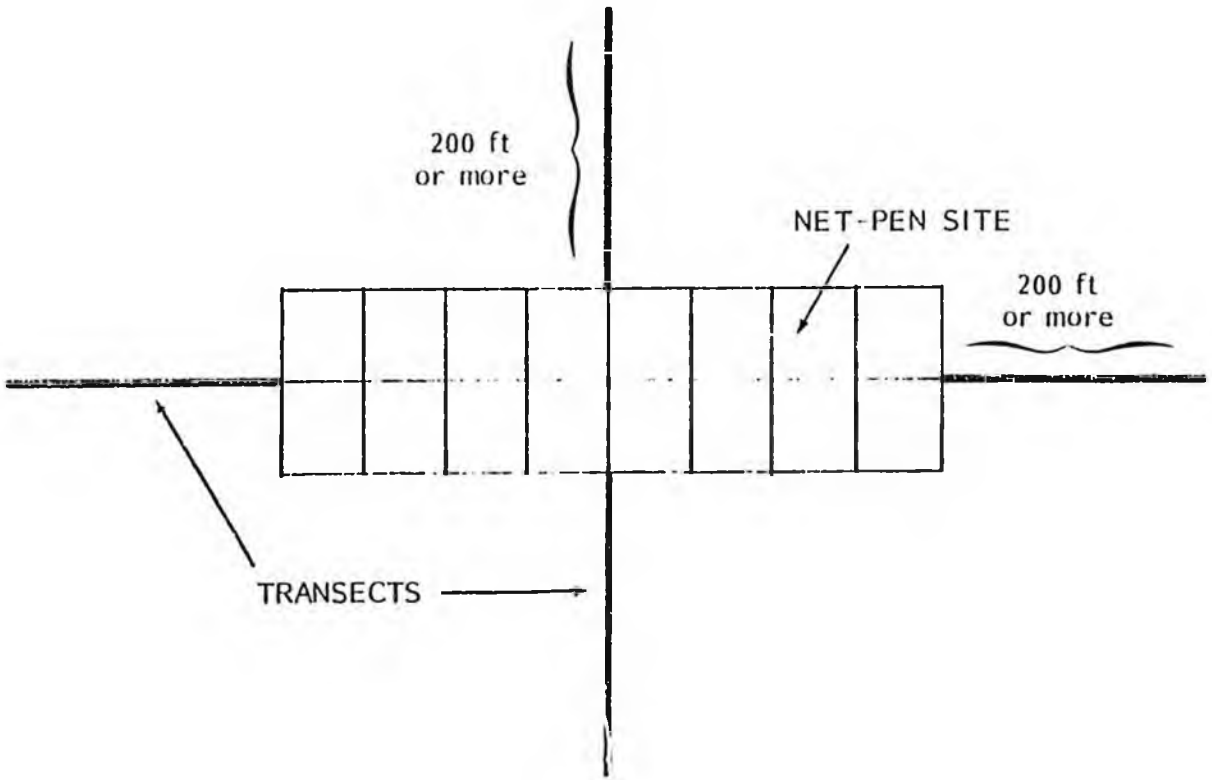

Figure 9. RECOMMENDED DIVER TRANSECTS DURING THE ANNUAL MONITORING SURVEY

WATER QUALITY SURVEY

Water quality sampling is intended to document the effect of culture activity on dissolved oxygen and nutrients in the water passing through the culture structure. The survey should be conducted in July, August or September of each year that the facility is in operation. Sampling in July through September is recommended since it is during this period that dissolved oxygen reductions or nutrient enrichment are of greatest concern. Three stations should be sampled: 100 feet upcurrent of the net-pens; 20 feet downcurrent; and 100 feet downcurrent. The precise location of the stations will depend on net-pen configuration, but they should be located so as to monitor the water passing through the greatest possible number of net-pens. Sampling should be conducted within one hour of slack tide. Three replicates should be taken at each station at a depth mid-way between the water surface and the bottom of the net-pens. Samples should be analyzed for the following parameters: dissolved oxygen; temperature; salinity; pH; ammonia; and nitrite/nitrate (either separate or combined). The concentration of unionized ammonia should also be calculated.

HYDROGRAPHIC SURVEY

Current velocity and direction should be measured at the depth at which the water quality samples are taken. A single measurement should be made 20 feet downcurrent of the net-pens concurrently with collection of the water quality sample from this station. Loading estimates (g/kg fish/day) should be calculated for ammonia and nitrite/nitrate based on: (1) the net increase in concentration between the upcurrent station and the 20 foot downcurrent station; (2) the current velocity 20 feet downcurrent; (3) the cross-sectional area of the net-pen complex; and (4) the weight of fish on hand at the time of the water quality survey.

REPORT PREPARATION

The comments made regarding the site characterization report apply here as well. Specifically, analysis and interpretation of the data should be provided, not merely presentation of the raw data. However, the raw data should be provided in appendices so as to permit independent assessment of conclusions.

In addition to a description of methods and data analysis and interpretation, the annual monitoring report should also include information on operational practices over the past year. This information should include:

- General description of facility (species cultured, size at which fish will be marketed, etc.).
- Size, number and configuration of net-pens at time of sampling.
- Significant changes in size, number and configuration of net-pens over the previous year.
- Annual production (pounds).
- Estimated weight of fish on hand during survey (pounds).
- Stocking density (average and range) (pounds/ft^3).
- Type of feed used and feeding method employed.
- Types of antibiotics used and frequency of usage over the past year.
- Interactions with birds and marine mammals and a summary of types and frequency of predator control measures used.
- Types of antifoulants employed and frequency of net treatment.

The annual monitoring report should be submitted to DNR and this agency will take responsibility for distribution to other appropriate state and local authorities.

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THE RESOURCES AGENCY OF CALIFORNIA
Department of Fish and Game
1416 Ninth Street
Sacramento, California 95814

MARINE RESOURCES - INFORMATION LEAFLET[1/]
REGULATIONS GOVERNING MARINE AQUACULTURE

Registration Requirements

All facilities used for the controlled growing and harvesting of aquatic plants and animals in the State, whether on public or private lands, must be registered annually. All forms of marine fish and shellfish that are approved by the Fish and Game Commission may be cultivated. Registration forms are issued by the Department of Fish and Game under provisions of the Fish and Game Code and regulations of the Fish and Game Commission. Pertinent regulations are cited in this leaflet.

The annual aquaculture registration fee for the period January 1 - December 31, or portion thereof, is [redacted].

How to Register Aquaculture Facilities

A person desiring to propagate and rear marine life should make application on Form FG 750 attached to the back of this leaflet. Additional copies may be obtained from the Department. Common and scientific names are to be used when listing species to be cultivated. Examples are listed on page 2.

Applications, together with the required fee, should be transmitted to the Marine Regional office nearest you. The mailing addresses of the five offices are listed below:

California Department of Fish and Game
Marine Resources Region
245 W. Broadway
Long Beach, CA 90802

California Department of Fish and Game
Marine Resources Region
2201 Garden Road
Monterey, CA 93940

California Department of Fish and Game
Marine Resources Region
411 Burgess Drive
Menlo Park, CA 94025

California Department of Fish and Game
Marine Resources Region
619 2nd Street
Eureka, CA 95501

California Department of Fish and Game
Marine Resources Region
State Building, Room 6042
1350 Front Street
San Diego, CA 92101

1/ Prepared by Emil J. Smith, Jr., July 1974; revised June 1979, January 1982, October 1983, August 1985.

An application for renewal, together with the required fee, should be transmitted to the Department of Fish and Game, Licenses and Revenue Branch, 3211 S Street, Sacramento, CA 95816, prior to the expiration of your current license. Possession of a valid aquaculture registration is a condition of all aquaculture leases.

Examples of Common and Scientific Names for Plants and Animals that Could be Propagated by Registered Marine Aquaculturists are:

Nori	Porphyra tenerima
Agar	Gelidium sp.
Prawn, Giant Freshwater	Macrobrachium rosenbergii
Prawn, Spot	Pandalus platyceros
Prawn, Japanese	Penaeus japonicas
Lobster, Eastern	Homarus americanus
Lobster, Spiny	Panulirus interruptus
Crab, Dungeness	Cancer magister
Mussel, Bay	Mytilus edulis
Mussel, California Sea	Mytilus californianus
Scallop, Japanese Bay	Patinopectin yessoensis
Scallop, Speckled	Argopectin aequisulcatus
Scallop, Rock	Hinnites giganticus
Oyster, Native	Ostrea lurida
Oyster, European Flat	Ostrea edulis
Oyster, Portuguese	Crassostrea angulata
Oyster, Australian Rock	Crassostrea commercialis
Oyster, Giant Pacific	Crassostrea gigas
Oyster, Eastern	Crassostrea virginica
Clam, Pismo	Tivela stultorun
Chione, Mexican	Chione cortezi
Clam, Common Littleneck	Venerupis staminea
Clam, Japanese Littleneck	Venerupis japonica
Clam, Japanese Red	Anadara broughtoni
Clam, Northern Quahog	Mercenaria mercenaria
Clam, Softshell	Mya arenaria
Abalone, Pink	Haliotis corrugata
Abalone, Japanese	Haliotis discus hannai
Abalone, Green	Haliotis fulgens
Abalone, Giant	Haliotis gigantea
Abalone, Red	Haliotis rufescens
Abalone, White	Haliotis sorenseni
Sablefish	Anoplopoma fimbria
Yellowtail	Seriola lalandei
Pompano	Trichinotus carolinus
White Seabass	Atractoscion nobilis
Orangemouth Corvina	Cynoscion xanthulus
Mullet	Mugil cephalus
Yellowfin Tuna	Thunnus albacares
Bluefin Tuna	Thunnus thynnus

GENERAL INFORMATION FOR APPLICANTS

Inspection of Marine Aquaculture Facilities

Before a marine aquaculture facility is first registered, an inspection will be made of the culture area. A person from your Regional Office will make an appointment with you. It is not always possible to make special trips immediately for such inspections. They are usually made on a scheduled trip into the area.

Sources of Fish and Shellfish

Marine fish or shellfish stock for cultivation or breeding purposes may be obtained from licensed commercial fishermen, the Department of Fish and Game, registered aquaculturists or by the registered aquaculturist under the provisions of Section 15301(b) of the Fish and Game Code, page 30 and Section 243, Title 14, California Administrative Code, page 54. For information regarding sources of breeding stock, please contact the Marine Resources Branch, 1416 9th Street, Sacramento, California 95814.

Lease of State-Owned Tidelands

The use of state-owned tidelands for aquaculture purposes is regulated by the Fish and Game Commission under authority delegated by the Fish and Game Code. A person desiring to lease state tidelands should make application to the Commission on Form "A" attached to the back of this leaflet. The lease form contains instructions for completion of the application. Additional copies may be obtained from the Department.

Private Lands

Persons operating on private tidelands are required to complete an aquaculture agreement with the state. Application form "A" in this leaflet may be used for that purpose.

Sale of Marine Fish and Shellfish

Marine fish and shellfish cultivated under the provisions of an aquaculture registration may be sold irrespective of seasons, bag limits, or angling license provisions. Some of the laws and regulations governing the sale of aquaculture products are cited in this leaflet.

Importation into California

Written permission is required to import live fish, shellfish, and aquatic plants into this State, Fish and Game Code Section 15600, page 36. For specific instructions regarding shellfish, please refer to Section 236.1 of the Fish and Game Commission regulations page 44. For additional laws or questions relating to marine aquaculture activities or the importation of fish or aquatic plants, please contact the Regional Marine Office nearest you.

Aquaculture Sanitary Requirements

Marine fish and shellfish cultivated under the provisions of an aquaculture registration may only be grown, processed, and marketed for human consumption under the laws established by Sections 28500-28519.5 of the State Health and Safety Code, pages 13 to 20. The provisions of the Health and Safety Code are enforced by the State Department of Health Services (SDHS).

All shellfish harvested commercially for human consumption in California must come from growing water which meets certain standards of cleanliness. These standards set maximum allowable levels for bacteria in the water, as well as for other contaminants such as pesticides, toxic organic compounds, and heavy metals. Within the Department of Health Services, the Sanitary Engineering Branch is responsible for approving shellfish growing-water quality.

During the evaluation of a shellfish growing area, prior to issuance or denial of a growing water certificate, considerable weight is placed on bacterial data reflecting "total" and "fecal" coliform levels. The watershed or source of water as a whole is also considered, and an attempt is also made to determine the hazards associated with all actual and potential sources of pollution which might impinge on the growing waters. This includes such things as sewage treatment plants, areas of urban runoff, industrial plants, agricultural operations, and the like.

Although the Sanitary Engineering Branch must study and decide on the acceptability of all commercial shellfishing areas, commercial operators are required to provide preliminary and on-going water-quality data to the Agency as deemed necessary to evaluate the area and to ensure year-round protection of the shellfish consumer. The amount of sampling required of the operator depends on the location and susceptibility of the harvesting sites to pollution problems.

The Department of Health Services', Food and Drug Branch is responsible for approving facilities, equipment, and procedures used for handling, shucking, storing, packaging and shipping of fish and shellfish after harvest. That Branch also enforces meat quality standards, and sets requirements for proper packaging and labeling of all fish and shellfish moved in commerce.

To facilitate consideration of your aquaculture proposal by SDHS, please include a description of your plans and map showing the locations of your proposed harvesting areas on your permit application forms. Also, include a description of the type and location of any facilities to be used for handling, packaging, or storing the aquaculture products within the State.

If you have any questions concerning the procedures followed by the State Department of Health Services in permitting commercial aquaculture operations, please contact:

For Growing Area Certification

Mr. Douglas W. Price
Department of Health Services
Sanitary Engineering Branch
50 D Street, Suite 205
Santa Rosa, California 95404
(707) 576-2145

For Processing and Marketing Information

Mr. A. L. Bloch
Department of Health Services
Food and Drug Branch
714 "P" Street
Sacramento, California 95814
(916) 445-2263

Selected Marine Aquaculture References

Anderson, Gregory J., Mark B. Miller and Kenneth K. Chew, 1982. A Guide to Manila Clam Aquaculture in Puget Sound. University of Washington Sea Grant Program, Publication WSG 82-4, 45 p. $3.50.

Bardach, John E. 1972. Aquaculture; the farming and husbandry of freshwater and and marine organisms by John E. Bardach and others. New York. Wiley-Interscience. 868 p., illus.

Barrett, Elinore M. 1963. The California oyster industry. The Resources Agency, California Department of Fish and Game. Fish Bulletin 123, 103 p.

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Hidu, Herbert and Mark S. Richmond. 1974. Commercial oyster aquaculture in Maine. Maine Sea Grant Bulletin 2. Darling Center Reference No. 74-12, Ira C. Darling Center, Walpole, Maine 04573, 60 pp. $2.00.

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_____. 1976. Farming the cupped oysters of the Genus Crassostrea. Developments in aquaculture and fisheries science, 2. Elsevier Scientific Publishing Co., Amsterdam-Oxford-New York. 224 p.

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AQUACULTURE PERIODICALS

AQUACULTURE
Associated Scientific Publishers
P.O. Box 211
1000 AE Amsterdam
The Netherlands

AQUACULTURE DIGEST
9434 Kearny Mesa Road
San Diego, California 92126

AQUACULTURE ENGINEERING
Elsevier Science Publishers
52 Vanderbilt Avenue
New York, New York 10017

AQUACULTURE MAGAZINE
P.O. Box 2329
Asheville, North Carolina 28802

CALIFORNIA AQUACULTURE
University of California
Cooperative Extension
Division of Agriculture Sciences
1422 Harbour Way South
Richmond, CA 94804-3688

FISH FARMER INTERNATIONAL REVIEW
Agriculture Press and Const., Ltd.
1 Throwley Way
Sutton, Surrey SM1 1QQ
England

FISH FARMING INTERNATIONAL
Highway Publication, Ltd.
London, England

JOURNAL OF THE WORLD MARICULTURE SOC.
World Mariculture Society
177 Pleasant Hall
Division of Continuing Education
Louisiana State University
Baton Rouge, Louisiana 70803

JOURNAL OF SHELLFISH RESEARCH
National Shellfisheries Association
P.O. Box 12559
Charleston, SC 29412

CALIFORNIA GOVERNMENT CODE SECTIONS REGULATING THE PROPAGATION AND HARVESTING OF MARINE LIFE AND THE PURIFICATION OF MOLLUSKS

The following section of the Code of Civil Procedure provides that:

1822.58 A warrant may be issued under the requirements of this title to authorize personnel of the Department of Fish and Game to conduct inspections of locations where fish amphibia, or aquatic plants are held or stored under Division 12 (commencing with Section 15000) of the Fish and Game Code.

The following section of the Food and Agriculture Code provides that:

23.5 The commercial production of fish propagated and raised by a registered aquaculturist pursuant to Section 15101 of the Fish and Game Code in the state is a growing industry and provides a healthful and nutritious food product, and, as a commercial operation, utilizes management, land, water, and feed as do other agricultural enterprises. Therefore, the commercial production of that fish and marine life shall be considered a branch of the agricultural industry of the state for the purpose of any law which provides for the benefit or protection of the agricultural industry of the state, except those laws relating to plant quarantine or pest control.

The following sections of the Labor Code provide that:

6302. As used in this division:

(a) "Director" means the Director of Industrial Relations.

(b) "Department" means the Department of Industrial Relations.

(c) "Insurer" includes the State Compensation Insurance Fund and any private company, corporation, mutual association, and reciprocal or interinsurance exchange, authorized under the laws of this state to insure employers against liability for compensation under this part and under Division 4 (commencing with Section 3201), and any employer to whom a certificate of consent to self-insure has been issued.

(d) "Division" means the Division of Occupational Safety and Health.

(e) "Standards board" means the Occupational Safety and Health Standards Board, within the Department.

(f) "Appeals board" means the Occupational Safety and Health Appeals Board, within the department.

(g) "Aquaculture" means a form of agriculture as defined in Section 17 of the Fish and Game Code.

The following sections of the Public Resources Code, provide that:

DIVISION 1

Chapter 4. AQUACULTURE DEVELOPMENT

825. This chapter shall be known and may be cited as the California Aquaculture Development Act.

826. The Legislature finds and declares that it is in the interest of the people of the state that the practice of aquaculture be encouraged in order to augment food supplies, expand employment, promote economic activity, increase native fish stocks, enhance commercial and recreational fishing, and protect and better use the land and water resources of the state.

827. The purpose of this chapter is to establish a policy and program toward improving the science and practice of aquaculture as a means of expanding aquaculture industry and related economic activity in the state.

828. As used in this chapter, "aquaculture" means the culture and husbandry of aquatic organisms, including, but not limited to, fish, shellfish, mollusks, crustaceans, kelp, and algae. Aquaculture shall not mean the culture and husbandry of commercially utilized inland crops, including, but not limited to rice, watercress, and bean sprouts.

829. As used in this chapter, "director" means the Director of the Department of Fish and Game.

830. As used in this chapter, "department" means the Department of Fish and Game.

833. The department shall be the lead agency for purposes of the California Environmental Quality Act (commencing with Section 21000 of the Public Resources Code) for any project involving the issuance of a permit required pursuant to Division 12 (commencing with Section 15000) of the Fish and Game Code.

DIVISION 20

Chapter 2. DEFINITIONS

30100.2 "Aquaculture" means a form of agriculture as defined in Section 17 of the Fish and Game Code. Aquaculture products are agricultural products, and aquaculture facilities and land uses shall be treated as agricultural facilities and land uses in all planning and permit-issuing decisions governed by this division.

Chapter 3. COASTAL RESOURCES PLANNING AND MANAGEMENT POLICIES

Article 3.

30222.5 Ocean front land that is suitable for coastal-dependent aquaculture

shall be protected for that use, and proposals for aquaculture facilities located on those sites shall be given priority, except over other coastal-dependent developments or uses.

Chapter 5. STATE AGENCIES

Article 2.

30411. (a) The Department of Fish and Game and the Fish and Game Commission are the principal state agencies responsible for the establishment and control of wildlife and fishery management programs and neither the commission nor any regional commission shall establish or impose any controls with respect thereto that duplicate or exceed regulatory controls established by these agencies pursuant to specific statutory requirements or authorization.

(b) The Department of Fish and Game, in consultation with the commission and the Department of Boating and Waterways, may study degraded wetlands and identify those which can most feasibly be restored in conjunction with development of a boating facility as provided in subdivision (a) of Section 30233. Any such study shall include consideration of all of the following:

(1) Whether the wetland is so severely degraded and its natural processes so substantially impaired that it is not capable of recovering and maintaining a high level of biological productivity without major restoration activities.

(2) Whether a substantial portion of the degraded wetland, but in no event less than 75 percent, can be restored and maintained as a highly productive wetland in conjunction with a boating facilities project.

(3) Whether restoration of the wetland's natural values, including its biological productivity and wildlife habitat features, can most feasibly be achieved and maintained in conjunction with a boating facility or whether there are other feasible ways to achieve such values.

(c) The Legislature finds and declares that saltwater or brackish water aquaculture is a coastal-dependent use which should be encouraged to augment food supplies and to further the policies set forth in Chapter 4 (commencing with Section 825) of Division 1. The Department of Fish and Game may identify coastal sites it deems appropriate for aquaculture facilities. I the department identifies these sites, it shall transmit information identifying these sites to the commission and the relevant local government agency. The commission, and where appropriate, local governments shall, consistent with the coastal planning requirements of this division, provide for as many coastal sites identified by the Department of Fish and Game for any uses that are consistent with the policies or Chapter 3 (commencing with Section 30200) of this division.

(d) Any agency of the state owning or managing land in the coastal zone for public purposes shall be an active participant in the selection of suitable sites for aquaculture facilities and shall make the land available for use in aquaculture when feasible and consistent with other policies of this division and other provision of law.

The following section of the State Penal Code provides that:

487. Grand theft is theft committed in any of the following cases:

1. When the money, labor or real or personal property taken is of a value exceeding four hundred dollars ($400); provided, that when domestic fowls, avocados, olives, citrus or deciduous fruits, other fruits, vegetables, nuts, artichokes, or other farm crops are taken of a value exceeding one hundred dollars ($100); provided, further, that when fish, shellfish, mollusks, crustaceans, kelp, algae, or other aquacultural products are taken from a commercial or research operation which is producing that product, of a value exceeding one hundred dollars ($100); provided, further, that where the money, labor, real or personal property is taken by a servant, agent or employee from his principal or employer and aggregates four hundred dollars ($400) or more in any 12 consecutive month period, then the same shall constitute grand theft.

2. When the property is taken from the person of another.

The following sections of the Revenue and Taxation Code provide that:

17063. For purposes of this chapter, the items of tax preference are:

(a) An amount equal to the excess itemized deductions for the taxable year (as determined under Section 17063.2).

(b) With respect to each "Section 18212 property" (as defined in Section 18214), the amount by which the deduction allowable for the taxable year for exhaustion, wear or tear, obsolescence, or amortization exceeds the depreciation deduction which would have been allowable for the taxable year, had the taxpayer depreciated the property under the straight line method for each taxable year of its useful life (determined without regard to Section 17211.7 or 17228.5) for which the taxpayer has held the property.

(c) With respect to each item of Section 18211 property (as defined in Section 18214) which is subject to a lease, the amount by which --

(1) The deduction allowable for the taxable year for depreciation or amortization, exceeds.

(2) The deduction which would have been allowable for the taxable year had the taxpayer depreciated the property under the straight [illegible] method for each taxable year of its useful life for wh[illegible] taxpayer has held the property.

(d) With respect to the transfer of a share of stock pursuant to the exercise of a qualified stock option (as defined in subdivision (b) of Section 17532) or a restricted stock option (as defined in subdivision (b) of Section 17534), the amount by which the fair market value of the share at the time of exercise exceeds the option price.

(e) With respect to each property (as defined in Sections 17681 to 17690, inclusive), the excess of the deduction for depletion allowable under Section 17681 for the taxable year over the adjusted basis of the property at the end of the taxable year (determined without regard to the depletion deduction for the taxable year).

(f) An amount equal to one-half of the amount by which net long-term capital gain exceeds the net short-term capital loss for the taxable year.

(g) Subdivision (f) of this section shall apply only to taxable years beginning after December 31, 1970, and ending on or before November 30, 1972. For taxable years beginning after December 31, 1971, the amount of the tax preference income with respect to capital gains shall be an amount (but not below zero) equal to the difference between (1) the taxpayer's total net capital gains and losses (determined without regard to any capital loss carryover) for the taxable year, and (2) the taxpayer's net capital gains and losses recognized by virtue of Section 18162.5 for the same taxable year.

(h) The amount of net farm loss in excess of fifty thousand dollars ($50,000) which is deducted from nonfarm income. In the case of a husband or wife who files a separate return, the amount specified in the preceding sentence shall be twenty-five thousand dollars ($25,000). This subdivision shall not apply if two-thirds or more of the taxpayer's average gross income from all sources for the taxable year and immediately preceding two years is from farming. Nor shall this subdivision apply if the net farm loss is the result of aquaculture activities. For purposes of this subdivision, "aquaculture" means a form of agriculture which is devoted to the controlled growing and harvesting of fish, shellfish, and plants in marine, brackish, and fresh water.

(i) The excess of the intangible drilling and development costs described in Section 17299(c) paid or incurred in connection with oil, gas, and geothermal wells (other than costs incurred in drilling a nonproductive well) allowable under this part for the taxable year over the amount which would have been allowable for the taxable year if such costs had been capitalized and straight line recovery of intangibles (as defined in Section 17963.3) had been used with respect to such costs. This subdivision shall be applied separately with respect to:

(1) All oil and gas properties which are not described in paragraph (2), and

(2) All properties which are geothermal deposits (as defined in Section 613 (e)(3) of the Internal Revenue Code of 1954).

The following sections of the Health and Safety Code provide that:

Chapter 5. FOOD

26569.4 (a) The state department may adopt regulations which name and describe the characteristics of salmon and any other fish or other seafood it considers appropriate. The state department shall consult with the Department of Fish and Game, the Joint Committee on Fisheries and Aquaculture, consumers, commercial fishermen, aquaculturists, and seafood processors, wholesalers, restaurateurs, and other retailers before adopting these regulations. The state department shall not adopt any regulation that conflicts with the common name of any fish designated by the Department of Fish and Game pursuant to Section 8023 of the Fish and Game Code.

(b) In addition to the consultations required by subdivision (a), the state department shall consult and seek the recommendations of the groups named in that subdivision concerning the possible need for, or desirability of, any further legislation or regulations affecting seafood labeling. The state department shall report to the Legislature the results of the consultations required by this subdivision, and make recommendations to the Legislature concerning any legislation it considers appropriate, on or before January 1, 1986.

(c) No regulation adopted pursuant to this section shall deviate from a pertinent United States standard where the fish or seafood product specified is packed or processed as a standardized product under a United States standard.

(d) Nothing in this section or in regulations adopted pursuant to this section shall be construed to require the use of more than the common family name of any fish or seafood by any restaurant in menus or advertisements.

Chapter 10. SANITARY CONTROL OF SHELLFISH
Article 1. Declaration of Policy and Definitions

28500. The Legislature finds and declares that the public health interest requires that the people of this state be protected from adulterated shellfish grown and harvested in state waters for sale to the public and for introduction into interstate commerce. This protection is a matter of statewide concern and the purpose of this chapter is to establish uniform sanitation standards for the growing waters, harvesting, shucking, packing, repacking, and handling of shellfish and shellstock intended for human consumption.

28501. Unless the context otherwise requires, the definitions set forth in this article govern the construction of this chapter.

(a) "Shellfish" means native or nonnative bivalve mollusks, which include oysters, rock scallops, clams, and mussels, either fresh or frozen, and either shucked or in the shell.

(b) "Shellstock" means shellfish which remain in their shells.

(c) "Growing area" means any offshore ocean, coastal estuarine, or freshwater area that may be classified by the department for natural shellfish growth or artificial shellfish propagation and includes open seawater systems.

(d) "Approved area" means a shellfish-growing area not adversely affected by sewage or other wastes.

(e) "Conditionally approved area" means a shellfish-growing area that may be occasionally affected by sewage or other wastes.

(f) "Prohibited area" means a shellfish-growing area not certified because of its proximity to a waste discharge or because the area is influenced by other detrimental environmental factors.

(g) "Restricted area" means a shellfish-growing areas subjected to a limited degree of pollution which makes it unsafe to harvest a shellfish for direct marketing but where harvesting for relaying or depuration may be permitted.

(h) "Other wastes" means wastes, such as, but not limited to, animal, industrial, radiological, and agricultural wastes which would render shellfish unsafe or unfit for human consumption.

(i) "Department" means the State Department of Health Services.

(j) "Director" means the State Director of Health Services.

(k) "Person" includes any individual, partnership, corporation, and association.

(l) "Closed area" means an area that the shellfish taken therefrom have been declared to be unsafe or unfit for human consumption.

Article 2. General Requirements

28502. (a) The director may declare any area within the jurisdiction of this state to be a closed area if it is determined that shellfish taken from the growing area may be unsafe or unfit for human consumption.

(b) The director shall close to the taking of shellfish for a period deemed advisable any waters to which shellfish from a closed area may have been transferred.

(c) The director shall establish by order the areas which he or she declares unsafe or unfit for shellfish harvesting and shall modify

or revoke the order in accordance with the results of chemical, toxicologic, and bacteriological surveys conducted by the department. The director shall file the order in the office of the department, and shall furnish copies of the orders describing closed areas to the Department of Fish and Game, the State Water Resources Control Board, and to any interested person without charge.

(d) Prior to the director's declaration that shellfish-growing waters may be unsafe and shellfish grown in these waters may not be taken for human consumption, the department shall do all of the following:

(1) Give at least 20 days' notice of its intended action. The notice shall include a statement of either the terms or substance of the intended action or a description of the subject and issues involved, and the time when, the place where, and the manner in which, interested persons may present their views thereon.

(2) Afford all interested persons reasonable opportunity to submit data, views, or arguments orally or in writing. The department shall consider fully all written and oral submissions respecting the proposed action.

(e) If the department finds that the shellfish harvested from an area is unsafe or unfit for human consumption and states in writing its reasons for that finding, it may proceed without prior notice or hearing to take emergency action. The action may be effective for a period of not longer than 30 days, during which time the department shall initiate the procedures contained in subdivision (d).

28503. (a) The department shall adopt rules and regulations regarding all of the following:

(1) The classification and minimum requirements for growing and harvesting areas, for relaying and depuration procedures, and for aquaculture facilities which are used for the cultivation and production of shellfish.

(2) Specifications for plant facilities and for the harvesting, transporting, storing, handling, packing, and repacking of shellfish.

(3) Fees.

(b) The department may adopt any regulations which it determines are necessary to interpret and enforce the provisions of this chapter. The regulations shall be adopted by the department in the manner prescribed by Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code.

(c) The rules and regulations shall conform, so far as possible, to

the standards which are adopted by the National Shellfish Sanitation Program that pertain to the evaluation of shellfish-growing areas and handling facilities, but shall provide for regulating other wastes or contaminants not covered by the National Shellfish Sanitation Program which would render shellfish unsafe or unfit for human consumption.

28504. (a) The director, or the director's duly authorized agent, shall conduct sanitary surveys of any shellfish growing water as deemed necessary to assure each of the following:

(1) Any shellfish grown in the water is safe as an article of food and meets bacteriological, chemical, and toxicologic standards as prescribed by regulation.

(2) Any shellfish grown in prohibited or restricted areas is either relayed to or depurated in approved water for a period of time as necessary to meet bacteriological, chemical, and toxicologic standards, as prescribed by regulation.

(3) For good cause shown, a shellfish grower or harvester may request the resurvey of restricted or unapproved growing water, and the director, or the director's duly authorized agent, shall conduct the sanitary resurvey.

(b) If it is found that the shellfish and growing water are in compliance with the rules and regulations promulgated under this chapter, the director shall issue a certificate attesting to the compliance to the lawful grower or harvester of the shellfish.

28505. It is unlawful for any person to engage in commercial shellfish cultivation or the harvesting for human consumption of shellfish from naturally occurring populations, except as provided for in Sections 5670, 7850, 8500, and 15101 of the Fish and Game Code and in regulations adopted by the department pursuant to this chapter, with regard to growing areas, relaying and depuration procedures, and aquaculture facilities.

28506. The director, or the director's duly authorized agent, may, at any reasonable hour of the day, do any of the following:

(a) Enter and inspect any facility or area used for cultivation, production, depuration, processing, transporting, or sale of shellfish.

(b) Obtain samples of water and shellfish. Upon request, split samples shall be given to the person from whose property the samples were obtained.

(c) Inspect all shellfish plants and the practices followed in the handling and packaging of shellfish. If it is found that the operator is complying with the rules and regulations promulgated under this chapter, the director shall issue a certificate attesting to the compliance.

(d) Cause a reinspection to be made at any time and may revoke the certificate upon refusal of the operator to permit an inspection or free access at all reasonable hours, or upon a finding that the plant is not being operated in compliance with the rules and regulations promulgated under this chapter.

(e) No revocation, suspension, annulment, or withdrawal of any certificate is lawful unless, prior to the institution of department proceedings, the department gave notice by mail, to the certificate holder, of facts or conduct which warrant the intended action, and the certificate holder was given an opportunity to show compliance with all lawful requirements for the retention of the certificate, pursuant to Section 28518.8. This section does not preclude the department from taking immediate action in accordance with subdivision (e) of Section 28502.

28507. It is unlawful for any person to take, sell, offer, or hold for sale any shellfish from an area declared by the director to be unsuitable for harvesting for human consumption, without complying with all rules and regulations promulgated by the department to ensure that the shellfish have been purified.

The intent of this section is not to prohibit the transplanting of shellfish from restricted or prohibited growing areas, if permission for the transplanting is first obtained from the Department of Fish and Game pursuant to Section 237 of Title 14 of the California Administrative Code.

28508. It is unlawful for any person to sell, offer, or hold for sale any shellstock or shucked shellfish which has not been harvested from a growing area which has been certified by the department or which has not been purified in accordance with Section 28504.

28509. It is unlawful for any person to sell, offer, or hold for sale any shellstock or shucked shellfish which has not been handled and packaged in accordance with specifications under this chapter, and regulations adopted pursuant to this chapter.

28510. It is unlawful for any person to sell, offer, or hold for sale any shellfish where the facilities for packaging and handling of the shellfish do not comply with regulations promulgated by the department under this chapter.

28511. It is unlawful for any person to operate a shellfish plant engaged in the handling and packaging of shellfish, either shucked or in the shell, without a valid certificate issued by the department for each plant or place of business.

28512. It is unlawful for any person to sell, offer, or hold for sale any shellstock or shucked shellfish without a label which bears a valid certificate number and is in compliance with Chapter 4 (commencing with Section 26400) of Division 21.

28513. It is unlawful for any person to sell, offer, or hold for sale any

shellfish not in a container bearing a valid certificate number from a state or a nation whose shellfish certification program conforms to the then current Manual of Recommended Practice for Sanitary Control of the Shellfish Industry, issued by the United States Public Health Service.

28514. The provisions of Sections 28512 and 28513, with respect to labeling requirements, shall not apply to any of the following:

(a) Shellstock held in dry storage under refrigerated conditions not for shipment or sale.

(b) Shellstock sold on premises when the sale is the ultimate point of sale.

28515. Any shellfish which are held or offered for sale at retail or for human consumption, and which have not been handled and packaged in accordance with the specifications fixed by the department under this chapter, or which are not in a certified container as provided in Sections 28512 and 28513, or which are otherwise found by the director to be unfit for human consumption, are subject to immediate condemnation, seizure, and confiscation by the director or the director's duly authorized agent. The shellfish shall be held, destroyed, or otherwise disposed of as directed by the director.

28515.5 The director may suspend or revoke any certificate issued pursuant to this chapter for any violation of this chapter or the regulations promulgated pursuant thereto.

Article 3. Fees

28516. The department shall charge and collect a fee for each certificate issued. The amount of the fee shall be established by regulation.

Article 4. Penalties

28517. Any person who willfully violates any provision of this chapter, or any regulation adopted pursuant to this chapter, is guilty of a misdemeanor and shall, if convicted, be subject to imprisonment for not more than six months in the county jail or a fine of not less than one hundred dollars ($100) nor more than five hundred dollars ($500), or both. If the violation is committed after a previous conviction under this section which has become final, or if the violation is committed with the intent to defraud or mislead, the person shall be subject to imprisonment for not more than one year in the county jail or a fine of not more than one thousand dollars ($1,000), or both.

28517.5 One-half of all fines collected by any court or judge for any violation of any provision of this chapter shall be paid into the State Treasury to the credit of the General Fund.

Article 5. Proceedings

28518. (a) The Attorney General, any district attorney, or any city attorney to whom the department reports any violation of this chapter shall begin appropriate proceedings in the proper court.

(b) Before any alleged violation of this chapter is reported to the Attorney General, a district attorney, or a city attorney for the institution of a criminal proceeding, the person against whom this proceeding is contemplated may be given appropriate notice and an opportunity to show cause why he or she should not be prosecuted and to present additional facts which may mitigate the action. The showing may be presented either orally or in writing, in person, or by attorney.

28518.2 The department is not required to institute proceedings under this chapter for minor violations of this chapter, if the department believes that the public interest will be adequately served in the circumstances by a suitable written notice or warning.

28518.5 When the state asserts a violation of this chapter, the state need not negate any exemption or exception from the requirements of this chapter in any pleading, or in any trial, hearing, or other proceeding. The burden of proof with respect to any such exemption or exception rests upon the person claiming its benefits.

28518.8 Except to the extent otherwise provided in Section 28502 and subdivision (e) of Section 28506, or when a violation is asserted pursuant to Section 28517, when the department asserts a violation of this chapter, all affected persons shall be afforded an opportunity for an administrative hearing after 20 days notice.

(b) The notice shall include all of the following:

(1) A statement of the time, place, and nature of the hearing.

(2) A statement of the legal authority and jurisdiction under which the hearing is to be held.

(3) A reference to the particular sections of the statutes, regulations, and rules involved.

(4) A short and plain statement of the matters asserted.

(c) Opportunity shall be afforded all persons to respond and present evidence on the issues involved.

(d) Hearings authorized or required by this chapter shall be conducted by the department or any agent as the department may designate for that purpose.

(e) Oral proceedings or any part thereof shall be transcribed at the request of any person. The person requesting the transcription shall bear the cost of the transcript.

(f) Final decisions or orders adverse to any person shall be in writing or stated in the record. A final decision shall include findings of fact and conclusions of law, which shall be separately stated. Persons shall be notified either personally or by mail of any decision or order.

28519. A person who has exhausted all administrative remedies available within the department and who is aggrieved by a final decision or order is entitled to judicial review pursuant to this chapter.

28519.5 All regulations applicable to this chapter, and currently in effect at the time this chapter takes effect, shall remain in effect until the department adopts regulations pursuant to Section 28503.

FISH AND GAME CODE SECTIONS REGULATING THE PROPAGATION AND HARVESTING OF MARINE LIFE AND THE PURIFICATION OF MOLLUSKS

The following sections of the Fish and Game Code provide that:

General Provisions and Definitions.

14. "Anadromous fish" means fish which spawn in fresh water and spend a portion of their lives in the ocean.

17. "Aquaculture" means that form of agriculture devoted to the propagation, cultivation, maintenance, and harvesting of aquatic plants and animals in marine, brackish, and fresh water. "Aquaculture" does not include species of ornamental marine or freshwater plants and animals not utilized for human consumption or bait purposes that are maintained in closed systems for personal, pet industry, or hobby purposes, however, these species continue to be regulated under Chapter 2 (commencing with Section 2116) of Division 3.

61. "Ocean ranching" means aquaculture where juvenile anadromous fish are reared and released into state waters to grow and return to an aquaculture facility to be harvested commercially.

DIVISION 2.

Chapter 7. CONSERVATION OF AQUATIC RESOURCES.

1700. It is hereby declared to be the policy of the state to encourage the conservation, maintenance, and utilization of the living resources of the ocean and other waters under the jurisdiction and influence of the state for the benefit of all the citizens of the state and to promote the development of local fisheries and distant-water fisheries based in California in harmony with international law respecting fishing and the conservation of the living resources of the oceans and other waters under the jurisdiction and influence of the state. This policy shall include all of the following objectives:

(a) The maintenance of sufficient populations of all species of aquatic organisms to insure their continued existence.

(b) The recognition of the importance of the aesthetic, educational, scientific, and nonextractive recreational uses of the living resources of the California Current.

(c) The maintenance of a sufficient resource to support a reasonable sport use, where a species is the object of sport fishing, taking into consideration the necessity of regulating individual sport fishery bag limits to the quantity that is sufficient to provide a satisfying sport.

(d) The growth of local commercial fisheries, consistent with aesthetic, educational, scientific, and recreational uses of such living resources, the utilization of unused resources, taking into consideration the necessity of regulating the catch within the limits of maximum sustainable yields, and the development of distant-water and overseas fishery enterprises.

(e) The management, on a basis of adequate scientific information promptly promulgated for public scrutiny, of the fisheries under the state's jurisdiction, and the participation in the management of other fisheries in which California fishermen are engaged, with the objective of maximizing the sustained harvest.

(f) The development of commercial aquaculture.

DIVISION 3.

Chapter 3.

Article 3. Fish, Reptiles, Amphibia, and Aquatic Plants Generally.

2270. It is unlawful for any person to receive, bring, or cause to be brought into this state, for the purpose of propagation, any fish, reptile, amphibian, or aquatic plant from any place wherein any infected, diseased, or parasitized fish, reptile, amphibia, or aquatic plants are known to exist.

2271. (a) No live aquatic plant or animal may be imported into this state without the prior written approval of the department pursuant to regulations adopted by the commission. A written application for the importation, submitted in conformance with the procedural requirements established by the commission, is deemed approved where it has not been denied within 60 days.

(b) This section does not apply to the following plants or animals unless the plants or animals are or may be placed in waters of the state:

(1) Mollusks.
(2) Crustaceans.

(3) Ornamental marine or freshwater plants and animals that are not utilized for human consumption or bait purposes and are maintained in closed systems for personal, pet industry, or hobby purposes.

(c) The section does not apply to any live aquatic plant or animal imported by a registered aquaculturist.

2272. Each package containing any live aquatic plant or animal shall bear, in a conspicuous place, a tag on which shall be stated the name and address of the consignor, the name and address of the consignee, and the exact contents of the package.

Chapter 4.

Article 1. Dead Wild Birds, Mammals, Fish and Reptiles and Amphibia.

2345. This article applies to all dead wild birds, mammals, fish, and amphibia. This article also applies to live mollusks and crustaceans which are transported for purposes other than placement in the waters of this state. This article does not apply to animals imported for purposes of aquaculture under Division 12 (commencing with Section 15000).

DIVISION 6. FISH

Part 1. Generally

Chapter 1. MISCELLANEOUS

5503. It is unlawful to take any fish for the sole purpose of removing its eggs except for the purpose of developing a brood stock for aquaculture purposes under Division 12 (commencing with Section 15000) pursuant to regulations promulgated by the Fish and Game Commission.

The commission shall also determine ownership and regulate distribution of progeny taken from wild brood stock, other than those obtained pursuant to section 15300.

Chapter 2. POLLUTION

Article 2. Shellfish Area Contamination.

5669. For purposes of this chapter, "shellfish" means any bivalve mollusk.

5670. It is unlawful to take shellfish used or intended to be used for human consumption from any area from which it shall be determined, as provided in this article, that the taking of shellfish does or may constitute a menace to the lives or health of human beings.

5671. The State Department of Health Services may:

(a) Examine any area from which shellfish may be taken.

(b) Determine whether the area is subject to sewage contamination.

(c) Determine whether the taking of shellfish from the area does or may constitute a menace to the lives or health of human beings.

5672. Upon determination by the State Department of Health Services that the area is or may be subject to sewage contamination, and that the taking of shellfish from it does or may constitute a menace to the lives or health of human beings, it shall ascertain as accurately as it can the bounds of the contamination, and shall post notices on or in the area describing its bounds and prohibiting the taking of shellfish therefrom.

The taking of shellfish from the area is unlawful after the completion of the publication of the notices as prescribed in this article.

5673. The fact of posting the notices shall be published once a week for four successive weeks in some newspaper of general circulation published in the county in which the contaminated area is situated, if there is such a newspaper, and if there is none, then in such a newspaper published in an adjoining county.

5674. The State Department of Health Services shall enforce the provisions of this article, and for that purpose the inspectors and employees of that agency may enter at all times upon public or private property upon which shellfish may be located.

5675. If examinations are conducted pursuant to this article for purposes of certifying the quality of shellfish-growing waters, certification of water quality shall be commenced within 30 days, and completed within three months of the filing of an application by an aquaculturist.

Article 2.5. Purification of Mollusks

5700. Notwithstanding Sections 5670, 5672, 8341, and 9050, native and nonnative mollusks may be taken in Districts 12 and 13 and moved to other areas to be purified for human consumption under such rules and regulations as shall be established by the commission. Such regulations may include, but are not limited to bag limits, methods of harvest, and provisions for public use. Mollusks taken under this section shall not be used for human consumption unless such use is approved by the State Department of Health Services.

5701. The State Department of Health Services may make sanitary surveys of mollusk-growing areas or may use sanitary surveys of mollusk-growing areas made by qualified state or county agencies and, based on such information, may classify such areas for purposes of harvesting and moving mollusks which are to be purified for human consumption in accordance with Section 5700. The State Department of Health Services shall adopt such rules and regulations as are necessary to implement this section.

5701.5 If examinations are conducted by the State Department of Health Services pursuant to this article for purposes of certifying the quality of shellfish-growing waters, certification of water quality shall be commenced within 30 days and completed within six months of the filing of an application by an aquaculturist.

5702. Any person who moves any native mollusks taken under regulations of the commission from Districts 12 and 13 for purposes of purification for human consumption, shall pay a royalty, as the commission may prescribe, of not less than two cents ($0.02) per pound of mollusks so taken.

Chapter 4. INFECTED OR DISEASED FISH

6300. This chapter applies to all fish and amphibia, including but not limited to, fish and amphibia being imported or transported. This chapter does not apply to activities governed by Division 12 (commencing with Section 15000).

6301. The department is authorized to enter at any time any car, warehouse, depot, ship, or growing area where any fish, amphibia, or aquatic plants are held or stored for the purpose of making an examination to ascertain whether such fish, amphibia, or aquatic plants are infected, diseased, or parasitized.

6302. Except as otherwise provided in Division 12 (commencing with Section 15000), all fish, amphibia, or aquatic plants found to be infected, diseased, or parasitized are a public nuisance and shall be summarily destroyed by the department.

6303. All fish, amphibia, or aquatic plants which the department determines are merely deleterious to fish, amphibia, aquatic plants, or aquatic animal life, shall be destroyed by the department unless the owner or person in charge of the fish, amphibia, or aquatic plants ships them out of the state within a period of time to be specified by the department.

6304. If the department finds any infected, diseased, or parasitized fish, amphibia, or aquatic plants within this state, the department shall post notices describing, as nearly as possible, the boundaries of the area within which the fish, amphibia, or aquatic plants are found, and shall state the period during which the taking, carrying, and transportation of the fish, amphibia, or aquatic plants from the area shall be unlawful. The fact of posting the notices shall be published once a week for four successive weeks in some newspaper of general circulation in the county in which the infected area is situated and, if there is no such newspaper in that county, then in a newspaper of general circulation published in an adjoining county.

6305. It is unlawful to carry or cause to be carried from one point in this state which has been posted according to the provisions of this article, to any other point in this state, any infected, diseased, or parasitized fish, amphibia, or aquatic plant.

6306. The expense of any examination made necessary by the provisions of this code, shall be borne by the owner of the fish, amphibia, or aquatic plants, or the person or persons importing them into this state; provided that the department may assume such expense in the case of fish imported to provide fishing under the authority of a sport fishing license in the public waters of this state.

Chapter 5. FISH PLANTING AND PROPAGATION

Article 1. General Provisions

6400. It is unlawful to place, plant, or cause to be placed or planted, in any of the waters of this state, any live fish, any fresh or salt water animal, or any aquatic plant, whether taken without or within the State, without first submitting it for inspection to, and securing the written permission of, the department.

6401. Any person may, under the terms of a permit first obtained from the department, under regulations the commission may prescribe, purchase or receive live fish from any registered aquaculturist, and may stock the fish in a stream or a lake.

6403. This chapter does not apply to activities governed by Division 12 (commencing with Section 15000).

Part 3. Commercial Fishing

Chapter 1. GENERALLY

Article 1. Application of Part

7600. The provisions of this part apply to the taking and possession of fish for any commercial purpose. This part does not apply to activities governed under Division 12 (commencing with Section 15000).

Article 7. Packing and Processing Licenses and Taxes.

8045. Every person operating under a license issued pursuant to this article, in addition to the license fee, and a fisherman as described in Section 8015 who sells fish, mollusks, or crustaceans in any load or lot of 100 Pounds or more to persons not licensed pursuant to Section 8040, shall pay a privilege tax for each pound, or fraction thereof, of fish purchased, received, or taken by him in accordance with the following schedule.

	Rate per pound
(a) All fish, irrespective of use, except as otherwise specified in this section.....	$0.0013
(b) Mollusks and crustaceans irrespective of use,	

excluding squid and crab..... 0.0125

(c) Crab and squid, irrespective of use 0.0019

(d) Salmon, except imported salmon offal, based on the weight in the round, irrespective of use..... 0.0500

(e) Sardines irrespective of use..... 0.0063

(f) The following fish when used for bait or human consumption, except canning 0.0125

(1) Albacore
(2) Barracuda
(3) Bluefin
(4) Broadbill swordfish
(5) Flying fish
(6) Frogs
(7) Giant seabass
(8) Halibut
(9) Saltwater worms
(10) White seabass
(11) Yellowtail

(g) Anchovy 0.0006

Provided, however, that when the price paid as stated on the fish receipt required in accordance with Section 8011 is in excess of fifty dollars ($50) per ton, the tax on anchovy shall be $0.0013 per pound.

All fish, except shrimp (Pandalus jordani) and crab (Cancer magister), imported into California from another state or country, and which are for human consumption and are not thereafter canned or cooked by a licensee, shall not be subject to such a privilege tax.

Shrimp (Pandalus jordani) and crab (Cancer magister) imported into California from another state or country, irrespective of use, shall not be subject to such privilege tax.

Chapter 2. PARTICULAR VARIETIES OF FISH

Article 3. Clams and Other Mollusks

8341. All of the species of clams commonly known as littlenecks, chiones and hard-shell cockles, including thin-shelled littleneck, common littleneck, Japanese littleneck, rough-sided littleneck, smooth chione, wavy chione, and banded chione, may be taken at any time, except in the waters of Marin County, where they may be taken only between September 1st and March 31st.

No such clams measuring less than one and one-half inches in greatest diameter may be taken, possessed, transported, or sold.

The bag limit on such clams is 50 per day, in the aggregate. Not more than one daily bag limit of such clams may be possessed by any person during one day.

Clams of the species herein designated, when legally taken outside the state and brought within the state pursuant to this code, may be possessed, transported and sold without restrictions, except that all shipments of such clams into this state shall be accompanied by a bill of lading, or invoice, showing the species, total number or weight, and the origin of the clams.

8345. It is unlawful for any person to sell or purchase any rock scallops (Hinnites multirugosus) or scallops (Pecten circularis), except that scallops cultivated pursuant to Division 12 (commencing with Section 15000) which may be sold or purchased subject to regulations of the commission.

DIVISION 9. FINES AND PENALTIES

Chapter 1. GENERAL PROVISIONS

12000. The violation of any provision of this code, other than Sections 3009 and 12001, or of any rule, regulation, or order made or adopted under this code, is a misdemeanor.

12002. The maximum punishment for a violation constituting a misdemeanor is a fine of one thousand dollars ($1,000) or imprisonment in the county jail for six months, or both, except as follows:

12010. Notwithstanding Section 12000, the maximum penalty for a violation of Sections 15202 or 15509 is a fine of two thousand dollars ($2,000) or imprisonment in the county jail for one year, or both the fine and imprisonment.

DIVISION 12. AQUACULTURE

Chapter 1. GENERAL PROVISIONS

15000. The business of aquaculture is governed by this division. Aquaculture and its products are exempt from those provisions of this code dealing with commercial fishing and harvesting.

15001. The cultured progeny of wild plants and animals lawfully obtained under Section 15300 are the exclusive property of that person who cultured them or that person's successor in interest.

15002. Any person who takes aquaculture products without lawful entitlement is subject to prosecution for theft.

15003. (a) The department may assess a fee on persons growing aquaculture products on public lands and in public waters based on the price per pound of the products sold. The fees, if imposed, shall be

set at amounts necessary to defray the costs of the commission and the department in administering this division. however, the fees if any, may not exceed the privilege taxes as provided in section 8045.

(b) the price per pound for these taxation purposes shall be based on the whole product weight or its equivalent as taken by the lessee.

(c) the privilege tax imposed by this section shall be paid monthly to the department within 30 days after the close of each month. if not paid within 60 days after the close of the month in which it is due, a 10 percent penalty shall be paid.

15004. aquaculturists operating under this division shall pay all costs incurred by the department when conducting any inspections of plants, animals, facilities, or culture areas required by this division, or by regulations made pursuant to it, when requested by the aquaculturists.

15005. (a) When necessary for the protection of native wildlife, the commission may regulate the transportation, purchase, possession, and sale of specific aquaculture products as provided for in this section.

(b) The commission may determine that aquaculture products shall be accompanied by a document containing any of the following information:

(1) The name, address and registration number of the aquaculture producer.
(2) The species.
(3) The weight, volume or count within the container.
(4) The date of the shipment.
(5) The name and address of the intended receiver.

(c) The commission may require that certain aquaculture products shall be additionally identified as being aquaculture produced, except for the following:

(1) Trout.
(2) Catfish.
(3) Kelp and aquatic plants.
(4) Frogs and amphibia.
(5) All bivalve mollusks (except littleneck clams).
(6) All members of the family Centrarchidae.
(7) Crayfish.
(8) Sea urchins.
(9) Shrimp and freshwater prawns.
(10) Crab.

15006. Nothing in this division applies to authorized species of ornamental marine or freshwater plants and animals not utilized for human consumption or bait purposes that are maintained in closed systems for personal, pet industry, or hobby purposes.

15007. Except as specifically authorized in Chapter 10 (commencing with Section 15900), nothing in this division permits ocean ranching.

Chapter 2. AQUACULTURE DEVELOPMENT SECTION

15100. There is within the department the Aquaculture Development Section. The Aquaculture Development Section shall perform all of the following duties:

(a) Promote understanding of aquaculture among public agencies and the general public.

(b) Propose methods of reducing the negative impact of public regulation at all levels of government on the aquaculture industry.

(c) Provide information on all aspects of regulatory compliance to the various sectors of the aquaculture industry.

(d) Provide such advice to aquaculturists on project siting and facility design that may be needed to comply with regulatory requirements.

15101. The owner of each aquaculture facility shall register all of the following information with the department by March 1 of each year.

(a) The owner's name.

(b) The species grown.

(c) The location or locations of each operation or operations. The department may provide registration forms for this purpose and may impose a registration fee not to exceed [redacted] dollars [redacted]. Anyone failing to register under this section shall be operating unlawfully.

15102. The department may prohibit an aquaculture operation or the culturing of any species at any location where it is determined it would be detrimental to adjacent native wildlife.

Chapter 3. STOCKING AQUATIC ORGANISMS

15200. The commission may regulate the placing of aquatic plants and animals in waters of the state. Movement of live fish between two registered aquaculturists who are registered for those species does not require a permit.

15201. A permit is required to place fish on public or private land or water in any watershed above an established public or private fish hatchery. The department shall deny the permit if there is evidence that water quality and potential disease transfers will be adverse to the established hatchery.

15202. The commission may prohibit the placement of specific species of aquatic plants or animals in designated waters of the state. The prohibition may not include species that are found to be native or that are stocked by the state in a location where prohibition is contemplated.

Chapter 4. BROOD STOCK ACQUISITION

15300. Aquatic plants or animals may be legally obtained for use as brood stock from all of the following sources:

(a) A holder of a commercial fishing license.

(b) A registered aquaculturist.

(c) The department.

(d) Imported sources authorized by Chapter 7 (commencing with Section 15600).

15301. (a) The department may sell wild aquatic plants or animals, except rare, endangered, or fully protected species, for aquaculture use at a price approximating the administrative cost to the department for collection or sale of the plants or animals. The commission shall set this price.

(b) Aquatic plants and animals may be collected by a registered aquaculturist only with the written approval of the department. The department may specify the time, place, and manner of collection and may collect a fee from the aquaculturist in an amount sufficient to cover the cost of processing the approval.

Chapter 5. LEASING OF STATE WATER BOTTOMS

15400. The commission may lease state water bottoms to any person for aquaculture. The commission may adopt regulations governing the terms of the leases. No state water bottoms shall be leased, unless the commission determines that the lease is in the public interest.

15401. .. as used by the public for digging clams shall not be leased. The department shall designate those areas.

15402. A lessee of a state water bottom owns all lawfully cultivated organisms that are described in the application for the lease and produced in the area leased. The lessee has the exclusive right to cultivate and harvest the aquatic organisms in the area leased.

15403. Persons wishing to lease a state water bottom shall make a written application to the commission. An application shall contain all of the following information:

(a) A map showing the area to be leased, its general vicinity, and all

ownership and boundary lines in the vicinity.

(b) A description of the organisms to be grown and the culture techniques to be used.

(c) An estimate of the acreage to be leased.

(d) A nonrefundable one hundred dollar ($100) filing fee.

The lessee shall assume responsibility for any infringement on privately owned water bottoms, or water bottoms owned by, or under the jurisdiction of any city, county, or district.

15404. (a) If the commission finds that the area applied for is available for lease and that the lease would be in the public interest, it shall publish a notice that the area is being considered for leasing.

(b) The commission shall have legal notices published in a newspaper of general circulation in each county where the water bottom, or any part thereof, is located, describing the area to be leased and the type of operation to be conducted. The publication shall comply with Sections 6060 and 6066 of the Government code.

15405. No initial term of a state water bottom lease shall exceed 25 years.

15406. (a) Each state water bottom lease shall specify a period prior to expiration when renewal of the lease may be requested by the lessee. If during this period the lessee is still actively engaged in aquaculture, as determined by the commission, the lessee shall have a prior right to renew the lease on terms agreed upon between the commission and the lessee. If terms are not agreed upon, the commission shall advertise for bids on the lease. If a request for renewal is not made by the lessee, the commission shall advertise for bids on the lease. The commission shall consider bids only from aquaculturists registered pursuant to Section 15101.

(b) Notwithstanding subdivision (a), with respect to any lease of state water bottoms in effect on January 1, 1983, the lessee shall have a prior right to renew the lease. If the lessee does not renew the lease, the commission shall advertise for bids on the lease. The commission shall consider bids only from aquaculturists registered pursuant to Section 15101.

(c) A lease may be renewed for additional periods not to exceed 25 years each.

15406.5 The commission shall award water bottom leases to the highest responsible bidder, if the bid meets or exceed the minimum annual rent established by the commission, which shall not be less than two dollars ($2) per acre, for all species cultivated, unless the acreage applied for is 10 acres or less, in which case the minimum acceptable rent shall be ten dollars ($10) per acre. The annual rent for any lease in effect on January 1, 1983, for the cultivation of oysters

shall be one dollar ($1) per acre until the expiration thereof. The commission may reject any or all bids for the lease of state water bottoms if it deems the rejection to be in the public interest.

15406.7 In addition to the rent provided for in Section 15406.5, every person operating under an oyster lease shall pay a privilege tax of two cents ($0.02) per packed gallon or fraction thereof of shucked oysters harvested by the lessee.

If the oysters are marketed in the shell, the tax shall be based on the equivalent yield of shucked oyster meat. In determining the yield of oysters, it shall be deemed that 100 oysters are equivalent to one packed gallon of shucked oyster meat.

The tax imposed by this section is the exclusive privilege tax that shall be imposed on lessees of state water bottoms for oyster cultivation, notwithstanding subdivision (a) of Section 15003.

15407. The annual rent shall be paid to the department within 30 days of the commencement of the lease and within 30 days of the anniversary thereof. The commission may establish penalty fees for late payment and may cancel the lease if rent is not paid within 90 days of the commencement of the lease or within 90 days of any anniversary thereof.

15408. The commission shall promulgate regulations governing the termination of leases due to failure to pay rent or improper use of the leasehold.

15409. Upon termination of a lease, for any reason, all structures will be removed at the lessee's expense from the leasehold, and the area shall be restored to its original condition. If the lessee fails to remove the structures, the state may remove them and the lessee shall pay the removal costs so incurred.

15410. All leases shall be subject to the power of the Legislature to increase or decrease the rents, fees, taxes, and other charges relating to the lease, but no increase in rent shall be applicable to an existing lease until it is renewed.

15411. Lessees under a state water bottom lease may not unreasonably impede public access to state waters for purpose of fishing, navigation, commerce, or recreation. The lessee may, however, limit public access to the extent necessary to avoid damage to the leasehold and the aquatic life culture therein.

The commission may prohibit any recreational activity in any aquaculture area subject to a state water bottom lease if it determines that the activity is detrimental to the enhancement of the resource.

15412. No water bottom lease may be assigned without the prior approval of the commission. Application for approval of a lease assignment shall comply with all of the requirements for an original lease.

15413. No person may enter upon any area subject to a water bottom lease in which aquatic life is cultivated, or remove the aquatic life therefrom without the consent of the lessee, or willfully destroy the cultivated aquatic life or any markers intended to designate the boundaries and limits of the leased area.

15414. A water bottom lease may require periodic reports that the commission deems necessary for the proper administration of the state's water bottoms.

15415. The department shall notify the State Lands Commission of all applications for water bottom leases.

The department shall inform the State Lands Commission of all leases executed, renewed, or assigned pursuant to this chapter, and shall furnish the State Lands Commission with such information concerning these leases that it may require.

Chapter 6. DISEASE CONTROL

15500. Upon the recommendation of the department and after consultation with the Aquaculture Disease Committee created pursuant to this chapter, the commission shall compile a list of diseases and parasites and the aquatic plants and animals they are known to infect or parasitize. All government activities relating to aquaculture disease detection, control, and eradication that do not affect human health and safety are the responsibility of the department.

15501. The department may enter, under an inspection warrant issued pursuant to Title 5 (commencing with Section 1822.50) of Part 3 of the Code of Civil Procedure, at any time, any car, warehouse, depot, ship, or growing area where any aquatic plants or animals are held or stored, for the purpose of making an examination to ascertain whether the aquatic plants or animals are infected, diseased, or parasitized.

15502. The director, in consultation with the Aquaculture Industry Advisory Committee and the Interagency committee for Aquaculture Development, shall appoint an 11-member Aquaculture Disease Committee consisting of at least six industry producers selected to represent geographic, species, and other diverse aspects of the industry; two to represent the department; one to represent the Department of Food and Agriculture; and academic scientist who is an expert in aquatic diseases; and one representative of the University of California Cooperative Extension. Members of the committee shall serve without compensation, but shall be paid their necessary expenses.

15503. The Aquaculture Disease Committee may recommend regulations to the commission designed to safeguard wild and cultured organisms from the list of harmful organisms compiled pursuant to Section 15500.

15504. Regulations recommended under Section 15503 and adopted by the commission may include all of the following:

(a) Routine monitoring procedures.

(b) Standardized diagnostic procedures.

(c) A requirement for the confirmation of the diagnosis by the state through at least one other independent and qualified laboratory.

(d) Criteria for ordering quarantine, condemnation, or destruction.

(e) A stated maximum time period between diagnosis and destruction.

(f) Methods to be employed in animal destruction and facility cleanup.

(g) Procedures for determining fair and rapid compensation.

(h) Any other related procedures that the commission may determine are necessary.

15505. If any of the diseases or parasites listed pursuant to Section 15500 is found to exist which the director, in consultation with the Aquaculture Disease Committee and consistent with the regulations adopted under Section 15504, deems to be detrimental to the aquaculture industry or to wild stocks of aquatic plants and animals, the director may do any of the following:

(a) Establish the area to be quarantined and list the aquatic plants and animals affected by it.

(b) Post notices describing, as nearly as possible, the boundaries of an area within which specific disease or parasite infestations are found. Notices posted pursuant to this subdivision shall be published once a week for four successive weeks in a newspaper of general circulation in the county in which the infected area is located. If there is no newspaper of general circulation in that county, then the notice shall be published in a newspaper of general circulation published in an adjoining county.

(c) Hold and impound diseased or parasitized plants and animals.

(d) Forbid, prevent, or restrict the movement of all plants and animals subject to the disease or parasite from or into the area, or from place to place within it, during the existence of the quarantine.

(e) Order the destruction and disposal of diseased or parasitized plants and animals consistent with Section 15504.

15506. Except for those diseases in the list compiled pursuant to Section 15500, infected plants or animals shall not be quarantined or destroyed, unless the director, in consultation with the Aquaculture Disease Committee, finds that an outbreak of aquatic disease among privately cultured plants or animals presents a threat to the aquaculture industry or to fish life or plant life.

15507. If the director, in consultation with the Aquaculture Disease Committee, finds that a disease is present in a nearby government operated facility or in nearby wild stocks, infected plants or animals in a private aquaculture facility shall not be quarantined or destroyed unless similar action is taken with respect to the government facility and wild stocks.

15508. Reports of those diseases and parasites compiled pursuant to Section 15500 shall be immediately forwarded by the director to the Aquaculture Disease Committee and shall be promptly investigated by the department.

15509. No person may move, or allow to be moved, any of the aquatic plants or animals which are subject to a quarantine established pursuant to Section 15505 across the quarantine line which is established, unless the person has first obtained a permit from the director authorizing the movement.

The director may issue a permit after inspection, if the aquatic plants or animals, premises, transportation vehicles, and equipment which are subject to the quarantine established pursuant to Section 15505 are properly cleaned and disinfected.

15510. If the director determines that any disease designated pursuant to Section 15500 exists among domestic aquatic plants and animals, or that aquatic plants and animals have been exposed, or may have been exposed, to the disease, or to the vectors of the disease, in any other state or territory in the United States or in any foreign country, and the importation of aquatic plants or animals from the state, territory, or foreign country may transmit, carry, or disseminate the disease to domestic plants and animals within this state, the director shall notify the commission which may, after consulting the State Department of Health Services and the Department of Food and Agriculture, issue a regulation restricting or prohibiting the importation of the diseased or infected aquatic plants or animals into this state from any other state, territory, or foreign country.

15512. (a) If aquatic plants or animals are destroyed pursuant to subdivision (e) of Section 15505, the owner shall be promptly paid from the General Fund an amount equal to 75 percent of the replacement value of the plants or animals, less the value determined by the department of any replacement stock provided by the department under subdivision (b) if the claim is submitted pursuant to Section 15513. If the replacement value is not settled between the owner and the department, the replacement value shall be determined by an appraiser appointed by the director and an appraiser appointed by the owner. Appraiser's fees shall be paid by the appointing party. Disputes between these two appraisers shall be submitted to arbitration under the commercial Arbitration Rules of the American Arbitration Association.

(b) If the department provides replacement stock to an aquaculturist whose plants or animals are destroyed pursuant to subdivision (e) of Section 15505, the amount to be paid to the aquaculturist

pursuant to this section shall be reduced by the value of the replacement stock, as determined by the department.

(c) The result of the arbitration or the amount settled between the owner and the department, reduced by the value determined by the department of any replacement stock provided under subdivision (b), may be submitted as a claim by the owner to the Board of Control pursuant to Section 15513.

15513. Claims against the department arising under this chapter may be submitted pursuant to Section 905.2 of the Government Code.

15514. No claim arising under this chapter shall be paid where the director, in consultation with the Aquaculture Disease Committee, finds that the claimant's management practices were negligent or in violation of law, and that the negligence or violation was the proximate cause of the disease or infection prompting the order of destruction or finds the claimant willfully violated any provision of Section 15505.

15515. The owner of an aquaculture product who does not diligently pursue the eradication of a disease from its facility when ordered to do so by the director shall be responsible for paying to the director the full costs of the department for all disease eradication efforts conducted by the department to eradicate the disease. Payment of the costs under this section shall not excuse compliance with the provisions of law, regulations of the commission, and orders of the director, nor be a defense in any criminal or civil proceedings.

Chapter 7. IMPORTATION OF AQUATIC PLANTS AND ANIMALS

15600. No live aquatic plant or animal may be imported into this state by a registered aquaculturist without the prior written approval of the department pursuant to the regulations adopted by the commission.

15601. A written application for the importation submitted in conformance with the procedural requirements established by the commission is deemed to be approved where it has not been denied within 60 days.

Chapter 10. OCEAN RANCHING

15900. A registered aquaculturist may be granted a permit by the commission, under any terms and conditions that the commission may prescribe, to release and capture anadromous fish in state waters which have been reared in an aquaculture facility.

15901. Prior to the issuance of any permit by the commission, a public hearing shall be held in the county or counties affected. Notice of the hearing shall be published at least once, and at least 10 days prior to the hearing, in a newspaper of general circulation in each of the counties in which the hearing is to be held, or if no such newspaper is published in that county or counties then in such a newspaper in an adjoining county. The hearing shall be conducted by

the commission, a member of the commission designated by it, or the director if requested to do so by the commission.

15902. No permit shall be issued which may tend to deplete the natural runs of anadromous fish, result in waste or deterioration of fish, or when the proposed operation is located on a stream or river below a state or federal fish hatchery or egg-taking station.

15903. All fish released into the wild under authority of this chapter during the time they are in the wild are the property of the state and may be taken under the authority of a sport or commercial fishing license.

15904. Requirements for the screening of outlets may be waived by the commission. The waiver shall only be during the period fish are being released and captured under a permit issued under authority of this chapter. The condition of the waiver shall be described in any permit issued.

15905. Any permit granted by the commission pursuant to this chapter shall contain the following conditions:

(a) The department shall determine under what conditions and the number of fish to be permitted access to the stream above the hatchery site.

(b) If after a hearing the commission finds that the operation described in the permit and conducted pursuant to this chapter is not in the best public interest, the commission may alter the conditions of the permit to mitigate the adverse effects, or may cause an orderly termination of the operation under the permit. Proceedings to cause the alteration or termination shall be conducted in accordance with Chapter 5 (commencing with Section 11500) of Part 1 of Division 3 of Title 2 of the Government Code, and the commission shall have all the powers granted therein. An orderly termination shall not exceed a three-year period and shall culminate in the revocation of the permit in its entirety. During this period, the permittee may continue to examine and take specified anadromous fish reared according to the provisions of the permit, but may not release additional fish.

(c) If the commission finds that the operations has caused deterioration of the natural run of anadromous fish in the waters covered by the permit, it may require the permittee to return the fishery to the same condition as it was prior to issuance of the permit. If the permittee fails to take appropriate action, the commission may direct the department to take the action, and the permittee shall bear any cost incurred by the department.

(d) Prior to release into state waters, the fish may be examined by the department to determine that they are not diseased or infected with any disease which, in the opinion of the department, may be detrimental to the state fishery resources.

(e) The permittee has the right to divert all fish returning to the

stream to an inspection area as authorized by the commission, and may examine all fish for the purpose of identifying those fish reared and released by the permittee.

(f) No unmarked fish may be transported from the trapping facility other than to be returned to state waters.

15906. The provisions of this chapter shall be applicable only to the waters of Davenport Landing Creek which are within the County of Santa Cruz and located near the town of Davenport Landing. Any activities conducted pursuant to this chapter are conducted as a pilot program for the release and capture of anadromous fish reared in a registered aquaculture facility.

15907. This chapter shall remain in effect only until January 1, 1991, and as of that date is repealed, unless a later enacted statute, which is enacted before January 1, 1991, deletes or extends that date.

15908. (a) The department shall, from time to time, require reports from a permittee operating pursuant to this chapter on the permittee's operations, and the department shall then make findings regarding the operations available to the commission.

(b) The department shall prepare and submit to the Joint Committee on Fisheries and Aquaculture and to the standing committee of each house of the Legislature that has jurisdiction over fishery issues a report, on or before July 1, 1985, including the data obtained from the permittee pursuant to subdivision (a) and its findings and recommendations.

FISH AND GAME COMMISSION REGULATIONS
TITLE 14
CALIFORNIA ADMINISTRATIVE CODE

Part 1. Fish, Amphibians and Reptiles

Chapter 7. CAPTURE, TRANSPORTATION, POSSESSION, AND SALE OF FRESHWATER FISH FOR BAIT FOR PROFIT

200.29 Sources of Live Freshwater Bait Fish for Commercial Purposes.

(a) Sources of live fin fish for bait are limited to the following:

(1) Fish reared by a registered aquaculturist.

(2) The following species taken under the authority of a commercial fishing license:

(A) Longjaw mudsucker (Gillichthys mirabilis)
(B) Staghorn sculpin (Leptocottus armatus)
(C) Oriental gobies

Chapter 8. MISCELLANEOUS

227. Sale of Live Aquaculture Products by Aquarium or Pet Stores.

(a) No live aquaculture products shall be maintained or sold by aquarium or pet stores except the following.

(1) Tropical species of ornamental marine or freshwater plants and animals not utilized for human consumption or bait purposes;
(2) Goldfish;
(3) Koi;
(4) Albino channel catfish;
(5) White sturgeon not to exceed 8 inches in total length;
(6) Giant freshwater prawn (Macrobrachium rosenbergi);
(7) Brine Shrimp;
(8) Worms of the family Tubificidae;
(9) Crustaceans of the order Amphipoda that are native to California water;
(10) Mosquitofish, Gambusia affinis, except that mosquitofish may not be sold by aquarium or pet stores in Inyo, Mono, San Bernardino, Riverside and Imperial counties;
(11) Abalone.

(b) White sturgeon and abalone shall be sold under an Aquarium Dealer's Permit issued by the department to the owner of the aquarium or pet store. Applications shall be made on a department form available upon request from the department's Wildlife Protection Branch, Sacramento. The permit shall be issued free of charge on a calendar year basis, or part thereof. Aquarium dealer permittees shall maintain a log of all sales and shipments of live sturgeon and abalone, the name of the individual, company or organization taking possession of the product, the date of sale, and the number sold. The log shall be shown upon request by an authorized department official.

(c) All abalone sold under an aquarium dealer's permit shall be marked as provided by Section 238(e)(1)(B) of this title.

(d) Under no condition shall any live aquaculture product sold at an Aquarium or Pet Store be planted in any waters of the state.

Chapter 9. AQUACULTURE

235. Aquaculture Registration

(a) Registration Required. Pursuant to the provisions of Section 15101 of the Fish and Game Code, all aquaculture facilities must be registered with the Department of Fish and Game each year. For purposes of this section, an aquaculture facility is one that is devoted to the propagation, cultivation, maintenance and harvesting of aquatic plants and animals in marine, brackish or freshwater. This registration does not apply to: the maintenance

of koi and goldfish in closed systems for personnel, pet or hobby purposes; the sale or cultivation of brine shrimp; and the sale or cultivation of tropical species of ornamental marine or freshwater plants or animals, not utilized for human consumption or bait purposes, but maintained in closed systems for personal, pet industry or hobby purposes.

(1) Who Shall Register. The owner of each aquaculture facility shall register each year on forms provided by the department. Individual forms must be completed for each aquaculture facility location. Application forms and a list of laws and regulations governing aquaculture are available from the department's aquaculture development section, 1416 Ninth Street, Sacramento, CA 95814 and from the department's regional offices in Redding, Yountville, Rancho Cordova, Fresno, Long Beach and Menlo Park, on request.

(2) Cost of Registration. The registration fee shall be [redacted] dollars [redacted] for each registered owner or operator.

(3) Where to Submit Applications. Application forms together with the [redacted] dollar [redacted] registration fee shall be submitted to one of the department's regional offices listed in Section (1) above. Applications will be processed within five working days after approval.

(b) Registration Limitation. The applicant must certify that he/she has read, understands and agrees to be bound by the regulations of the Commission and the Fish and Game Code sections governing aquaculture and its products.

(c) Duration of Registration. The annual term of registration shall be January 1 to December 31, or if issued after the beginning of such term, for the remainder of that calendar year. Aquaculturists must reregister their facilities by March 1 of each year. Anyone failing to register under this section shall be operating unlawfully.

(d) All permits specified in this chapter, in addition to the aquaculture registration issued pursuant to Section 15101 of the Fish and Game Code, shall be issued under the following conditions:

(1) Where Issued. Requests for permits required in Chapter 9, unless specifically directed otherwise, shall be submitted to the Department of Fish and Game, Aquaculture Development Section, 1416 Ninth Street, Sacramento, California 95814.

(2) Cost of Permits. All permits required in Chapter 9 are issued free of charge.

(3) Permit Flow. The department shall return permit application forms to the applicant within three days of receipt. Completed permits will be returned to the applicant within

five working days following receipt of completed permit applications.

(4) Duration of Permits. Except as otherwise provided, permits will be issued on a calendar year basis, or if issued after January 1, for the remainder thereof.

235.1 Screening Requirements for Aquaculture Facilities. All bodies of water or private hatcheries registered for aquaculture purposes shall be entirely within the exterior boundaries of the land owned or leased by the owner of the facility. No aquaculture facility shall be built or operated on a natural water course or lake without the prior written approval of the department. Prior written approval is not required for aquaculture facilities constructed below a spring rising on private property.

For purposes of this section, waters existing seasonally or intermittently and not serving as a passageway or nursery area for anadromous fish are not required to be screened.

Except for those facilities using marine water, all artificial inlets and outlets of such bodies of water or private hatcheries used for aquaculture purposes shall be screened to prevent the ingress or egress of aquatic plants or animals.

The department may exempt anadromous fish facilities operating under conditions imposed by Section 235.3(i) from all or any portion of this section.

235.2 Permit to operate an aquaculture facility for anadromous fish on Davenport Landing Creek (Santa Cruz County).

Permits may be issued to operate a registered aquaculture facility for anadromous fish under the following general terms and conditions:

(a) Any permit issued shall be on an experimental basis until its impact on the fishery resource can be ascertained. These regulations shall be applicable only to the waters of Davenport Landing Creek, contained within Santa Cruz County, until January 1, 1986, after which date these regulations and permit shall have no force or effect.

(b) Persons desiring a permit to operate an anadromous fish aquaculture facility on Davenport Landing Creek shall file a request with the commission. Commission approval must be obtained following a public hearing as required by Section 6576 of the Fish and Game Code. If a permit is authorized by the commission, a free permit will be issued to the permittee by the Wildlife Protection Branch within five working days following notification by the commission.

(c) No permit will be issued which may tend to deplete the natural runs of anadromous fish, result in waste or deterioration of fish, or when the proposed operation is located on a stream or river

above or below a state or federal fish hatchery or egg-taking station.

(d) All fish released into the wild under authority of any permit during the time they are in the wild will become the property of the state and may be taken under the authority of a sport or commercial fishing license.

(e) Prior to release into state waters, fish may be examined by the department to determine that they are not diseased or infected with any disease which, in the opinion of the department, may be detrimental to the state fishery resources. If such fish are found to be diseased or infected, they shall not be released into state waters and shall be disposed of in accordance with department instructions. Cost of such inspection shall be paid by the permittee.

(f) Importation of eggs or fish into the state by permittee shall be in accordance with Section 15600 of the Fish and Game Code, and Section 236(c) of these regulations.

(g) Any liberation of fish by permittee into state waters shall be approved in advance by the department.

(h) The department may require the permittee to mark specific numbers of fish prior to their release into state waters. Any marks used by permittee to identify fish released into state waters shall be approved in advance by the department.

(i) Requirements for the screening of outlets are waived, under the following conditions:

(1) The department shall be notified and give approval prior to the removal of the required fish screens.

(2) Department approval to remove screens shall only be during the specific period when fish are being released and/or captured.

(3) At all other times the screens shall be in place and operational.

(j) The permittee shall have the right to trap and retain all fish returning to the stream; the department shall be allowed to examine all fish trapped.

(k) All live fish being transported by the permittee shall be in accordance with the provisions of Sections 2270-2282, 15005 and 15600 of the Fish and Game Code.

(l) All dead fish being transported from facilities operated pursuant to this permit shall be tagged or packaged in accordance with the provisions of Section 238 of this title, and with Section 15005, Fish and Game Code.

(m) The permittee shall file a report each January on forms furnished by the department at its headquarters office, 1416 Ninth Street, Sacramento, California 95814.

(n) If, after a hearing, the commission finds that the operation described in the permit and conducted pursuant to this section is not in the best public interest, the commission may alter the conditions of the permit to mitigate such adverse effects, including but not limited to the immediate suspension of operation under the permit, as provided in Section 6575(b), Fish and Game Code.

(o) The permittee shall reimburse the department for all actual costs incurred by the department in inspecting and monitoring the permittee's operations.

(p) The permittee shall provide all necessary security measures to protect fish at the rearing, release, and trapping facilities.

(q) Upon termination of the permit, the permittee shall remove all structures and facilities placed in the stream bed by the permittee, and shall return the watercourse to its original condition. In the event the permittee fails to do so, the state may restore the site at the permittee's sole cost. The permittee shall post a performance bond, signed by both the permittee and a corporate surety company, in the amount of $15,000, to assure restoration of the premises to their original condition and to assure compliance with all other provisions of this permit.

236. Importation of Live Aquatic Plants and Animals.

No person shall import into this state any prohibited species of live aquatic plant or animal listed pursuant to Section 2118 of the Fish and Game Code, or Section 671 of these regulations. Brine shrimp and tropical species of ornamental marine or freshwater plants and animals, not specifically prohibited by these sections, may be imported without special authority but all other species of aquatic plants and animals may not be imported except in accordance with the following terms and conditions:

(a) Importer's License. Live aquatic plants and animals obtained lawfully in any other state or country may be imported into California under an annual license obtained from the department as per instructions in Section 235(d).

(b) Importation Permit. Importation of each load or lot of live aquatic plants and animals must also be authorized by an importation permit. The person who is to receive any shipments of aquatic plants and animals shall apply to the department for this importation permit.

(1) Application for an importation permit shall be made as directed in Section 235(d) and shall reach the department's headquarters office by certified mail at least 10 working days

in advance of the probable arrival date of the shipment. A copy of the permit authorized by the director or his agent, must accompany each load.

(2) All live aquatic plants and animals imported into California may be inspected by the department, either at the place of entry into the state, or at other locations suitable to the department. The person importing the aquatic plants or animals may be required to provide facilities for inspecting and sorting them, and may be required to pay inspection costs, including salary and travel expenses of the inspector.

(3) Any lot or load of aquatic plants and animals found by the inspector to be diseased, parasitized, or to contain species not authorized by the importation permit must be immediately destroyed, or transported out of California within a period of time specified by the department. In such cases, the importation permit is automatically revoked.

(c) Importation of Salmonid Eggs. Applications to import eggs of fishes of the family salmonidae (trout, salmon and char) shall be accompanied by a health certificate signed by a person competent in the diagnosis of fish diseases stating that the hatchery or other sources of the eggs to be imported and the eggs themselves are free of the following diseases: Infectious pancreatic necrosis (IPN); Whirling disease; Infectious hematopoietic necrosis (IHN); Viral hemorrhagic septicemia (Egtved).

In questionable cases, the director of the department shall determine whether or not the person making the certification is technically qualified to do so.

(d) If a change in date of shipment becomes necessary after a permit has been issued, the permittee shall notify the Chief, Wildlife Protection Branch, at least 5 days before the new date of shipment. Under special circumstances, the department may waive this 5-day notice requirement.

(e) The requirements of this section do not apply to live shellfish imported under the provisions of Section 236.1.

236.1. Importation and Planting of Live Bivalve Mollusks

(a) For the purposes of this section bivalve mollusks include oysters, clams, mussels and scallops. Any person desiring to import or plant live bivalve mollusks under provision of Section 15000 of the Fish and Game Code, shall give the department's Marine Resources Regional Office, 411 Burgess Drive, Menlo Park, CA 94025 or other designated office a written notice by certified mail at least 10 working days in advance of the probable arrival date of the expected shipment and a forty-eight (48) hour notice of the time and place in California where such live bivalve mollusks may be inspected. Such live bivalve mollusks must be kept in dry storage or in a closed water system until inspection is made or a

planting certificate is issued by the department. A closed water system is a self-contained circulating system or a system discharging in such a manner that discharge waters shall not enter or may be caused to enter state waters. Regardless of any inspection, written permission to plant live bivalve mollusks must be secured and will be issued by the inspecting officer at the time of inspection if the shipment is certified.

(b) Bivalve mollusk seed produced by a government certified hatchery, either foreign or domestic may be exempt from formal inspection if accompanied by a certificate from an accredited shellfish pathologist declaring the seed to be free of parasites or disease.

(c) Naturally produced bivalve mollusk seed imported from the states of Oregon or Washington may be exempt from formal inspection prior to planting, provided each shipment is accompanied by a certification from the state of origin guaranteeing the shipment to be free of disease, predaceous drills or their progeny or other shellfish pests.

(d) All shipments of bivalve mollusk seed from approved areas lacking government certification or shipments that spot checks have shown to contain pests that would be deleterious to native aquatic plant or animal life are subject to formal inspection.

At least 4% of these live bivalve mollusk shipments must be opened by the importer for inspection of a minimum of 10% of the contents of each container inspected.

(e) One adult predaceous drill, young drill, or egg case or other pests found by an inspector indicates the shipment is deleterious to aquatic animal life. When only one pest is found during the course of an inspection, the inspection will be repeated, using another 4% sample of the shipment. The finding of two individual pests (or egg cases) of the same species will subject the shipment to rejection, or repacking by the importer and reinspection.

(f) When individual shipments are made of live bivalve mollusks from different geographical areas and the units of the shipment are marked accordingly, 4% of the components from each such area is to be opened for inspection and destruction or reshipment will apply to that portion of the shipment of common origin which yields pests.

(g) An inspection fee of ten cents per case, with a minimum fee of $50 per shipment shall be paid by the applicant. The term "case" includes barrel, sack, box, or similar container comprising the shipment. A money order or check, made payable to the California Department of Fish and Game, must be received by the inspector before written permission to plant such live bivalve mollusks shall be given.

(h) Live bivalve mollusks or shells of such shellfish grown on pest-infested beds within the state must be inspected by a

representative of the department and approved for planting before being returned to any waters of the state. This inspection is separate from that referred to hereinabove and no fee is required.

237. Leasing of State Water Bottoms for Aquaculture.

(a) Definitions. The following definitions are established for terms used in this section:

(1) "Aquaculture Area" means any public waters or private waters contiguous to public waters set aside for the purpose of cultivating, harvesting or relaying of any aquatic plant or animal life.

(2) "Aquaculture Agreement" means an agreement for the establishment of an aquaculture area on private water bottoms contiguous to state water bottoms which may include a permit for relaying or depuration of shellfish under authority of Fish and Game Code Division 12. Permits may include use of state or private lands for aquaculture purposes.

(3) "Aquaculture Lease" means a lease of state water bottoms for the cultivation of aquatic plants and animals.

(4) "Depuration" means the process by which shellfish cleanse themselves of contaminants in a controlled process water environment.

(5) "Depuration Facility" means the physical structure, enclosure or device in which depuration is accomplished, including all appurtenances.

(6) "Growing Area" means any offshore ocean, coastal estuarine or freshwater area suitable for natural shellfish growth or artificial shellfish propagation and shall include open seawater systems.

(7) "Relaying" means the moving of shellfish from one water to another.

(8) "Shellfish" in this section means native or nonnative bivalve mollusks.

(9) "Classified Areas" include those waters that may be classified by the State Department of Health according to the following:

(A) "Approved Area" - a shellfish-growing area not adversely affected by sewage or other wastes.

(B) "Conditionally Approved Area" - a shellfish-growing area that may be occasionally affected by sewage or other toxic substances.

(C) "Prohibited Area" - a shellfish-growing area not certified

because of its proximity to a known waste discharge or because the area is influenced by other detrimental environmental factors.

(D) "Restricted Area" - a shellfish-growing area subjected to a limited degree of pollution which makes it unsafe to harvest shellfish for direct marketing but where harvesting for relaying or depuration may be permitted.

(10) "Lot" is a designated quantity of shellfish that is identifiable and may consist of one or more batches.

(11) "Batch" is a measurable, identifiable unit such as bushel, and one or more batches will comprise a lot.

(12) "Tidal Area" means the intertidal area between the high tide mark and 1,000 feet offshore. Commercial harvesting of native invertebrates in this area is subject to special permit requirements under Section 6500 of the Fish and Game Code.

(b) Applications.

(1) Applications for a lease or state water bottoms for aquaculture or for an aquaculture agreement or for a permit to relay or depurate shellfish shall be made to the commission.

(2) Applications shall be accompanied by proof of ownership of, or a valid lease on the lands on which the operations are to occur, or description of the state lands which the applicant has leased or intends to lease and on which the operations are to occur.

(3) Applications also shall be accompanied by a description of the area involved and a reference map clearly showing the exterior boundaries of the area. The description must be tied to monuments of record and maps must be in a form acceptable for recording in the county(ies) in which the aquaculture area is located. A copy of all maps shall be submitted by the commission to the State Lands Commission. No aquaculture agreement will be valid until the State Lands Commission has certified to the department that the area applied for is unencumbered or the private ownership is properly described, so as not to preclude its use for the proposed culture.

(4) No aquaculture lease for state water bottoms will be approved until the commission has held a public hearing at least ninety days after notice thereof has been published in a newspaper of general circulation within the county involved. An aquaculture lease or aquaculture agreement is subject to repeal if a map of the area is not filed by the holder of such lease or agreement in the appropriate county(ies) within thirty days of approval by the commission.

(5) No aquaculture agreement for private water bottoms will be

approved until the commission has held a public hearing at least thirty days after notice thereof has been published in a newspaper of general circulation within the county involved. An aquaculture agreement is subject to repeal if a map of the area is not filed by the holder of such aquaculture agreement in the appropriate county(ies) within thirty days of approval by the commission.

(6) An explanation of the type of operation including the aquaculture practices, relay or depuration activities to be employed, shall be included in all applications for aquaculture leases or agreements.

(7) The change of any authorized cultural practices as specified in the aquaculture lease or agreement must have approval of the commission before the change is put into effect.

(8) The application shall include information as to whether each of the areas involved in the aquaculture relay or depuration operation has been classified by the Department of Health Services as approved, conditionally approved, prohibited, restricted, or unclassified.

(c) Aquaculture Leases and Agreements.

(1) Aquaculture leases or agreements shall not be modified, amended, transferred, assigned or hypothecated without the approval of the commission.

(2) The holder of the aquaculture lease or agreement shall comply with the provisions of the Fish and Game Code and the rules and regulations of the commission and any special provisions set forth in the lease or agreement by the commission.

(3) Before an aquaculture lease or agreement is issued by the department, the applicant must present evidence that the applied for aquaculture area has been registered in compliance with Fish and Game Code Section 15101.

(4) The department may inspect the depuration facilities, culture or relay areas of a holder of an aquaculture lease or agreement at any time.

(5) Vessels used by holders of an aquaculture lease or agreement may be required to maintain clearly visible identifying numbers.

(6) The holder of an aquaculture lease or agreement shall record the size, numbers or pounds of shellfish or other marine life planted, relayed or taken in or from waters of the state on forms as designated by the department.

(d) In addition to other requirements, a permit to relay or depurate shellfish shall contain the following conditions:

(1) An operation conducted under an aquaculture agreement or a relay or depuration permit that receives shellfish from the licensee's or permittee's own lands or lands leased by it, is not required to be licensed as a wholesale fish dealer and preserver, but shall maintain such records as are required by the department to monitor such operations, including but not limited to: data with respect to each batch of shellfish depurated or relayed that will show: its origin and quantity: date or reception by the depuration facility or relay bed and the length of time held in the facility or bed; and their final disposition. All depurated or relayed shellfish shall be identified by a tag or label securely fastened to the shipping container and bearing the certificate number of the shipper, his name and address, the name and address of the consignee, and the kind and quantity of shellfish in the container and the batch or lot number.

(2) The operator of a depurating facility receiving shellfish from other than the operator's owned or leased areas shall obtain a wholesale fish dealer's and preserver's license prior to the department's issuance of a permit and the permittee will maintain such records as required by the department.

(3) A relay or depuration permittee, moving shellfish for the purpose of cleansing, shall satisfactorily identify each lot of shellfish harvested and maintain its identity separate from other shellfish throughout its relaying or depuration process until certification by the Department of Health Services that edible shellfish standards have been met.

(4) Persons holding an aquaculture lease or agreement who receive shellfish from out-of-state for planting, shall comply with shellfish inspection procedures found in Section 236.1(a) and (f) of this title. Persons holding an aquaculture lease or agreement who relay shellfish from one area of the state to another, whether from private or public water bottoms, shall give the department notice two working days prior to the relay. Such notification shall be given to the department's office specified in the agreement.

(5) No shellfish shall be relayed without obtaining written permission from the department.

(6) Shellfish harvested from a conditionally approved or restricted area for relaying or depuration, shall be identified by a lot number. Shellfish so identified must be kept separate throughout the relaying or depuration process.

(7) Oysters, clams and mussels harvested for human consumption from the waters of Districts 12 and 13 by commercial fishermen, shall be taken only for the purposes of relaying or depuration.

(8) Shellfish produced by a registered aquaculture hatchery within

the state may be relayed at any time. Such shellfish shall be free of disease and parasites so as to pose no threat to the environment. Hatcheries producing shellfish to be planted in state waters shall be inspected by the department for the presence of disease organisms at least once a year and, following such inspection, a permit authorizing planting of specified species for the ensuing year may be issued.

In lieu of the hatchery inspection, at the option of the registrant, inspection of each lot from the hatchery that is to be planted in state waters shall be requested. Request for inspecting each lot shall be made by the registrant at least two working days prior to the transfer. The inspection fee for each lot and the manner paid shall be the same as in Section 236.1(f) of this title. A written permit authorizing the planting shall be obtained before planting the shellfish.

(9) Subsection (d)(8) does not preclude inspections under Section 1006 of the Fish and Game Code.

(e) Shellfish relayed from Districts 12 and 13.

(1) Native shellfish taken from Districts 12 and 13 under an aquaculture lease or agreement for purposes of purification, whether from public or private lands, are subject to a royalty of 0.0125¢ per pound after taking the shellfish from the relaying or depurating site. For the purpose of computing the royalty, the charge shall be based on the weight (including shell) of the shellfish after completion of the cleansing process. The royalty is payable within thirty days after close of the calendar month in which it became due. If not paid within sixty days after the close of the month for which it became due, a penalty equal to ten percent of the royalty shall be added to it.

(2) Nonnative shellfish relayed from Districts 12 and 13 and relayed for the purposes of purification, are subject to a 0.02¢ per pound fee after taking them from the relaying or depuration site. The fee is charged to cover administrative costs and is subject to adjustment and penalty as described in subsection (e)(1).

(f) Persons holding an aquaculture lease or agreement and using state water bottoms shall, in addition to the acreage rental fee for use of state water bottoms, be assessed a fee on all shellfish harvested not to exceed the privilege tax as provided in Fish and Game Code Section 15003. The fees shall be subject to the penalty and adjustment as described in subsection (e)(1). These fees shall not apply to the harvesting of shellfish from state or private water bottoms in Districts 12 and 13 for the purposes of cleansing. When water quality in Districts 12 and 13 permits direct use of the shellfish from state water bottoms or native shellfish from private water bottoms, the fee established by Fish and Game Code Section 15003 shall apply.

(g) Agar-bearing plants taken from state waters are subject to the fees of Section 165(a)(2)(E) of this title.

(h) Oysters, clams and mussels harvested from Districts 12 and 13 for commercial purposes must be taken by licensed commercial fishermen. In addition to a commercial fishing license, every fisherman when harvesting shellfish, must have in his possession a current permit issued pursuant to Section 123 of this title. Only those species listed on the permit for harvest from Districts 12 and 13 may be taken.

(i) Improvements of aquaculture leases.

(1) Oyster Cultivation.

(A) Bottom culture - leases must be improved at an average rate of at least two cases of seed-bearing shell (160 pounds of seed-bearing shell) or thirty bushels of shellfish one or more years of age per acre over the allotted acreage per year. Improvements by unattached, single seed (less than one year old) shall consist of planting an average rate of 10,000 single seed per acre per year over the allotted acreage. Term of improvement shall be four years for seed-bearing shell and three years for oysters one or more years of age.

(B) Off-bottom culture - leases must be improved at an average rate of at least one case of seed-bearing shell (80 pounds of seed-bearing shell), or fifteen bushels of oysters one or more years of age per acre over the allotted acreage per year. Improvement by unattached single seed (less than one year old) shall consist of planting an average rate of 5,000 single seed per acre per year over the allotted acreage. Term of improvement shall be four years for seed-bearing shell, and three years for oysters one or more years of age.

(C) Production requirements - the annual harvest rate shall be an average of 2,000 oysters per acre (over one year of age) over the allotted acreage effective three years after the effective date of the lease. Harvest reports shall be recorded in the form of a receipt in quadruplicate furnished by the department. The triplicate copy shall be delivered to the department on or before the first and sixteenth day of each month.

(2) Miscellaneous Aquatic Species.

(A) A lease of state water bottoms for the cultivation of species other than oysters will include minimum planting and harvesting requirements for the species to be cultivated to insure that water bottoms so encumbered will be used for the purpose intended.

(B) Harvest amounts shall be recorded in the form of a receipt in quadruplicate furnished by the department. The triplicate copy shall be delivered to the department on or before the first and sixteenth day of each month.

(j) As proof of use, holders of aquaculture leases shall submit to the department office designated in the lease agreement, a written declaration under penalty of perjury showing the date, quantity of species and acreage in each planting, also including a map showing acres, amounts, and dates planted.

238. Sale and Transportation of Aquatic Plants and Animals.

This section does not apply to the importation of live aquatic plants and animals described in Sections 236 and 236.1 of these regulations.

No person shall sell or transport aquaculture products in this state except in accordance with the following general terms and conditions:

(a) All aquaculture products sold or transported under the provisions of this section must have been legally reared or imported by an aquaculturist registered in this state.

(b) Sales between registered aquaculturists.

(1) A registered aquaculturist may sell and transport live aquaculture products authorized by that registration to any other aquaculturist authorized to possess the same species.

(2) All shipments of authorized aquaculture products shall be accompanied by a duplicate of a sales invoice or waybill showing the name of the producer, the producer's aquaculture registration number, date of shipment, the species being transported, the weight, volume or count of each species in the shipment, and the name and address of the consignee.

(3) Duplicates of the required sale or shipping documents shall be retained for a period of one year from the date of sale. The records shall be shown upon written demand by the director of the department. The information contained in these documents is confidential except that such information may be disclosed in accordance with a proper judicial order in cases or actions instituted for enforcement of this section or for prosecution of violations of this section.

(c) A registered aquaculturist may sell and transport live those aquaculture products authorized by that registration to any of the following whose licenses or permits authorize the possession of the same live plants and animals for commercial purposes.

(1) Scientific or educational establishments;

(2) Aquarium Dealer Permitees (See Section 227 of these regulations);

(3) Live Freshwater Bait Fish Licensees (See Sections 200 through 200.32 of these regulations);

(4) To any other legal purchaser or possessor for whom possession is legal. Documents as described in Section 238(b)(2) shall accompany each shipment. Under no condition may these aquaculture products be stocked in any lake, pond, or stream.

(d) Except for live bivalve mollusks, the operator of any commercial establishment where aquaculture products are maintained alive for human consumption shall retain copies of all sales invoices or waybills received with the products. Such invoices or waybills shall be retained by the operator for a period of at least one year following receipt of the aquaculture products listed thereon, and such invoices or waybills shall be produced upon request of an official of the department. All aquaculture products, except live shellfish, sold and leaving the premises of the dealer shall be killed and accompanied by a sales receipt showing the date of purchase and name of business where purchased or be packaged in accordance with Section 240 of these regulations. Under no condition shall these aquaculture products be stocked in any waters of this state.

(e) Marking and Tagging Requirements.

(1) Abalone.

(A) All abalone produced by an aquaculturist registered pursuant to section 15101 of the fish and game code may be possessed, harvested, sold and transported, provided the abalone are identifiable as being cultivated.

Such abalone are exempt from the size limits established by Section 8304 of the Fish and Game Code.

(B) Abalone which spend part of their life in marine waters of the state, other than while in an aquaculture facility, must have an identifying mark or tag approved by the department. Such identifying mark must be approved, or a tag attached, prior to the abalone being placed in waters outside the aquaculture facility. For purposes of this section, the term "aquaculture facility" includes a hatchery, rearing facility, pen, cage or any similar structure or device.

(C) Any person other than a registered aquaculturist processing cultured abalone at the wholesale level must possess a wholesale fish dealer's and processor's license as provided by Section 8040 of the Fish and Game Code as well as a revocable processing permit for cultured abalone, as issued by the department.

(f) Retail Sales of Aquaculture Products at an Aquaculture Facility. All aquaculture products sold at an aquaculture facility shall be

dead at the time of sale except for:

(1) Aquaculture products sold under the provisions of Sections 238(c) and 238.5.

(2) Striped bass, steelhead trout and sturgeon sold pursuant to the provisions of Section 240.

(3) Marine Aquaculture Products. Such retail sales of aquaculture products taken from the aquaculture facility by the purchaser need only be accompanied by a sales receipt showing the name and aquaculture registration number of the producer, the item(s) and quantity purchased and the date of purchase. All other shipments of aquaculture products shall be accompanied by a sales invoice or waybill as provided in Section 238(b)(2).

243. Take of Aquatic Plants, Invertebrates, Fishes and Bullfrogs From the Wild for Use as Broodstock for Aquaculture Purposes.

Pursuant to the provisions of Sections 5503 and 15300 of the Fish and Game Code, aquatic plants, invertebrates, fishes and bullfrogs (Rana catesbeiana) may be taken from the wild for aquaculture purposes only in accordance with the following regulations:

(a) This section does not apply to the following:

(1) The take of live freshwater fish for sale as bait (see Sections 8460-8463 of the Fish and Game Code and Sections 200-200.31 of Title 14, CAC).

(2) The take of aquatic animals by commercial fishermen (see Section 226.7, Title 14, CAC).

(3) The take of anadromous fish under restrictions applied to ocean ranching (see Sections 15900-15908 of the Fish and Game Code and Section 235.2, Title 14, CAC).

(b) The department may issue a revocable, nontransferable permit to collect aquatic plants, invertebrates, fishes and bullfrogs from the wild for use in developing a domesticated broodstock for aquaculture purposes. Permits shall not be issued for striped bass or white sturgeon except by specific commission authorization. No permits shall be issued for golden trout, steelhead trout, chinook salmon, or coho salmon; or for those animals listed by the state or federal government as endangered, threatened or fully protected. Permits shall state the name of permittee, permittee's aquaculture registration number, name of the collector(s) if different from permittee, species to be collected, number or total weight to be collected, collection locations and methods, period for which the permit is valid, and any special collection requirements.

(1) Who May Obtain Permits. Permits shall be issued only to the

owner or operator of an aquaculture facility currently registered according to Section 15101 of the Fish and Game Code and Section 235 of Title 14, CAC. The aquaculturist must be authorized by said registration to posses the species to be taken. The aquaculturist may designate, on the permit application, a person to collect for him.

(2) Cost of the Permit. An administrative fee of $25 shall be charged for processing the permit. The department shall assess an additional fee, equal to the actual costs to the department in salaries, travel expenses and equipment use, if any department personnel are required to assist in the collection or inspection of the wild broodstock.

The department may waive any portion of the fees, except the $25 administrative fee, if the permittee agrees to restock into the wild a portion of the cultured progeny of wild broodstock. Fees waived may not be in excess of the current wholesale market value of the progeny stocked. The number of progeny and place to be stocked may be negotiated by the department and the permittee.

(3) How to Apply for the Permit. Application for the permit shall be made on forms provided by the department. Application forms are available on request from the Aquaculture Development Section, Department of Fish and Game, 1416 Ninth Street, Sacramento, CA 95814.

Completed and signed application forms and the $25 administrative fee shall be submitted to the Department of Fish and Game, Aquaculture Development Section, 1416 Ninth Street, Sacramento, CA 95814.

(c) Who May Collect Wild Broodstock. Wild broodstock shall be collected only by those persons listed on the permit. At least one of the persons designated by the permit shall be present when animals are collected. Collectors shall have the collection permit in their possession while engaged in collection activities and while transporting species collected to the permittee's registered facility. Persons assisting the collector, and under their direct supervision, need not have a broodstock collection permit.

The department may require that an employee of the department be present to monitor collection operations, or that the broodstock be collected by department personnel. All costs to the department for monitoring or collecting shall be borne by the permittee. Any special conditions applied to the collection of wild brood stock shall be stated on the permit.

(d) Collection Methods and Gear. All aquatic plants and animals authorized to be taken by the permit shall be captured only in those waters and only with those types of gear specified in the permit. All species other than those specified in the permit

shall be returned immediately in good condition to the water of origin.

The permittee shall comply with department requirements concerning construction and deployment of collection gear. Locations and times of collecting and the amount taken may be restricted by the department to protect the wild populations of authorized species or other species found in the collecting area, or to reduce interference with angling.

(e) Notification of Department. Before making any collection, the permittee shall notify the department's regional office having responsibility for the area where the permittee wishes to collect. Such notification shall reach the regional office by letter, telephone or personal contact at least 48 hours in advance of the collection date(s) and shall include the locality, dates and time(s) during which collecting is to be done.

(f) Written Reports. Permittee shall submit a written report within six months of the permit's expiration date or prior to application for any additional broodstock collection permits, whichever is earlier. The report shall state the number of plants or animals collected, the location and condition of the wild broodstock, and the number or amount of progeny cultured.

(g) Disposition of Wild Broodstock and Their Cultured Progeny. Wild plants and animals taken under the authority of this permit remain the property of the state and shall not be sold, bartered, or traded without written permission of the department. Wild broodstock shall be held only at an aquaculture facility registered by the permittee. The department may require that animals obtained under this permit be returned alive and in good condition to the water where taken, or donated to a charitable organization approved by the department.

The cultured progeny of plants and animals lawfully obtained under the authority of a broodstock collection permit are the exclusive property of that person who cultured them, or that person's successor in interest.

(h) Permittees shall allow authorized department employees to inspect any and all wild broodstock authorized by this permit and their holding facilities. Inspections may be made during normal working hours or with prior notification, if some other time is agreeable to both parties.

(i) Permit Denial or Revocation. The department may deny or revoke a permit to take wild plants and animals for use in developing a domesticated broodstock for the following reasons:

(1) To protect an aquatic resource.

(2) To protect public safety.

(3) A commercial source is available.

(4) The applicant does not have facilities or experience necessary to develop a domesticated broodstock from wild plants or animals.

(5) The applicant or permittee has demonstrated repeated failure to develop a domesticated broodstock from wild plants or animals.

(6) The applicant or permittee, his designated collector, or an employee or assistant has violated the terms of a permit issued for the collection of wild broodstock, or has been convicted by a court of competent jurisdiction of any violation of the Fish and Game Code or commission regulations pertaining to activities covered by this permit.

Denial or revocation may be appealed to the commission.

245. Aquaculture Disease Control Regulations.

(a) General Conditions.

(1) All fish inspections and disease examinations shall be conducted in accordance with the 1979 edition of "Procedures for Detection and Identification of Certain Fish Pathogens" published by the Fish and Health Section of the American Fisheries Society (FHS Blue Book). All such inspections and examinations shall be conducted by a fish pathologist.

(2) When a listed disease is identified by a fish pathologist in aquatic plants or animals in an aquaculture facility or in transit to or from such a facility which requires restrictive action by the department, the owner or consignee involved shall be notified by the department immediately. The owner or consignee may accept the original identification or may request that the department seek confirmation of the identification by another fish pathologist.

(3) Upon confirmation, if requested, or acceptance of the identification of any listed disease which requires restrictive action by the department as set forth in subsection (c), a compliance agreement describing the action to be taken may be drawn up between the owner and the director. The department shall commence negotiation of the terms of the compliance agreement within 48 hours after acceptance or confirmation as defined in subsection (a). The agreement must be signed by the owner and the director within 30 days of acceptance or confirmation. If the compliance agreement is not signed within 30 days, a quarantine as specified in Fish and Game Code Section 15505 may be imposed while the owner appeals to the commission. The agreement shall be designed in consultation with the Aquaculture Disease Committee to bring the least amount of economic hardship

possible to the affected party while affording maximum protection to other growers and the fishery resources of the State.

(4) If at any time a fish pathologist identifies one or more pathogens listed in this section anywhere within the State of California, he must immediately report the identification to the director of the department.

(5) Methods for disposal of aquatic plants and animals and for disinfection of aquaculture equipment and facilities shall be specified in the compliance agreement in accordance with the disease category and the threat to other aquatic plant or animal life or aquaculture facilities.

(6) Any live aquatic plants, animals, or eggs originating outside the United States shall be certified by a fish pathologist as disease- and parasite-free before a permit for importation is issued.

(7) Anyone interested in conducting research on those diseases designated as catastrophic must submit a written research proposal to the director of the department and obtain written approval from the director before the causative agent is brought to their facility. Anyone denied approval pursuant to this subsection may appeal such denial to the commission.

(8) Upon identification of a disease which presents a threat to the aquaculture industry or aquatic animal or plant life, but which is not listed in this section, the director of the department shall immediately consult, by phone if necessary, with the Aquaculture Disease Committee, impose an immediate holding action, and develop a plan of action.

(b) Definitions.

(1) Compliance Agreement. A written agreement between the director of the department and the owner or consignee of the diseased or parasitized aquaculture product which outlines the steps for disposal of the diseased or parasitized aquatic plants or animals and the procedures, both chemical and mechanical, for clean un of the facility.

(2) Confirmation. The second identification of a disease agent from the original sample or source by another fish pathologist.

(3) Disposal. The destruction or marketing of animals by methods prescribed in a compliance agreement.

(4) Eradication. The elimination of disease-causing agents.

(5) Fish Pathologist. A department virologist or fish pathologist, or a fish pathologist certified by the Board of

Certification of the Fish Health Section of the American Fisheries Society pursuant to their guidelines adopted effective January 1, 1982.

(6) Immediate Holding Action. A probibition of moving any plant or animal from an aquaculture facility for up to 30 days.

(7) Other Holding Action. Restrictions outlined in the compliance agreement on plant or animal movement to specific markets, watersheds, or geographic areas deemed necessary by the department to protect other aquaculture facilities and the aquatic plants and animals of the State.

(8) Q Diseases. Diseases for which there is so little information they cannot be given a permanent classification.

(c) Disease Categories. The diseases of concern are grouped in four categories as to their seriousness and the specific action to be taken when diagnosed.

(1) Significant Diseases. On identification by a fish pathologist and confirmation, if requested, of any of these diseases, the director shall immediately consult, by phone if necessary, with the Aquaculture Disease Committee, and shall impose an immediate holding action, other holding action, or no restrictions as the director in consultation with the Aquaculture Disease Committee may deem necessary.

(A) Furunculosis (Aeromonas salmonicida).
(B) Enteric Redmouth (ERM) (Yersinia ruckeri).
(C) Vibriosis (Vibrio sp.)
(D) Copepod (Genera Lernaea, Salmincola, and Ergasilus).
(E) Golden Shiner Virus.
(F) Oyster Fungus Disease (Labyrinthomyxa marina).
(G) MSX Oyster Disease (Minchinia nelsoni).
(H) Ichthyophonus (Ichthyophonus hoferi).

(2) Serious Diseases. On identification by a fish pathologist of any of these diseases, the director shall immediately consult, by phone if necessary, with the Aquaculture Disease Committee, and shall impose an immediate holding action until confirmation, if requested, is obtained; then the action will be disposal or other holding action the director in consultation with the Aquaculture Disease Committee may deem necessary, as specified in the compliance agreement.

(A) Infectious Hematopoietic Necrosis (IHN).
(B) Ceratomyxosis (Ceratomyxa shasta).
(C) Bacterial Kidney Disease (Renibacterium salmoninarum).
(D) Pleistophora ovariae.
(E) Proliferative Kidney Disease (PKD).
(F) SSO (Minchinia costalis).
(G) Microcell disease of oysters.

(3) Catastrophic Diseases. On identification by a fish pathologist of any of these diseases, the director shall immediately consult, by phone if necessary, with the Aquaculture Disease Committee, and shall impose an immediate holding action until confirmation, if requested, is obtained; then other holding action, disposal, and eradication shall be required, as specified in the compliance agreement.

(A) Viral Hemorrhagic Septicemia (VHS), Egtved Virus.
(B) Infectious Pancreatic Necrosis (IPN).
(C) Channel Catfish Virus Disease (CCVD).
(D) Whirling Disease (Myxosoma cerebralis).

(4) Q Diseases. On identification by a fish pathologist and confirmation, if requested, of any of these diseases, the director shall immediately consult, by phone if necessary, with the Aquaculture Disease Committee, and shall impose an immediate holding action pending determination of a course of action for diseases in this classification.

(A) Viral Erythrocytic Necrosis (VEN).
(B) Herpesvirus salmonis (HPV).
(C) Spring Viremia of Carp (Rhabdovirus carpio).
(D) Edwardsiella ictaluri.
(E) Denman Island Disease of Oysters.

(d) Aquatic Diseases and Host Organisms. Pursuant to Section 1650 of the Fish and Game Code, the commission has compiled a list of diseases and parasites and the aquatic plants and animals they are known to infect or parasitize. Infected plants or animals are considered detrimental to the aquaculture industry and to wild stocks of aquatic plants and animals.

Disease	Host
1. Viral Hemorrhagic Septicemia (VHS)	Rainbow trout
2. Infectious Pancreatic Necrosis (IPN)	Salmonids
3. Channel Catfish Virus (CCVD)	Channel catfish
4. Whirling Disease - Myxosoma cerebralis	Salmonids, tubifex
5. Infectious Hematopoietic Necrosis (IHN)	Salmonids
6. Ceratomyxosis - Ceratomyxa shasta	Salmonids
7. Bacterial Kidney Disease - Renibacterium salmoninarum	Salmonids
8. Pleistophora ovariae	Golden shiner, fathead minnow
9. Proliferative Kidney Disease (PKD)	Salmonids
10. SSO - Minchinia costalis	Oyster
11. Microcell Disease of Oysters	Oyster
12. Furunculosis - Aeromonas salmonicida	All fin fish
13. Enteric Redmouth (ERM) - Yersinia ruckeri	Salmonids
14. Vibriosis - Vibrio sp.	All fin fish
15. Copepod (Genera: Lernaea, Salmincola, and Ergasilus)	Freshwater fin fish
16. Golden Shiner Virus	Golden shiner
17. Oyster Fungus Disease - Labyrinthomyxa marina	Oysters

18. MSX Oyster Disease - *Minchinia nelsoni*	Oysters
19. Ichthyophonus - *Ichthyophonus hoferi*	All fin fish
20. Viral Erythrocytic Necrosis (VEN)	Marine and anadromous fin fish
21. *Herpesvirus salmonis* (HPV)	Rainbow trout
22. Spring Viremia of Carp - *Rhabdovirus carpio*	Carp
23. *Edwardsiella ictaluri*	Channel catfish
24. Denman Island Disease of Oysters	Pacific oyster

STATE OF CALIFORNIA
DEPARTMENT OF FISH AND GAME

APPLICATION FOR LEASE OF STATE WATER BOTTOMS FOR AQUACULTURE

Applicant Name: _____ Phone No. ( ) _____

Address: _____

_____

_____

Aquaculture Registration No. _____ Expiration Date _____

Species of plants or animals to be cultured:

Application is hereby made to the Fish and Game Commission of the State of California for a lease of State water bottoms in the area described in the attached exhibit entitled "Exhibit A-Legal Description", and as shown on the map attached hereto marked "Exhibit B". Each exhibit bears the name of this applicant. Such lease will be for the purpose of aquaculture involving the species designated above. In support of this application, the applicant hereby submits the following explanation of the type of operation and cultural practices to be employed:

A. Purpose of operation - research and development or production.

B. Plan of development and proposed production schedule.

C. Type of cultural method(s) to the employed; bottom, longline, buoyed habitats, etc.

D. Department of Health Services growing water classification; approved, conditionally approved, prohibited, restricted or unclassified.

(Attach additional sheets for detailed explanation)

Date: _____ Signed(X) _____

_____

(See instructions on the back)

1. Prepare application form in duplicate and send to Fish and Game Commission, 1416 Ninth Street, Sacramento, California 95814.

2. Attach a legal description marked "Exhibit A" and a map in duplicate marked "Exhibit B" to the application. The name of the applicant should be clearly shown on both the legal description and the map. The map must reflect the legal description of the lease area in the application, must show the acreage (or square footage if less than one acre) and be in a form acceptable for recording in the county(ies) in which the requested lease is located. Ties to monuments of record, the scale of the drawing, and where available, high and low tide lines should be shown. The nearest public access should be shown or the route of proposed access to the lease area from the nearest public access to the lease area described.

3. The application must show the name of the applicant and indicate whether a single ownership, a partnership, or a corporation.

4. The application must be dated and signed below the name indicated. The title of the person(s) signing the application should be shown. If a single ownership, the title "Owner" should be shown. If a partnership, all the partners' names should be shown, and the application should be signed by at least one "general partner." If a corporation, the duly authorized "Corporation Officer(s)" must sign their title(s) shown.

5. Appropriate fee must accompany the application. The present law requires that $100.00 be remitted with the application. Payment may be made by check or money order. Do not send cash in mailing the application to the State.

6. Assistance in completing and filing this application may be obtained from the Marine Resources Branch of the Department of Fish and Game, 1416 Ninth Street, Sacramento, California 95814, or from Marine Resources Region offices at 245 West Broadway, Long Beach, California 90802, or 411 Burgess Drive, Menlo Park, California 94025.

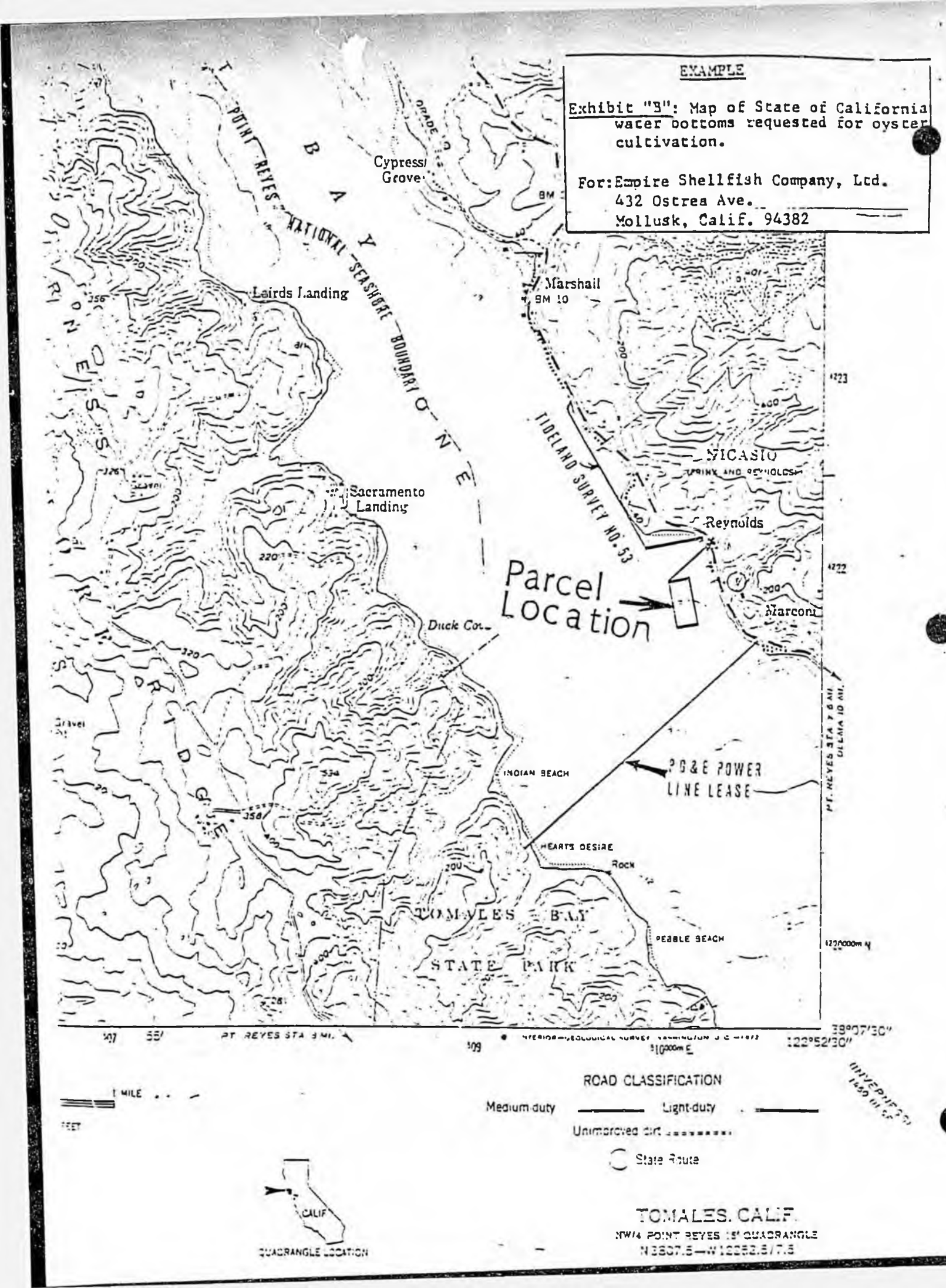
EXAMPLE

EXHIBIT A

Legal description of the proposed water bottom lease for cultivation of oysters by Empire Shellfish Company, Ltd.

LOCATION

In Tomales Bay, Marine County, State of California, starting from the "Bench Mark 9" located at approximately 38° 8' 53" North latitude and 122° 52' West longitude on the Tomales quadrangle, California Marin County 7.5 minute series, Topographic, U.S. Dept. of the Interior, Geological Survey; South 45° West, 1000' to the point of beginning, then South 12° East, 800' then North 78° East, 400', then North 12° West, 800', then South 78° West, 400' to the point of beginning; containing an area of 8 ± acres.


EXAMPLE
Exhibit "B": Map of State of California water bottoms requested for oyster cultivation.
For: Empire Shellfish Company, Ltd.
432 Ostrea Ave.
Mollusk, Calif. 94382
POINT REYES NATIONAL SEASHORE BOUNDARY ONE
B A Y
Cypress Grove
Marshall
BM 10
Lairds Landing
Sacramento Landing
TIDELAND SURVEY NO. 53
Reynolds
Parcel Location
Marconi
Duck Cove
INDIAN BEACH
PG&E POWER LINE LEASE
HEARTS DESIRE
Rock
TOMALES BAY
STATE PARK
PEBBLE BEACH
PT. REYES STA 7.6 MI.
DILLON BEACH 10 MI.
PT REYES STA 3 MI.
38°07'30"
122°52'30"
ROAD CLASSIFICATION
Medium-duty
Light-duty
Unimproved dirt
State Route
1 MILE
CALIF
QUADRANGLE LOCATION
TOMALES, CALIF.
NW/4 POINT REYES 15' QUADRANGLE
N3807.5—W12252.5/7.5

NOTE: A separate application form must be completed for each location registered.

Registration no. _____
Date issued _____
Issued by _____
Office _____

State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

APPLICATION FOR AQUACULTURE REGISTRATION
Pursuant to Sections 15000-15803 of the Fish and Game Code

Name of business: _____ Phone no. ( ) _____

Owner's name(s): _____

Mailing address: _____
Street or P. O. Box City Zip code

Address of facility: _____
(or plant) Street City Zip code

Species to be maintained (use only approved names): _____

_____

_____

Location of facility to be registered: County: _____

FOR FRESHWATER AQUACULTURE, FILL OUT THE FOLLOWING SECTION

Nearest town _____ Road or highway _____

Township _____ Range _____ Section _____

Name and describe fully the source from which water is obtained, and the location and type of diversion _____

_____

Attach a sketch showing arrangement of ponds and points at which inlet and outlet are screened. (SEE REVERSE SIDE)

FOR SALTWATER AQUACULTURE, FILL OUT THE FOLLOWING SECTION

Our cultivation areas are located as follows: (Please indicate whether State-leased or private)

Bay or area	Lot numbers or descriptions

General description of kind of work or business engaged in (please check ALL appropriate boxes)

_____research and development _____private consumption/use _____fishout ponds

_____rearing product for sale _____commercial _____noncommercial (no sales)

_____other _____

FG 750 (10/86)

INSTRUCTIONS FOR PREPARING MAPS FOR FRESHWATER AQUACULTURE

1. Give location number of point of diversion.
2. Show the location of the spring or stream, and give name.
3. Show the point of diversion (i.e., the point at which water is to be taken from the stream or spring).
4. Show location of the main ditch or pipeline and points where screened.
5. Indicate clearly the proposed place of use of the water. For ponds, show the number and location of each. (See sketch below.)

(EXAMPLE)

Township 25N Range 1W Section 6

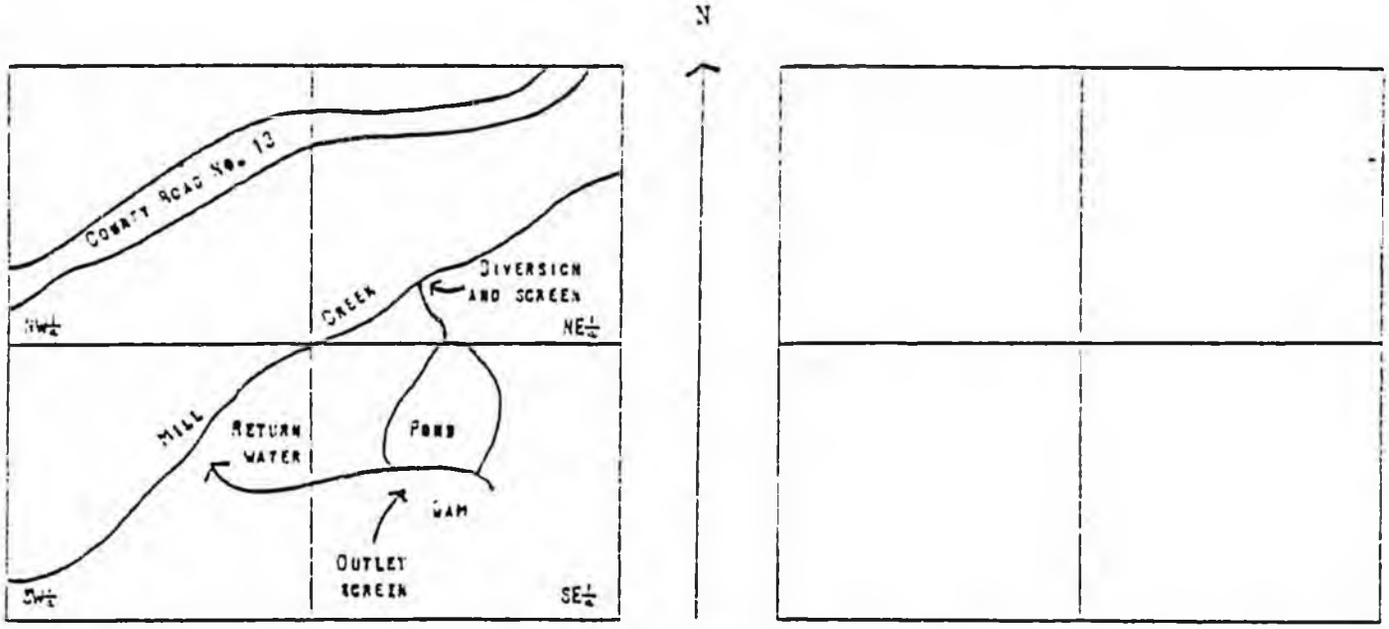
_____ 1/4 _____ 1/4

_____ Base and meridian

Township _____ Range _____ Section _____

_____ 1/4 _____ 1/4

_____ Base and meridian



Section 6 NW¼

I have read the Fish and Game Commission regulations governing registered aquaculturists and Sections 15000 through 15803 of the Fish and Game Code, and will operate in conformity with them.

Signed _____ Title _____ Date _____
(if a company)

NOTE: There is a $100.00 registration fee for each company registering their facilities, regardless of the number of locations. On receipt of $100.00 and completed registration applications, and if all applicable provisions of the Fish and Game Code and the Fish and Game Commission regulations have been complied with, certificate of registration will be issued.

Inspected by _____ Approved by _____

Date _____ Date _____

Canada draft regulations for Aquaculture

JANUARY 9, 1987

FINAL DRAFT

DEPARTMENT OF FISHERIES AND OCEANS

[illegible] DRAFT

FOR DEVELOPMENT AND OPERATION OF AQUACULTURE FACILITIES

The Department of Fisheries and Oceans Canada

Pacific Region

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE

Aquaculture - the farming and husbandry of marine and freshwater plants and animals is a rapidly expanding industry in B.C. The recent growth in the industry has placed new demands on both freshwater and marine environments which may be incompatible with existing resource uses. The characteristics which make sites attractive for aquaculture purposes are often the same characteristics that make these areas productive fish habitat or important fishery areas: with the increased demand for aquaculture sites and the potentially significant impacts which can result from intensive culturing and processing activities, the likelihood of resource conflicts and impacts increases.

The Department of Fisheries and Oceans maintains that an aquaculture industry can be developed in British Columbia in conjunction with continued maintenance of wild fisheries provided that great care is taken to ensure that aquaculture facilities are properly sited. These guidelines have been developed by the Department of Fisheries and Oceans (DFO) to prevent or minimize impacts to wild fish and fish habitats and to avoid conflicts between aquaculture and fishery activities by outlining requirements for siting, development, operation, and abandonment of freshwater and marine salmon culture and processing operations.

While these guidelines pertain specifically to hatcheries, seapens, and processing facilities, other culture activities (Table 1) also may have significant impacts, and individuals are therefore advised to contact the local DFO offices for information regarding requirements which pertain to their proposed operation.

TABLE 1 - Culture Techniques and Facilities for Shellfish, Finfish and Marine Plants

Molluscs/Crustaceans/Marine Plants	Finfish
- bottom culture	- freshwater hatcheries
- offbottom line or raft culture	- freshwater impoundments
- impoundments (pens or cages)	- instream incubation
- marine hatcheries	- land based seawater rearing facilities
	- marine impoundments

1.2 ENVIRONMENTAL IMPACTS

The Department of Fisheries and Oceans is concerned that salmon culture and processing operations proceed in such a manner that they do not negatively impact on other fisheries resources or fish habitats.

Hatcheries and other land-based operations have the potential to [illegible] pollute freshwater and discharge waste concentrations and amounts of nutrients to the marine environment adjacent to [illegible] enhances.

Salmon net pens, unless located properly, may cause smothering of valuable fish habitats such as herring spawning substrates, geoduck beds or intertidal clam or oyster beds. Net pens may attract juvenile wild salmon and herring in the vicinity of migration routes resulting in predation on the small fish by penned stocks or disease transfer between wild and cultured fish. Salmon in pens may also attract predators such as otters, seals or sealions and birds; these animals are often harassed, injured and sometimes illegally destroyed by salmon farmers anxious to protect their fish.

Less obvious, but also potentially harmful are the effects of antifoulants used on nets on adjacent shellfish and fish resources. Although research on this topic is still preliminary, initial indications are that oysters accumulate chemicals used to treat the nets with the result that their rate of growth is reduced and their flesh is rendered poisonous or unpalatable. No research on antifoulant accumulation in farm fish flesh is available yet, but this may also be of concern to potential farmers.

Finally, when antibiotics are administered to cultured fish, what effects do the often major additions of disease treatment chemicals have on the surrounding environment? Could the antibiotics eventually result in treatment-resistant strains of certain pathogens previously not encountered by wild fish stocks in the vicinity? This may be a very real and dangerous possibility.

It is for these reasons that the following guidelines have been developed. Many of these concerns and impacts can be minimized or avoided by: carefully selecting sites, mitigating or preventing impacts associated with site development and adopting appropriate operational or abandonment procedures.

1.3 LEGISLATIVE MANDATES AND RESPONSIBILITIES

The Department of Fisheries and Oceans (DFO) has jurisdictional responsibility for management of coastal and inland fisheries, fish health protection, product quality for exported fish and fish products, and protection of fish and marine mammals and their associated habitats.

The Department of the Environment, Conservation and Protection, Environmental Protection (EP) shares responsibility with DFO for Section 33 of the Fisheries Act which deals with water quality. In addition, EP is also responsible for classifying shellfish growing waters on the basis of sanitary quality.

The legislative mandates of DFO and EP which pertain to aquaculture are based on a number of federal statutes, regulations and international agreements which have been listed in Appendix I.

The guidelines presented herein have been developed pursuant to these legislative mandates and reflect D O and F P requirements for protection of existing fish and shellfish resources, their habitats and the fisheries they support.

These guidelines are not, however, intended to address requirements of other federal, provincial and municipal agencies who also have jurisdiction for aspects of aquaculture development.

II AQUACULTURE LICENCE

An Aquaculture Licence will be issued to an applicant when, in the opinion of the Director General, Fisheries and Oceans, the facility does not violate or constitute a potential violation of federal regulations respecting (i) conservation and protection of fish, (ii) obstruction and pollution of waters frequented by fish, (iii) conservation and protection of spawning grounds and fish habitat and (iv) fish health protection.

The conditions of the Aquaculture Licence try to anticipate environmental and disease problems which might negatively affect both the wild fishery resource and habitat and the aquaculture venture, and they are structured to prevent or minimize such negative affects. The Aquaculture Licence signifies that a preliminary review of the site suggests that culture of fish, as proposed at the site, should result in minimal problems unless specified. The Aquaculture Licence is not a site certification; the Department of Fisheries and Oceans accepts no liability. An Aquaculture Licence may be modified, suspended or cancelled at any time when (a) the licence holder fails to comply with the terms and conditions of that licence, (b) aquaculture facilities under licence are found to have significant adverse effect on fish stock or fish habitat, or (c) any disease or disease organism that poses a hazard to fish stocks or adjacent aquaculture facilities is not reported to the Director General of Fisheries and Oceans. The licence is issued by the Department of Fisheries and Oceans for a one year term and it is renewable upon application. Currently there is no fee attached to the licence.

2.1 LICENCING PROCEDURES

: the applicant must submit an application for an Aquaculture Licence and a document establishing that all requisite approvals for a licence have been obtained or that the terms and conditions of the aquaculture licence held by the applicant in the preceding licence year have been complied with.

2.2 LICENCE ELIGIBILITY

: persons who

a obtain approval from the Department of Fisheries and Oceans for the net pen site or the hatchery site. - Note: approval would depend on meeting current Department of Fisheries and Oceans guidelines - See Sections III and IV, Siting Criteria.

(b) obtain, where applicable, the following from the Province - For salmon net pens:
- approval of a fish production plan for an aquaculture enterprise (Ministry of Environment and Parks);
- Crown Land tenure (Ministry of Forests and Lands);
For hatcheries:
- a water licence (Ministry of Environment and Parks);
- a waste management permit (Ministry of Environment and Parks);
- a provincial Commercial Fish Culture Permit (Ministry of Environment and Parks).

(c) receive Navigation Compliance from Department of Transport under Navigable Waters Protection Act

2.3 TERMS AND CONDITIONS

The following terms and conditions are presently included in the Aquaculture Licence issued by the Department of Fisheries and Oceans:

(a) the area and location of the aquaculture facility;
(b) the species of fish or eggs cultured
(c) the manner of disposing of any ailing or dead fish from the aquaculture enterprise;
(d) the reporting of fish diseases, drugs used and mortalities incurred;
(e) the transporting of live eggs or fish;
(f) the submission of commercial fish farm annual reports;
(g) compliance with Fish Health Protection Regulations;
(h) other terms or considerations that may be deemed necessary for the facility being licenced.

The following terms and conditions may be included in Aquaculture Licences:

(a) capture of brood stock;
(b) reporting of chemicals utilized;
(c) the size of and/or number of net pens, rafts or hatcheries being licenced.

2.4 LICENCE FEATURES

: the licence may be issued to an individual, company or corporation (referred to as the licencee) - in the case of a company or corporation, documents establishing company or corporate status must be provided together with a list of signing officers and specimen signatures (annually).
: the licencee is responsible for ensuring compliance with all terms and conditions of the licence.
: an aquaculture enterprise licence shall be valid from date of issue to December 31 of the licence year.
: a person may be issued a renewal licence annually, upon application.

: eligibility for a licence may be revoked or the licence cancelled for failure to comply with the terms and conditions of the licence or for failure to comply with the Fisheries Act and regulations made thereunder.

: a licence may not be transferred to another person without prior approval of the Department of Fisheries and Oceans

III MARINE FISH REARING FACILITIES

3.1 ENVIRONMENTAL ASSESSMENT

An environmental assessment must be completed for every potential net pen site as outlined in the Department of Fisheries and Oceans Aquaculture Licence Application to assess sensitivity and suitability of sites. Additional information may be required including descriptions of current patterns, sub-tidal vegetation mapping, invertebrate surveys and pre-installation water quality. Where sites are deeper than 20 metres, a SCUBA assessment would not normally be required. A complete description of information required for the purpose of evaluating marine aquaculture facility proposals appears in Appendix II.

3.2 SITING CRITERIA

(i) A finfish pen farm will be located no closer than a 1 km radius from the mouth of a stream populated by anadromous fish, to minimize disease transmission concerns and to protect highly sensitive estuarine fish habitat. Coastal areas adjacent to stream mouths and their estuaries are considered to be sensitive because of the concentrations of juvenile and adult salmon in their vicinity at various times of the year, the possible susceptibility to disease during saltwater/freshwater acclimation periods, and potential for disruption of residency, holding or migration behaviour patterns. The chemical storage characteristics of estuary deltas are documented and mechanisms may also exist for pathogen cycling. Isolation of pen sites from stream mouths may also protect farmed stock from river water transported disease arising out of the decay of wild stock carcasses. Distances may be increased depending on wild fish populations.

Facilities within a 5 km radius of such streams must have prior approval of the Federal/Provincial Transplant Committee and may require additional specific studies as per Appendix II.

The zero tideline will be the start of the stream mouth for measurement purposes. A net pen farm is an operation under a single licence of occupation or a foreshore lease issued under the Provincial Lands Act.

(ii) A finfish net pen must be located so as to provide a minimum of 30 metres clearance from the edge of the approach channel to a Small Craft Harbour, Department of Fisheries and Oceans wharf or dock.

(iii) A marine [illegible] will not be located within 125 metres of molluscan [illegible] recreational, native food fish or [illegible] within 125 metres of existing molluscan [illegible] this restriction is to prevent

contamination of molluscs and is to safeguard health to humans. Salmon farms have the potential to transfer pathogenic organisms and chemicals to shellfish.

(iv) Net pen facilities must have a minimum of 5 km distance between the lease boundaries, to minimize risk of disease transfer. Maximizing distances between facilities is also advisable to minimize potential cumulative water quality impacts.

(v) Net pens shall not be located over or near areas of sensitive fish habitat as defined by Section 31(5) of the Fisheries Act. This includes spawning, rearing, food supply and migration areas upon which fish and shellfish depend directly or indirectly to carry out their life processes.

The rapid expansion of salmon farms and other mariculture operations on the Pacific coast has raised concerns about possible environmental impacts on herring spawning areas. There are also concerns about impacts on herring roe-fishery sites which occur mainly in the vicinity of spawning areas. Salmon farms and herring could interact in several ways. Organic waste from netpens could contaminate nearby spawning locations and force herring to spawn in other secondary locations or it could jeopardize egg survival after spawning. Alternately, herring will spawn on fishing nets and netpens, and heavy egg deposition on salmon netpens could be deleterious to fish farm operators. Some diseases may be transmitted between wild herring stocks and salmon in farms. Further, if netpens were located in the vicinity of near-shore herring gillnet fisheries, there could be mutual gear interference during the fishing season.

(vi) Net pens shall not be located or anchored in an area with a depth less than 10 metres at zero tide to minimize impacts on sensitive, productive littoral fish habitats. In addition, there must be a minimum of two metres between bottom of net pen and sea bottom.

(vii) Net pens or fish rearing facilities will not be located in areas where they would directly interfere with important commercial, recreational or native food-fish fisheries. These fisheries include seine tie-up spots, gillnet drift areas, trap fishing areas, traditional trawl sites, bivalve shellfish beaches and areas of sport fish activity.

3.3 OPERATIONAL REQUIREMENTS

(i) Monitoring of Approved Net Pen Operations

Pursuant to Section 7(1) of the Fisheries Act authorizing net pen operations, it is required to provide the Department with

information on substrate quality, water quality, amount of feed used or other information on a site specific basis. Appendix II Section 2 identifies operational information requirements for all net pen operations, whereas Section 3 outlines information which may be required in a monitoring program.

(ii) Clean-up of Substrate and Disposal of Dead Fish

a. Waste deposits under net pens cannot be discharged from the site without review and approval from the Department of Fisheries and Oceans and the Environmental Protection Service, Department of Environment.

b. No dead cultured fish or offal may be disposed of at sea. All dead cultured fish or offal must be disposed in a manner acceptable to the Waste Management Branch and the Department of Fisheries and Oceans e.g., landfill site and incineration. This regulation is for disease control purposes.

(iii) Predator Control

No person shall destroy seals or sea lions without a special permit issued by the Minister of Fisheries and Oceans. In addition, other predators such as herons, kingfishers, gulls, terns, mink and otters which are attracted to fish farms may not be indiscriminately shot or trapped; they are protected species.

(iv) Feed

No person shall collect marine plants or animals (including euphausids) for fish food by any means unless the appropriate permits or licences have been obtained.

(v) Herring Spawn on Net Pens

In accordance with Section 30 of the Fisheries Act, any net upon which herring have spawned may be removed from the pen but it must remain suspended in the water column until such time as hatching of eggs is completed.

(vi) Reporting on Fish Mortalities and Treatments Used

Refer to Pacific Region Fish Health Policy, Section 6.7.

(vii) Fish Health Report

Annual health report shall be submitted by January 31st to the Transplant Committee - refer to Pacific Region Fish Health Policy, Section 6.7.

(viii) Fish Encroachments

No fish shall be released deliberately from the licensed facility into Canadian waters. Any inadvertent release of fish shall be immediately reported by the Licensee to the appropriate Area Manager, Fisheries Operations Branch, Department of Fisheries and Oceans, followed by the full written account of the inadvertent release. Any fish that escape the net pens or are released become part of the common property resources. Fish releases will be considered cause for non-renewal of the Aquaculture Licence.

(ix) Movement of Fish

The transport of live seawater-reared salmonids, their eggs or milt must be approved by the Transplant Committee. A copy of the Committee's Transplant permit must accompany each shipment. No fish shall be allowed to escape during transport and no dumping of dead fish en route is permitted. All dead fish must be disposed of in an approved manner.

3.4 ABANDONMENT REQUIREMENTS

All nets, in-water structures, fuel tanks or chemical storage containers must be removed from the site immediately upon cessation of the operation. Any live fish must be moved to a location or facility that has received prior approval from the Transplant Committee.

IV LAND BASED FACILITIES

4.1 ENVIRONMENTAL ASSESSMENT

(i) Applicants for hatcheries must provide information pursuant to Section 33.1(1), of the Fisheries Act. This will require that the applicant provide information on water supply requirements, anticipated effluent quality and quantity, location of intakes, outlets and sanitary facilities and any filling, dyking or stream bank protection work required as outlined in the Department of Fisheries and Oceans Licence Application. A complete description of information required for the purposes of evaluating proposed hatchery facilities appears in Appendix II.

4.2 SITING CRITERIA

(i) No privately operated freshwater fisheculture facility may discharge effluent within a 5 km radius of the mouth of a stream supporting anadromous species unless prior approval of the Transolent Committee has been received.

(ii) Water intakes should not be located within wild stock salmon and trout spawning beds, and must meet all current requirements for screening as described in the most recent revision of the Departmental Screening Guidelines. Special siting and screening provision may be specified for marine intakes.

(iii) No new facility for culture of chinook, steelhead or rainbow trout may be established where sockeye or kokanee are present in the hatchery water supply for disease prevention reasons.

(iv) No outfall from a private hatchery will be allowed within an upstream distance of 5 km of a publicly funded fish culture operation unless effluent is treated in a manner acceptable to the Department of Fisheries and Oceans.

(v) No private hatchery will be allowed upstream of a publicly funded hatchery designated as a major facility.

(vi) It is recommended that a 10 m natural vegetation leave strip be maintained adjacent to all streams and flood channels as it is recognized as important fish habitat and may also serve to protect the site from erosion.

4.3 OPERATIONAL GUIDELINES

(i) Monitoring of approved hatchery operations

Pursuant to Section 33.1 of the Fisheries Act, hatchery operations may be required to conduct routine effluent and receiving water monitoring programs. Appendix III Section 2 identifies operational requirements for all hatchery facilities.

whereas Section 7 outlines information which may be required in a monitoring program for information which may be required.

(ii) No effluent may be discharged directly onto salmonid spawning grounds. Effluent discharged to salmonid streams must be treated in a manner acceptable to the Department of Fisheries and Oceans. Settling ponds with sludge removal provision or isolation of tank cleaning wastes will normally be required for direct discharges.

(iii) No facility shall culture sockeye with any other salmonid species.

(iv) No modifications may be made to intake or discharge facilities or volumes without prior review and approval by the Department of Fisheries and Oceans.

(v) All discharges must be screened to prevent escapes or entries of fish.

(vi) No dead fish may be disposed of in the aquatic environment. All dead fish must be disposed of in a manner acceptable to the Waste Management Branch and Department of Fisheries and Oceans. e.g. landfill site, incineration.

(vii) All fish mortalities, drugs, chemicals and vaccines used must be reported.

Refer to Pacific Region Fish Health Policy, Section 6.3 and operational reporting requirement sections of Appendix II and III.

(viii) An annual fish health report shall be submitted by January 31st to the Transplant Committee. Refer to Pacific Region Fish Health Policy, Section 6.3.

(ix) Reporting of Fish Escapements

No fish shall be released deliberately from the licenced facility into Canadian waters and any release of salmon shall be immediately reported by the Licensee to the Appropriate Area Manager, Fisheries Operation Branch, Department of Fisheries and Oceans, followed by a full written account of the inadvertent release. Fish releases will be considered cause for non-renewal of the Aquaculture Licence.

x Movement of Fish

No transport of live freshwater reared salmonids or eggs must be approved by the Transplant Committee. A copy of the Committee's transplant permit must accompany each shipment. No

replenishing or discharge of water is permitted. All dead fish must be disposed of in an approved manner. No dumping of dead fish en route is permitted.

(xi) Fish Eggs Used

Fish eggs utilized in this licenced facility or location shall be obtained from broodstock determined to be free of the following diseases by techniques acceptable to the Department of Fisheries and Oceans:

a) Chinook salmon and rainbow trout

- any filterable replicating agent capable of causing cytopathological effects in tissue culture cells
- bacterial kidney disease (BKD)
- any infectious agent which may be deemed to be a threat to wild stocks or other cultured stocks.

b) Coho salmon

- bacterial kidney disease (BKD)
- any infectious agent which may be deemed to be a threat to wild stocks or other cultured stocks.

c) Atlantic salmon

- refer to Federal-Provincial Policy for Importation of Live Salmonids into British Columbia, Section VII.

(xii) Surplus eggs from federal hatcheries may only be distributed to approved hatcheries with current licences. Approvals and licenses must be in place by September 30 of any given year.

(xiii) Private hatcheries which do not meet current guideline requirements may be requested to achieve compliance in those areas that are deficient within a one year period from date of notification. If compliance is not achieved, licenses may be suspended which would affect future access to surplus eggs from federal hatcheries.

(xiv) No person may sell surplus eggs originally received from federal hatcheries to a private hatchery that is not currently licensed, at risk of suspension of their own license.

4.4 DECOMMISSIONING REQUIREMENTS

All intakes and outlets must be sealed and all fuel tanks, fish supplies, pharmaceuticals and toxic chemicals must be removed from the site upon cessation of the operation.

V FISH INSPECTION AND PROCESSING

5.1 ENVIRONMENTAL ASSESSMENT

An environmental assessment may be required for proposed facilities. A complete description of information required for the purpose of evaluating marine fish processing proposals appears in Appendix II.

5.2 SITING CRITERIA

Processing facilities shall not be located over or near areas of sensitive fish habitat as defined by Section 31(5) of the Fisheries Act. This includes spawning, rearing, food supply and migration areas upon which fish and shellfish depend directly or indirectly to carry out their life processes.

5.3 FISH HANDLING AND PROCESSING REQUIREMENTS

Farm fish and wild fish are treated equally under the processing requirements of both the Federal and Provincial Fish Inspection Regulations. Due to a higher incidence of diseases in farmed fish it is proposed that this be changed and farmed fish be processed separately with effluent treatment to reduce disease risks to wild fish. Processing includes cleaning, filleting, icing, packing, canning, freezing, smoking, salting, cooking, pickling, drying or preparing fish for market in any other manner.

When handling or processing farmed fish, the requirements of the Fish Health Protection Regulations must also be met. Section 4 of these regulations state that live and fresh cultured salmonids crossing a provincial boundary must be from a facility inspected and found to be free of certain named diseases.

(i) Bleeding of live fish on site: The fish farmer may stun and bleed his own fish by cutting the gills prior to delivery for processing. The fish must, however, not be dressed or otherwise cut. There must be no direct discharge of liquid effluent (e.g. blood and slime) or disposal of solid waste (e.g. gills, dead fish) into the marine or freshwater environment. Direct discharges may become a fish disease vector.

(ii) Processing of fish for interprovincial sales: If the fish are marketed within the province only, the fish must be processed in a provincially registered plant pursuant to Section 14 of the Fish Inspection Regulations of B.C.. Under the fresh and frozen category, processing would include gutting, washing, dressing, grading, freezing and packing.

(iii) Processing of fish for interprovincial or export sales: All fish must be processed in an establishment registered pursuant to Section 15 of the Federal Inspection Regulations. Federal

inspection officers will carry out inspection duties at federally registered facilities only.

Schedules I and II of the Fish Inspection Regulations contain requirements dealing with construction, equipment and operation of registered processing and packing plants. For further information concerning the requirements, you may wish to contact the nearest Field Inspection Office.

5.4 OPERATIONAL REQUIREMENTS

(i) Processing Plant Effluents

A permit from the Waste Management Branch, Ministry of Environment and Parks, is required for any discharge of liquid effluents from processing plants. The quality of processing plant effluents will be determined pursuant to Waste Management Branch pollution control objectives and Environment Canada Fish Processing Guidelines. In addition, the Department of Fisheries and Oceans may require that no effluent water from plant handling cultured fish may be discharged unless effluent is treated in an approved manner to kill infectious agents.

5.5 LIVE TRANSPORT OF FISH

At the present time the Department of Fisheries and Oceans is prepared to authorize live transport of fish from marine net pen facilities to land based processing plants in open or RSW systems. Written approval from the Department must be received.

VI PACIFIC REGION FISH HEALTH POLICY

The Pacific Region Fish Health Policy is an extension of the Fish Health Protection Regulations which are established under the Fisheries Act.

6.1 REASONS FOR FISH HEALTH POLICY

(1) For the protection of the fisheries resource and the aquatic environment.
(2) Possibility of quick spread of infectious agents in aquatic environment.
(3) Development of aquaculture industry.
(4) Primitive state of knowledge of infectious diseases.

This policy will be in addition to the Fisheries Act and other fisheries laws.

The Transplant Committee which is a combined Federal/Provincial fisheries body, is responsible for coordinating fish disease control in the Pacific Region.

This section of the Pacific Region Fish Health Policy applies to finfish only and their transplants as well as the control of fish diseases in all holding, culture and processing facilities in the Pacific Region of Canada (British Columbia and Yukon).

6.2 OBJECTIVES OF FISH HEALTH POLICY

(1) To provide guidelines to managers of fisheries resource and to the aquaculture industry for the control of infectious diseases of fish.
(2) To prevent the introduction of new diseases into the Region.
(3) To protect wild stocks of fish from serious infectious disease and to prevent the spread of infectious diseases among both cultured and wild stocks.
(4) To prevent the escape or release of seriously infected fish and to discourage and finally eliminate the culture of seriously diseased fish.
(5) To improve the health of fish cultured in this Region.

6.3 DISEASES

There are two categories of diseases depending on their seriousness and potential threat.

A. Emergency diseases
These diseases are not treatable and/or are not known to occur in this area.
a. Infectious hematopoietic necrosis (IHN)
b. Infectious pancreatic necrosis (IPN)
c. Viral hemorrhagic septicemia (VHS)

d) Herpes virus salmonis
e) Spring viremia of carp (SVC)
f) Oncorhynchus masou virus (OMV)
g) Any filtrable agent causing cytopathic effects in tissue culture (other than above)
h) Whirling disease
i) Ulcera disease
j) Any infectious agent causing losses in excess of 1%/day for 4 consecutive days

Action:

When any emergency disease or its causative agent is encountered, the Transplant Committee must be informed immediately by telephone.

It is the Transplant Committee's responsibility to spell out actions to be taken which may include destruction of the stock (at the expense of the owner). The Transplant Committee will undertake confirmation of the disease/agent encountered.

For the following diseases, depopulation and sanitation of the facility are mandatory: VHS, IPN, OMV, Herpes virus, Whirling disease and any disease of sufficient seriousness as designated by the Director General (DFO) or Director, Fisheries Branch (B.C. Ministry of the Environment and Parks).

(ii) Serious diseases
a) Bacterial Kidney Disease (BKD)
b) Furunculosis
c) Vibriosis
d) Enteric Redmouth Disease
e) Sea Lice
f) Diseases caused by the Flexibacter/Myxobacterial group
g) Other infectious agents designated by DFO, MOE staff

Action:

When a serious disease is identified on fish, movement and distribution of these fish shall be restricted to the quarantine zone in which the disease occurred. Fish can be moved between zones only when found free of causative agent of an appropriate examination by a person approved by the Transplant Committee. Zones in which fish can move freely will be designated and mapped. In addition, all operators of marine culture facilities must report the occurrences of these disease agents to the Transplant Committee annually on a fish health report.

6.4 INTRODUCTION OF SALMONIDS INTO THE PACIFIC REGION

Refer to Section VII Federal Provincial Policy for Importation of Live Salmonids into British Columbia - Section VII.

6.5 TRANSPLANTS OF FINFISH WITHIN B.C.

(i) There may be no movement or release of fish from a facility or site with a past record of VHS, IPN, whirling disease or any disease with no previous occurrence in the Pacific Region.

(ii) No movement of live fish between zones (see above) is permitted without a permit issued by the Transplant Committee.

(iii) No live fish may be transferred from a population suffering an estimated loss of more than 3%/week.

(iv) Screening of eggs (salmonids only): All eggs for the private industry must be derived from fish that have been screened for diseases in a manner approved by DFO and Ministry of Environment.

(v) Treatment of eggs (salmonids only): All eggs must be surface disinfected before they are moved from the site at which they were collected.

6.6 SITING OF FISH CULTURE FACILITIES

Definition of facility: All fish culture units/containers on a single land use permit, or site as defined in a private or commercial fish culture permit or foreshore lease. (refer Sections 3.2 and 4.2)

(i) General:
No privately operated fish culture facility may be established within a 1 km radius of the mouth of a stream containing anadromous species to minimize disease transmission concerns and to protect highly sensitive estuarian fish habitat.

Coastal areas adjacent to stream mouths and their estuaries are considered to be sensitive because of the concentrations of juvenile and adult salmon in their vicinity at various times of the year, the possible susceptibility to disease during saltwater/freshwater acclimation periods, and potential for disruption of residency, holding or migration behaviour patterns. The chemical storage characteristics of estuary deltas are documented and mechanisms may also exist for pathogen cycling.

(ii) Freshwater:
1. No privately operated facility may discharge effluent into the water supply of a publicly funded facility.
2. Any facility discharging effluent into a stream must be located a minimum of 3 km upstream of a privately owned facility using river water and must demonstrate that such

effluent will not pose a risk to fish of downstream operations.

3) For lake based netpens: there must be a minimum distance of 2 km between facilities or between a facility and any wild salmonid spawning and migrating areas. (Note: this may be revised depending on MOE policy.)

(iii) Seawater:

1) No fish culture facility will be permitted within a 9 km distance (by water) of another operation.

6.7 PROCESSING PLANTS

No effluent from a plant handling cultured fish may be discharged unless effluent is treated in an approved manner to kill infectious agents.

6.8 DISPOSAL OF DEAD FISH AND OFFAL

No dead cultured fish or offal may be discharged into the aquatic environment. All dead fish all offal must be treated in a manner acceptable to the Department of Fisheries and Oceans e.g., land fill site, incineration, etc.

6.9 DIET OF FISH

No unprocessed fish products of the same family should be used in the diet of cultured fish e.g., dead salmon should not be fed to cultured salmon.

6.10 CO-CULTURE OF SPECIES

(i) No facility shall culture sockeye and kokanee with any other salmonid species. This prohibition is necessary to prevent spread of IHN to other species in a culture situation.

(ii) No new facility for culture of chinook, steelhead or rainbow trout may be established where sockeye or kokanee are present in the hatchery water supply.

6.11 REPORTING OF FISH DISEASES

An annual fish health report must be completed listing all diseases encountered and treatments utilized.

VII FEDERAL-PROVINCIAL POLICY FOR THE IMPORTATION OF LIVE SALMONIDS INTO BRITISH COLUMBIA

In recognition of the commercial and recreational value of wild and cultured native salmonid stocks in British Columbia and the Yukon Territory, it is essential to protect their genetic integrity and freedom from exotic diseases.

Therefore, no importations of fish belonging to the family Salmonidae will be authorized by Federal or Provincial fisheries management agents which are not in compliance with this policy, effective on date of signing.

7.1 GENERAL

(i) Approved importation of live salmonids must comply with the Canadian Fish Health Protection Regulations (CFHPR).

(ii) Only surface-disinfected, fertilized eggs will be imported. No live fish or unfertilized eggs or milt will be allowed.

(iii) Only Atlantic salmon (*Salmo salar*) and non-anadromous rainbow trout (*Salmo gairdneri*) will be considered for importation.

(iv) Importation of rainbow trout will be considered only from Canada and continental U.S.A.

(v) As of April 1, 1987, egg imports will be limited to 100,000 eggs per year per licence and allowed only from brood stock that has been held at the source facility (hatchery and sea pen), separate from other stocks for one full generation.

7.2 ATLANTIC SALMON

(i) No direct importation of Atlantic salmon eggs will be permitted from continental Europe, from the southern hemisphere, or from countries where viral hemorrhagic septicemia (VHS) is known or suspected to occur. Importation will be considered only from sites that (i) a Canadian Local Fish Health Officer has approved after a site inspection; (ii) can demonstrate a thorough record of disease history to the satisfaction of Canadian Local Fish Health Officer; (iii) can document and demonstrate a fish-free water supply system; and (iv) can document and demonstrate the capability of the physical plant to isolate stocks and prevent disease transfer between stocks.

(ii) Importation of Atlantic salmon eggs will be for the purpose of developing aquaculture brood stocks in British Columbia. Importers must propose a number or percent of fish to be held to maturity for reproduction and collection of sex products and demonstrate progress and intent to establish brood stocks.

(iii) Consideration for import will be given particularly to stocks that are demonstrably adapted for commercial aquaculture net-pens, assuming that all other conditions are met.

(iv) After March 31, 1989, no further imports of Atlantic salmon eggs will be permitted.

(v) All Atlantic salmon must be held under strict quarantine (see 7.4).

7.3 LIVE SALMONIDS RESEARCH

(i) Notwithstanding sections 7.1 and 7.2, exceptions may be permitted for such activities as research or brood stock development and improvement when work is to be conducted under strict supervision of government fisheries agencies. Approval for exceptions must be obtained from the Director General, Pacific Region, Department of Fisheries and Oceans and the Director, Fisheries Branch, British Columbia Ministry of Environment and Parks.

7.4 ATLANTIC SALMON QUARANTINE CONDITIONS

(i) Prior to the arrival of any eggs, a quarantine facility must be inspected and approved by designated government personnel according to the following conditions as judged by the designated Fish Health Officer.

The quarantine facility must:
a) be an adequately enclosed area, physically separated from any other hatchery operation;
b) have restricted access;
c) have approved facilities for disinfection of effluent

(ii) All eggs and resultant fish must be held in quarantine for a minimum of 12 months after arrival.

(iii) All stocks in the initial year and thereafter all stock kept for brood stock must be inspected and sampled according to the CFHPR Manual of Compliance. Fish must be sampled 3 times in their quarantine and once just after transfer to salt water. Brood stock must be sampled at maturity.

(iv) Destruction of the stock by prescribed means will be required if any disease listed in Schedule II of the CFHPR is detected. Also detection of any other disease designated by Federal and Provincial fisheries management agencies may lead to the same requirement for stock destruction or to further quarantine of stock.

(v) Failure to comply with importation or quarantine conditions will result in suspension of the Commercial Fish Farm Licence of the facility.

7.5 MARINE REARING OF FIRST GENERATION ATLANTIC SALMON

(i) First generation Atlantic salmon hatched from imported eggs shall be confined to marine net pens:
   a) at the Pacific Biological Station
   b) in Jervis Inlet and associated bays and inlets east of its mouth; and,
   c) coastal waters between Latitudes 50° and 51° EXCEPT Broughton and Johnstone Straits and Discovery Passage and waters within 5 km of them.
   Such movements from hatchery to salt water will be by Federal-Provincial Transplant Committee approval only.

(ii) Second generation Atlantic salmon, whose parents are disease free, may be transplanted to marine net pens anywhere along the British Columbia coast with standard Federal-Provincial Transplant Committee approval.

The precautions taken above are designed to maximize the chances for detection of any exotic fish diseases that may be carried by the stock. It therefore follows that the first generation transplants to saltwater should be localized to ensure that all salmon stocks in British Columbia are not exposed and also to simplify the logistics of the rigorous sampling program that is scheduled under Section 7.4(iii).

7.6 PROCEDURES

(i) All requests for permission to import live salmonids are to be addressed to the Canada-British Columbia Transplant Committee. c/o Fish Health Officer, Pacific Biological Station, Hammond Bay Road, Nanaimo, British Columbia V9R 5K6.

(ii) In recognition of the importance of managing fish disease upon the orderly development of aquaculture in British Columbia; and recognizing the lead role of the Ministry of Agriculture and Fisheries and Oceans in aquaculture, the Department of Fisheries and Oceans and the Ministry of Environment and Parks will confer with the Ministry of Agriculture and Fisheries:
   a) prior to any decision being made by the parties regarding item II requests;
   b) prior to any amendments to the policy under item 20;

(iii) at least semi-annually regarding the nature and status of requests to the Canada-British Columbia Transplant Committee to import live salmonids to British Columbia.

APPENDIX I

FEDERAL LEGISLATIVE MANDATES PERTAINING TO AQUACULTURE

FISHERIES ACT

FISHERIES DEVELOPMENT ACT

FISH INSPECTION ACT

FISH HEALTH PROTECTION REGULATIONS

SEAL PROTECTION REGULATIONS

SANITARY CONTROL OF SHELLFISH FISHERIES REGULATIONS

FISH PROCESSING OPERATIONS - LIQUID EFFLUENT GUIDELINES
1975 DEPARTMENT OF ENVIRONMENT

APPENDIX II

DFO INFORMATION REQUIREMENTS FOR EVALUATING PROPOSED MARINE AQUACULTURE FACILITIES

1.0 PRE-DEVELOPMENT INFORMATION REQUIREMENTS

This information is required for the purposes of evaluating marine aquaculture or processing proposals. On the basis of its evaluation of this information, the Department will decide whether to approve a proposal and issue an Aquaculture Licence. The following information must be provided for all proposed marine aquaculture and proposed fish processing facilities and must accompany all Aquaculture licence applications for marine aquaculture facilities.

1.1 A marine chart copy and a site plan showing the general location and boundaries of the proposed fish farm including depth contours within the lease area and the numbers, size and configuration of rearing pens expected at full production.

1.2 A scuba survey of all portions of the lease area shallower than a depth of 20 meters, describing substrate, vegetation and faunal presence as required on the scuba survey form that will accompany the license application (example following).

1.3 A description of all foreshore construction or beach alteration works that are being considered. Note that such works must be in compliance with Section 31 of the Fisheries Act that prohibits harmful alteration of fish habitat. Review and approval is required before such works are initiated.

1.4 A production plan of numbers, species and size of fish to be reared estimated on a monthly basis through one complete representative production cycle, at maximum production. Include estimates of monthly food use.

1.5 A description of associated activities being considered for this site including bleeding, processing, hatcheries or acclimation tanks.

1.6 A description of the freshwater supply system, if one will be developed. A description of sites or methods that will be used to dispose of dead fish, offal, refuse and sewage.

1.7 In areas deemed sensitive, additional information requirements of the aforementioned fish farmer may provide personal assessment of [illegible] identification of other effluent discharges in the area, [illegible] water quality and sediment quality, [illegible] vegetation mapping, and compilation of fisheries resource information for the site. Requests

For such information may be made under authority of Section 33.1(1) of the Fisheries Act.

2.0 OPERATIONAL INFORMATION REQUIREMENTS

Annual reporting of operational information may also be required as a condition of the Aquaculture License. This may be expected for sites exceeding 200 tonnes average annual production, and also for smaller operations located in areas deemed environmentally sensitive by this Department. Operational information reporting requirements may include but are not limited to the following:

2.1 An operational log including monthly or quarterly production figures and feed supply use figures, identifying the use of antifouling preparations on nets, and describing local environmental events such as plankton blooms, incidence of herring spawn on nets, predator control problems, and accidental fish releases.

2.2 A water quality monitoring program with sampling measures, replicates and frequency to be specified on a site specific basis by this Department, sufficient to demonstrate distribution of dissolved and suspended solids, nutrients, pathogens, bacteria, antibiotics and chemicals including antifouling treatment contaminants, as may be considered warranted and to the satisfaction of this Department. In most cases this will require sample analysis by an independent laboratory. Such programs would continue until completion of one full maximum production cycle, or longer as required to characterize operational impacts and absence of negative effects.

2.3 Monitoring programs describing accumulation patterns of organic deposits under pens sites, alterations in vegetation distribution patterns in the vicinity of pen sites, or changes in benthic invertebrate community structure.

2.4 Once a site has been operational for some time, information reporting requirements may be required if the site has increased production, appears to be negatively affecting the environment, or if it is selected to be part of a more general coastwide aquaculture impact assessment program.

APPENDIX III

MOE INFORMATION REQUIREMENTS FOR EVALUATING PROPOSED LAND BASED FACILITIES

1.0 PRE-DEVELOPMENT INFORMATION REQUIREMENTS

This information is required for the purpose of evaluating hatchery proposals. On the basis of its evaluation of this information, the Department will decide whether to approve the proposal and issue an Aquaculture Enterprise Licence.

APPLICATION INFORMATION

The following information must accompany all applications for an Aquaculture Enterprise Licence.

1.1 A topographical map or equivalent, with scale, showing the general site location. If the facility will discharge to the marine environment, include a nautical chart, photocopy or equivalent with scale.

1.2 A scale drawing or engineering plan of the site showing the location of adjacent streams, floodchannels, location of water supply structures, and location of water discharges. If the facility is at a river mouth, show the high water and low water lines, and the 20m below low water depth contour. (This will bear on marine outfall placement requirements.)

1.3 For sites on floodplains, prepare a site elevation survey to show ground elevations relative to historic flood levels. Identify areas that will be filled and the source of fill materials. Gravel removal from streams is generally not acceptable.

1.4 A production plan estimating the maximum stock density at full production in terms of the numbers of fish, species and expected average weight that will be achieved before off site transfer. This will permit assessment of wastewater characteristics.

1.5 For all proposed stream intakes or infiltration galleries including emergency water supplies and saltwater intakes, provide drawings including full engineering specifications and descriptions of intake structures and screens. Estimate maximum withdrawals for each month. Provide information on the streamflow volume available both during low flow periods and during periods of maximum water withdrawal for hatchery use. If this information is not available or cannot be reasonably estimated from existing records, then hatchery development is to be delayed until low flow studies can be completed.

1.6 Provide a description of the intended treatment system and point of discharge of the hatchery and rearing effluent. Include retention time and cleaning procedures for settling basins, or alternately describe control and disposal measures that will be taken to isolate tank cleaning wastes from the general effluent. Identify the location and describe the screens that will be used to prevent accidental escapements.

1.7 Provide a description of the other waste facilities, structures and disposal procedures for sewage, lab wastewater, refuse, dead fish and offal.

1.8 For marine effluent discharges, estimate the distance if net pens will be located nearby. State if fish processing is also being considered for this site.

1.9 Provide a proposed construction schedule. This Department may require modification of scheduling in respect to critical periods for wild fish stocks that may be affected by instream works. In stream construction is generally limited to summer low flow periods.

2.0 OPERATIONAL INFORMATION REQUIREMENTS

Annual reporting of operational information may also be required as a condition of the Aquaculture License. This may be expected for hatcheries exceeding 1,000,000 smolts average annual production, and also for smaller operations located in areas deemed environmentally sensitive by this Department. Operational information reporting requirements may include but are not limited to the following:

2.1 An operational log including monthly or quarterly production figures, feeding rates, weights, survival rates, water flow volumes extracted from supply streams, quantities and types of chemicals or disinfectants used by date, and occurrence of accidental fish releases.

2.2 A water quality monitoring program with sampling measures, replicates and frequency to be specified on a site specific basis by this Department, sufficient to demonstrate distribution of dissolved and suspended solids, nutrients, pathogens, bacteria, antibiotics and chemicals, as may be considered warranted and to the satisfaction of this Department. In most cases this will require sample analysis by an independent laboratory. Such programs would continue until completion of one full maximum production cycle, or longer as required to characterize operational impacts and absence of negative effects.

2.3 Monitoring programs describing accumulation patterns of organic deposits, bacterial growths, deterioration or algal mat growths, changes in the benthic invertebrate community and changes in interstitial water characteristics downstream of freshwater discharges, as compared to upstream control sites; or for hatchery discharges to marine

environments, monitoring programs describing accumulation patterns of organic deposits and changes in vegetation and benthic invertebrate communities in the vicinity of the marine outfall.

2.4 Operational information and monitoring programs may be required of hatcheries that have been licensed and operating for some time, if they have expanded smolt production capabilities, are perceived to be negatively affecting fish habitat, have demonstrated poor husbandry or site operational practices, are out of compliance with current guidelines or if they are requested to take part in a more general survey of aquaculture industry impacts.

3.0 COMPLIANCE

A compliance schedule may be established for existing licenced freshwater facilities that are presently licenced but whose current operation fails to meet current Departmental standards as published in these guidelines.

Appendix IV

RECOMMENDATIONS RESPECTING SITING AND OPERATION OF AQUACULTURE FACILITIES

(i) Net pens should be located in areas of good circulation and tidal flushing.

(ii) Net pens should not be located in traditional anchorage areas or safe harbours or within one kilometer of major shipping lanes i.e., B.C. Ferry routes or oceanliner routes,

(iii) There should be no direct sewage discharge from living quarters on the lease site.

(iv) Net pens should not be located in an area adjacent to a facility which is routinely dredged in order to protect cultured fish from dredgate.

(v) No unprocessed fish products of the same family should be used in the diet of cultured fish to minimize disease transfer.

Appendix 7

DEPARTMENT OF FISHERIES AND OCEANS KEY CONTACTS

A. Regional Aquaculture Coordinator (research, training, egg supply)
Fisheries Research Branch
Pacific Biological Station
Nanaimo, B.C. V9R 5K6 756-7046

B. Chief, Aquaculture Division (licencing, general information)
Fisheries Operations
1090 West Pender Street
Vancouver, B.C. V6E 2P1 Ron Dinetz

C. Area Managers

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Department of Fisheries and Oceans, Field Services Branch
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Nanaimo, B.C. V9T 1K3 Larry Duke 756-7280

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Fraser River, Northern B.C. and Yukon Division
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New Westminster, B.C. V3L 1B5 Fred Fraser 666-6478

D. Transplant Committee
Fisheries Research Branch
Pacific Biological Station
Nanaimo, B.C. V9R 5K6 Dorothee Kieser 756-7069

E. Diagnostics Service, Fish Health Section
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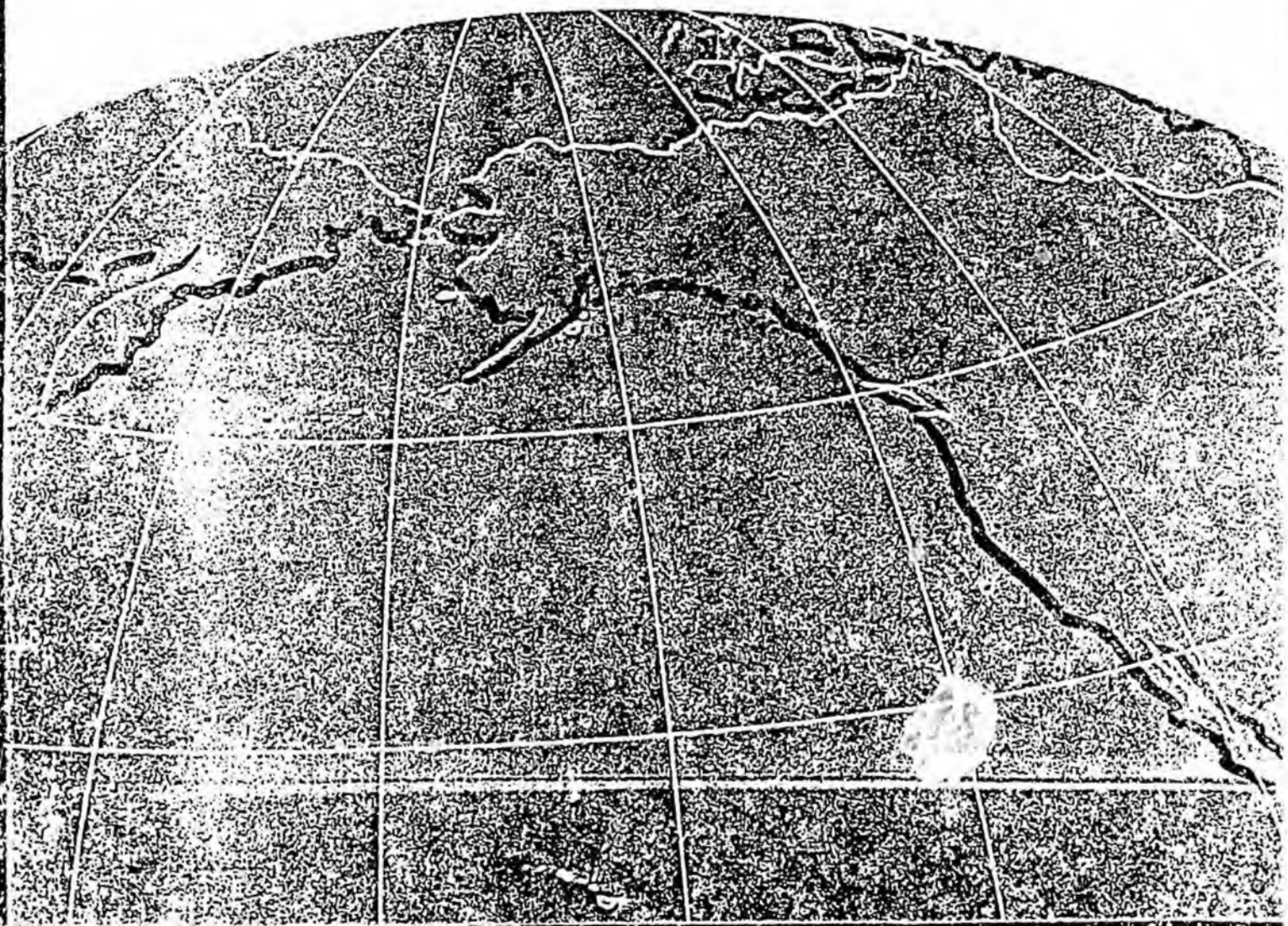
THE ENVIRONMENTAL EFFECTS OF FLOATING MARICULTURE IN PUGET SOUND

Donald P. Weston

August 1986



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ABSTRACT

Mariculture, particularly net-pen culture of salmon and suspended culture of shellfish, has grown rapidly in Puget Sound and the potential exists for this growth to continue. This review attempts to assess the probable magnitude of environmental changes that may result from mariculture operations in Puget Sound. The environmental changes which have been addressed can be summarized in four categories. First, there are some adverse changes which are highly probable for most salmon or suspended shellfish culture operations. These would include the accumulation of organic-rich sediments beneath the culture structure, and the consequent effects on the benthic macrofauna community. Secondly, the potential exists for mariculture effects on water circulation, water quality, phytoplankton productivity and the introduction of exotic species. However, the likelihood of these effects and their potential magnitude is highly dependent upon site-specific conditions or the species cultured. Thirdly, there are several issues for which available data are inadequate for a conclusive determination of significance. These include: 1) the environmental effects of anitbiotic usage; 2) alteration of the wild gene pool; 3) the capacity for a mariculture operation to serve as a disease reservoir for the infection of wild organisms; and 4) the proliferation of human pathogens in the vicinity of mariculture sites. These potential effects of mariculture have not yet been demonstrated, and the existence of such effects remains largely speculative. Finally, there is little likelihood that mariculture would adversely affect local abundance of fish and megafauna.

Water circulation - A culture structure placed in the marine environment will reduce current velocity in the surrounding area, particularly in the down-current direction. This reduction in current velocity will impair dilution and dispersal of wastes downstream of the culture operation. However, this effect is not likely to be significant except in cases of intensive culturing in an area with very restricted natural circulation.

Water quality - Cultured organisms and culture practices alter the chemistry of the water passing through the culture structure, most notably increasing ammonia concentrations and decreasing dissolved oxygen concentrations. Greater

changes will occur with salmon net-pen culture than with mussel culture, given the relative production capacities of typical Puget Sound facilities.

The concentrations of nutrients and BOD in the water passing through a mariculture structure are generally very dilute compared to most other discharges to the marine environment. Field studies have typically observed little or no changes in water quality outside the culture structure in well-flushed areas. Adverse effects would be anticipated only in areas of extremely limited flushing or very intensive culturing activity.

Phytoplankton - Floating mariculture is unlikely to have a measurable effect on phytoplankton standing stock or productivity in most of Puget Sound. In the Main Basin of Puget Sound nutrients are not limiting to phytoplankton growth. Thus, additional nutrient input attributable to mariculture should have no effect on productivity. Nutrients may be periodically limiting in some vertically stratified area (e.g., Saratoga Passage), however, in many of these areas the dilution of nutrients which would occur prior to their utilization by phytoplankton would probably make any effect on productivity unmeasurable. A localized and measurable effect on productivity would be expected only in highly stratified and poorly flushed areas (e.g., some embayments of the southern Sound) in which the water passing through a culture structure could maintain its integrity with minimal dilution.

Sedimentation - Floating mariculture generates large amounts of solid wastes in the form of feces and unutilized feed (salmon culture) or feces, pseudofeces and shell debris (shellfish culture). These materials are generally deposited in the immediate vicinity of the culture structure. This deposition results in physical and chemical changes to the natural sediments including decreased redox potential, increased sediment oxygen consumption and increased concentrations of total volatile solids, total organic carbon, sulfides, nitrogenous compounds, and phosphates. While there are profound effects on sediment chemistry, and consequently the sediment biota, these effects are very localized. Visible accumulation of solids and the alteration of sediment chemistry typically extends no more than 30 m from the culture structure.

Accumulation of organic-rich sediments occurred around most culture facilities reviewed. The depth of this accumulation depends for the most part upon water depth and current velocity. In general, accumulation of sediments can be

expected beneath any culture facility when less than 15 m exists between the bottom of the structure and the sea floor. Sediment accumulation is possible at even greater depths, but little data are available since few culture operations have been sited in deeper waters.

Benthic macroinvertebrates - The accumulation of organic-rich sediments beneath culture facilities and the consequent depletion of oxygen in the pore waters results in changes in the infaunal invertebrate community. Loss of species intolerant of organic enrichment (typically echinoderms, crustaceans and molluscs) often occurs. A few opportunistic species, most frequently polychaetes, attain numerical dominance in the community. In cases of extreme organic enrichment, there may be a total absence of benthic macroinvertebrates. Benthic community changes have been typically observed to be limited to an area within about 30 m of the culture structure. These changes can be expected to persist for the duration of culture activities and for at least several years following their cessation.

Fish and megafauna - Accumulation of organic material in the vicinity of a mariculture operation may result in the loss of nonmotile megafauna (e.g., geoducks) living in intimate contact with the sediments. However, fish and motile megafauna (e.g., crabs) living on or above the sediment surface are typically found in higher densities around floating mariculture structures than in the surrounding area. The attraction of fish and megafauna to the culture area is probably due to increased availability of food in the form of feed unutilized by the cultured fish, the high abundances of opportunistic macroinvertebrates, and epifaunal organisms living on the culture structure or which fall to the bottom.

Introduction of exotic species - If culture operations require the importation of live material into the state, the potential introduction of exotic species probably represents the greatest environmental threat posed by mariculture. Introduced species may establish self-sustaining wild populations, potentially becoming pests or eliminating native species. While there appears to be little risk of this occurring for those species currently being deliberately introduced for culture in Puget Sound, requests for future introductions should be carefully evaluated in this regard.

Accidental introduction of pests, parasites and diseases associated with imported organisms may also occur. Because of this risk the state has placed many restrictions on the type of organisms which may be imported and the steps which must be taken before live material destined for aquaculture may be placed in state waters. The adequacy of these regulations is currently being evaluated.

Diseases - Some concern has been expressed that the culture environment may serve as a reservoir for those diseases which are present in an environment but demonstrating no clinical symptoms in wild fish. There is a fear that the disease organism may proliferate among the cultured fish, become more virulent, and reinfect the wild stocks. However, there is no evidence to indicate that this scenario has ever occurred. The outbreak of a disease is often associated with some form of stress. In the culture environment, fish may be stressed by overcrowding, undernourishment, poor water quality and physical damage associated with handling and confinement. Thus, while fish held in culture are likely to show more frequent appearance of disease than wild fish, disease does not appear to be transmitted to the wild populations.

The bacterial diseases of salmonids in mariculture are not transmissable to humans. However, some investigators have questioned whether the organic enrichment of bottom sediments caused by mariculture could promote the growth of those species pathogenic to humans. Consumption of shellfish collected in the vicinity could then serve as a route for human infection. This is an issue where available scientific evidence is very meager, but experience to date has failed to show cause for concern. Increased bacterial abundance in sediments beneath a mariculture facility is quite probable, but it has not been demonstrated that this increased abundance is of any significance in terms of human health.

Genetic effects - The issue of the genetic effects of mariculture is largely speculative. Cultured organisms may be at a competitive disadvantage with respect to wild individuals. Thus, if escapes and interbreeding with the wild population occur, there may be some temporary loss of reproductive capacity in the wild population resulting from the production of less fit genotypes. The potential magnitude of this effect is dependent upon the proportion of the breeding population comprised of escaped animals.

The potential consequences of the interbreeding of escaped and wild organisms, if any at all, are unclear. However, for salmonids at least, the potential magnitude of the problem would seem minimal. For decades fisheries management agencies have routinely been transferring hatchery-reared salmonids between river systems to improve commercial and recreational fisheries. The number of fish which might escape from mariculture is negligable in comparison.

Toxicants - Salmon net-pen culture in Puget Sound requires the occasional usage of antibiotics, most frequently oxytetracycline. The potential environmental effects of this usage are minimized by the high water solubility of the compound, rapid dilution with the surrounding water and the infrequency of its use. Although, there is very little information available, the use of oxytetracycline does not appear to be a major problem at the present level of mariculture development in Puget Sound.

Modeling of Environmental Effects

Mathematical models are not yet available which provide reliable a priori estimates of the effect of mariculture on the receiving water body. As a short-term solution, a model is proposed to predict the changes in dissolved oxygen or metabolite concentration only in that parcel of water which passes directly through a culture structure. Since the model neglects the role of dilution by the surrounding water mass, it does not provide a definitive solution to modeling water quality. However, the model may have applications to site evaluation or the determination of maximum allowable culture intensity in a given area.

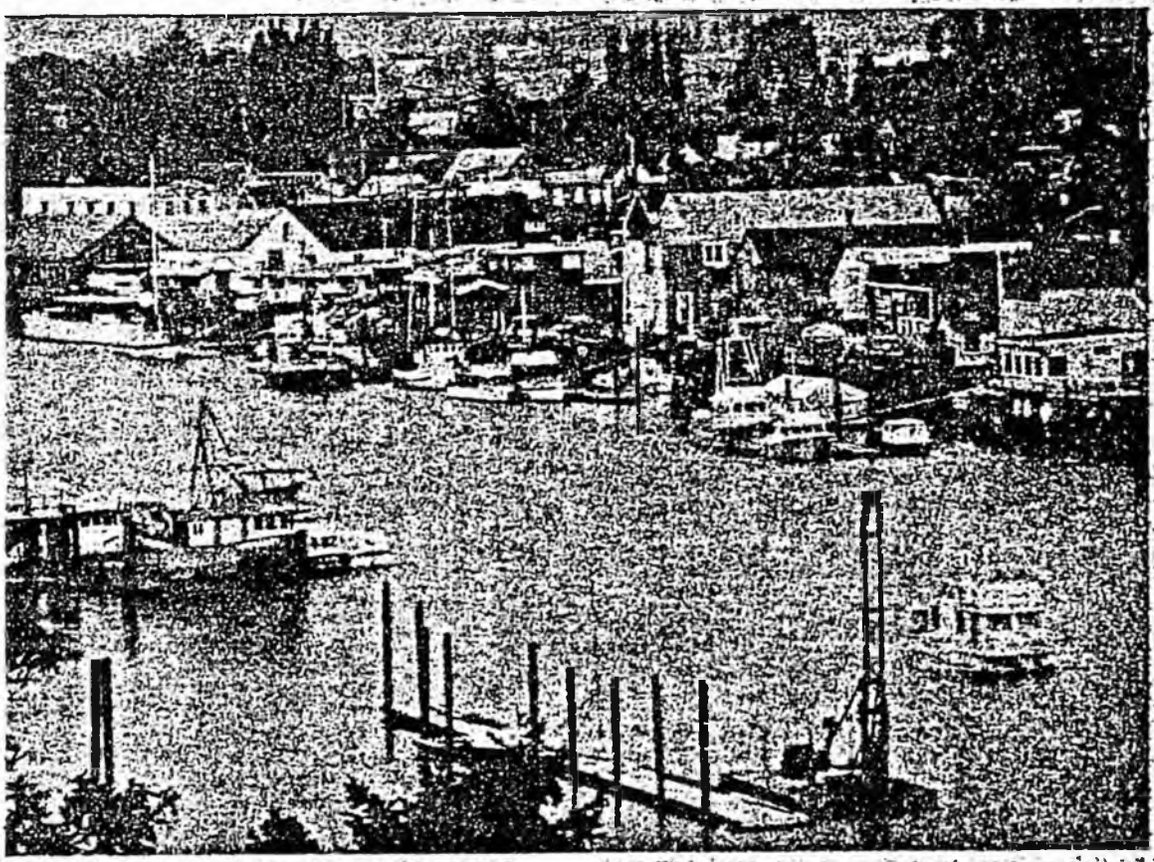
Sedimentation models would be valuable in predicting the depth and spatial extent of the accumulation of organic-rich sediments around a culture structure. Analytical models which predict this accumulation based entirely on properties of the settling particles and the moving fluid are beyond the current state-of-the-art. Empirical models are limited by site-specificity, but they represent the only modeling approach of immediate utility. A simple empirical model originally developed for net-pen culture of yellowtail in Japan is described. Given field measurements of particle settling velocity and current regime, the model is able to predict the depth of sediment accumulation as a function of distance from the culture structure.

Environmental Regulation of Mariculture

A review of environmental regulations pertaining to mariculture indicates that the policies of Washington State are generally comparable to those of many of the other states and countries surveyed. In general, the potential environmental consequences of mariculture are assessed on a site-specific and case-by-case basis. Applications for mariculture permits are usually subject to a review process which includes an opportunity for the responsible government agencies to evaluate potential environmental effects. There are typically few, if any, formalized criteria with regards to siting and operation.

Importation of eggs or live animals typically requires a permit from the responsible government agency. The permit will carry with it certain conditions which, depending on the particular state or country, may include restrictions on the country of origin, visual and/or pathological inspections, periods of quarantine, or disinfection requirements. Policies governing importation are tending to become more restrictive, and in several countries there is a total ban on the importation of eggs and/or live animals.

SHORELINE MASTER PROGRAM STUDY: ANALYSIS REPORT



Prepared for the Washington State Department of Ecology

By Nancy Fox and Susan Heikkala

With Keith Dearborn, Marc Hershman and Jens Sorensen

September, 1983

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This report was prepared under contract to the Washington State Department of Ecology with funds obtained from the National Oceanic and Atmospheric Administration and appropriated under Section 306 of the Coastal Zone Management Act of 1972.

Cover photograph by Marc Hershman

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I. STUDY BACKGROUND

This study was initiated by the Washington State Department of Ecology as part of a broad evaluation of the State's shoreline management program. It is one of four concurrent studies sponsored by the Department, including also a public process study, an analysis of wetlands management and a public perception survey.

The primary purpose of this study was to prepare a Shoreline Master Program Handbook which compiles the "best practices" from existing master programs to aid local jurisdictions in developing future amendments to their master programs. Most programs were developed and adopted close to ten years ago without the benefit of model programs or good examples to draw upon. As a result, the quality of these programs varies and many local jurisdictions are now working on amendments to improve and update their plans. The handbook will serve as a reference containing exemplary master program approaches and standards developed by local governments over the past ten years.

The project began with a survey of 30 local jurisdictions, designed to collect information on the strengths and weaknesses of existing master programs. The jurisdictions surveyed were selected to represent a complete range of shoreline types, jurisdiction sizes and locations in the state. A questionnaire was mailed to each jurisdiction, and responses were recorded during a subsequent interview, either in-person or by phone.

The results of the survey are contained in the Appendix to this report and are summarized in Section II. Many of the ideas expressed in the survey helped to shape our approach to developing the handbook. But the survey also raised a number of issues which went beyond the scope of the handbook. To gain a broader perspective on these issues, informal discussions were held with representatives of various groups concerned about shoreline management, including the State Associations of Cities and Counties, environmental groups, and development interests. These issues are discussed and general recommendations to address them are presented in Sections III and IV of this report.

Although this study focused on the content and use of existing shoreline master programs, one of its principal

findings was that shoreline master programs are only one element of an effective shoreline management approach. Dedicated and experienced staff, in-depth planning to address specific local management issues and a commitment to implementation were identified as equally important elements of a successful management strategy. Effective shoreline management also depends on a workable partnership between the state and local governments, a relationship designed to balance state and local shoreline interests. The ideas presented in this report are intended to stimulate discussion and consideration of some of these broader management issues.

II. SUMMARY OF SURVEY FINDINGS

The purpose of the survey was to find out from local governments how they had applied the required master program components, how well their programs are working, and whether any of their program standards might serve as examples for other jurisdictions. This summary highlights key survey findings, roughly in the order of questions presented in the questionnaire. The findings do not necessarily reflect the views of the project team, but rather represent a synopsis of the information and opinions offered by local planners in the jurisdictions surveyed. A complete listing of survey questions and the compilation of survey results is contained in the Appendix.

A. Regulatory Emphasis. The survey indicates that the primary and often sole purpose of shoreline master programs (SMPs) is to regulate shoreline development through the issuance of shoreline substantial development permits. Thus, environment designations and use regulations are the portions of the programs most frequently used. Policies in the master programs are generally used only if and when support is required on controversial permit applications or to aid in interpreting specific regulations.

B. SMP Organization. Organization of master programs varies. In most programs the regulations are organized around use activities, rather than the environments, to facilitate administration and minimize redundancies. However, there was no single dominant approach concerning the organization of the policies. This aspect of master program structure seemed to be determined in part by considering how to best relate the SMP to a jurisdiction's comprehensive plan and other local regulatory programs.

Jurisdictions with complex and extensive land development regulations often separate policies and regulations into separate chapters of the master program. The shoreline policies can then be inserted as a chapter of the comprehensive plan and the regulations become a chapter of the zoning ordinance. Where there is less planning complexity, jurisdictions often place policies and regulations in the same chapter of the SMP. The first approach facilitates overall planning integration;

the second makes it easier to understand the internal relationship of policies and regulations in the SMP.

C. Shoreline Environments. Considerable variation exists in the application of environment designations. The designations established in the Shoreline Management Act and the WACs seem to be limited in their usefulness in marine aquatic and urban areas. To bridge these gaps, many jurisdictions have established environments for aquatic areas or urban subcategories to better reflect local conditions. The design, application and use of the environment designations is one of the principal ways in which local jurisdictions have tailored the state program guidelines to serve the distinctly different needs and characteristics of local shorelines. Permissible uses by environment also vary widely between jurisdictions.

D. General vs. Detailed Regulations. Another SMP characteristic which varies considerably is the level of specificity in SMP regulations. The range is from very general regulations, which are similar to policy statements, to very detailed standards which may include specific numerical limits on size, bulk, etc.

Many planners feel that increased specificity makes program administration easier, more consistent and more understandable to the public. They frequently indicated that they would like to see more detailed standards in their shoreline master programs. In jurisdictions where public interest is high and shoreline development is often contested, local planners and elected officials seem to be more likely to invest the time and energy needed to develop detailed regulations.

However, other planners favored more general regulations offering maximum flexibility. This viewpoint was expressed by planners in jurisdictions with detailed regulatory programs and heavy shoreline development demands as well as those with less stringent shoreline programs and little public interest. Some planners pointed out that DOE's oversight role in the permitting process made them reluctant to lock themselves into very detailed, inflexible standards. Others noted that rigid standards tend to increase the need for variances to accommodate individual property conditions, thus

lengthening the review process for actions which are relatively minor in scale. Finally, some planners acknowledged that it would be politically difficult or impossible to obtain legislative approval of strict development standards in their jurisdiction; consequently, they feel they can achieve the best results through negotiation with each permit applicant based on general policies and regulations.

E. Factors Affecting Program Effectiveness. The effectiveness of shoreline management at the local level seems to depend as much on how well a SMP is used as on its actual contents. Shoreline planners indicate some of the most important factors influencing program effectiveness are data availability; staff expertise, experience working with the program and commitment to shoreline management goals; good working relationships between staff and the community; and the local political climate. Strong SMP standards cannot compensate for the lack of these other program assets.

F. Planning and Zoning Coordination. Almost all local planners stress the need for coordinating SMP regulations with zoning and other local development regulations to the extent possible. Except in a few cases where shoreline management preceded local zoning and comprehensive planning, local SMPs were established as an overlay to a jurisdiction's existing regulatory programs. While recognizing the role of the State in overseeing local SMPs, planners generally feel that their ability to effectively implement the shoreline program depends in large measure on how well shoreline regulations can be meshed with their other regulatory programs.

The best way to accomplish this integration seems to vary by jurisdiction. Tacoma, for example, has developed shoreline subarea plans which consolidate general land use policies and regulations with goals and plans for specific shoreline segments. Bellevue, on the other hand, has incorporated shoreline policies in its comprehensive plan and shoreline regulations in its zoning code, while Edmonds inserts its entire SMP in its comprehensive plan. In some cases, planners felt that their attempts to incorporate strong shoreline protection measures in city or county regulatory codes had

been hampered by DOE's insistence on keeping the SMP independent from other plans and regulations.

G. Inadequate Standards. Although use regulations are the backbone of master programs, the survey showed that most jurisdictions feel their use regulations lack adequate standards for many of the most common uses. Few jurisdictions felt their program should be used as a source of exemplary standards. They further indicated the lack of useful sources of technical information to help develop new or amended use regulations. Frequently cited areas of deficiency were bulkheads, landfills, setbacks for bluff development, dredge spoil disposal, water quality standards and visual design standards. Standards are essentially non-existent for certain uses such as small hydro facilities, dredge-mining and float plane moorage.

H. Exemptions. Some of the most significant management problems are caused by activities that are beyond the scope of a shoreline use regulatory program. Planners frequently cited problems stemming from the cumulative impacts of exempted single family residences and residential bulkheading, poor forest management practices, upland drainage problems and unregulated clearing and grading.

I. Small Towns. Small town waterfronts encompassed within county programs have a special set of planning needs which tend to fall through cracks in county SMPs. Most small towns are treated as blanket "urban" shorelines without special local guidelines and regulations. If the town is incorporated, it may administer the county program to suit its special needs. Unincorporated urban areas must compete for the county's attention with all the rest of the county shoreline. The scale of needs are entirely different, and county planning offices are seldom equipped (with staff or resources) to undertake small town waterfront studies. However, some towns have been successful in obtaining funding through DOE for waterfront studies to address special local problems; e.g., Langley, Coupeville, Friday Harbor and LaConnor.

J. Urban Waterfronts. Shoreline planners in large urban areas point out that urban waterfront issues are some of the most complex and tax the flexibility of the SMP. A single urban environment can not begin to address the

distinctly different characteristics of various urban waterfronts and, consequently, large cities have generally created several urban subcategories. Tacoma has developed "mini-plans" for specific segments of its shoreline. Seattle has established a series of urban classifications which are applied to specific segments of its urban waterfront, such as Lake Union and the central waterfront.

The intense competition between water-dependent, water-related and other uses which benefit from a water location complicate use allocation decisions. These decisions involve difficult tradeoffs between competing uses and between various segments of the urban waterfront, and often occur through a process of negotiation rather than through application of specific standards. Establishing a blanket requirement for water-dependent uses may be unwise, especially in central city waterfronts like Seattle's where there is a consensus in the business, industrial and economic community that this type of activity may no longer be viable. The problem facing these jurisdictions is when and where to set aside areas specifically for water-dependent uses, or whether to give preference to water-dependent uses but allow a mix of uses. Public access is often considered a trade-off with water-dependency, so that one or the other is required.

K. Shorelines of Statewide Significance. As a practical matter, there does not seem to be a significant difference between the management of Shorelines of Statewide Significance (SSS) and management of all other shorelines. Although the SSS are geographically identified, the identification of special resource values in particular areas is lacking. Furthermore, the definition of SSS blankets extensive areas and often seems unrelated to actual features. As a result, planners say they try to be "a bit more restrictive" when making management decisions for SSS but would like more guidance from DOE. Many planners note that the general priorities established for the use of SSS are essentially applicable to all shorelines.

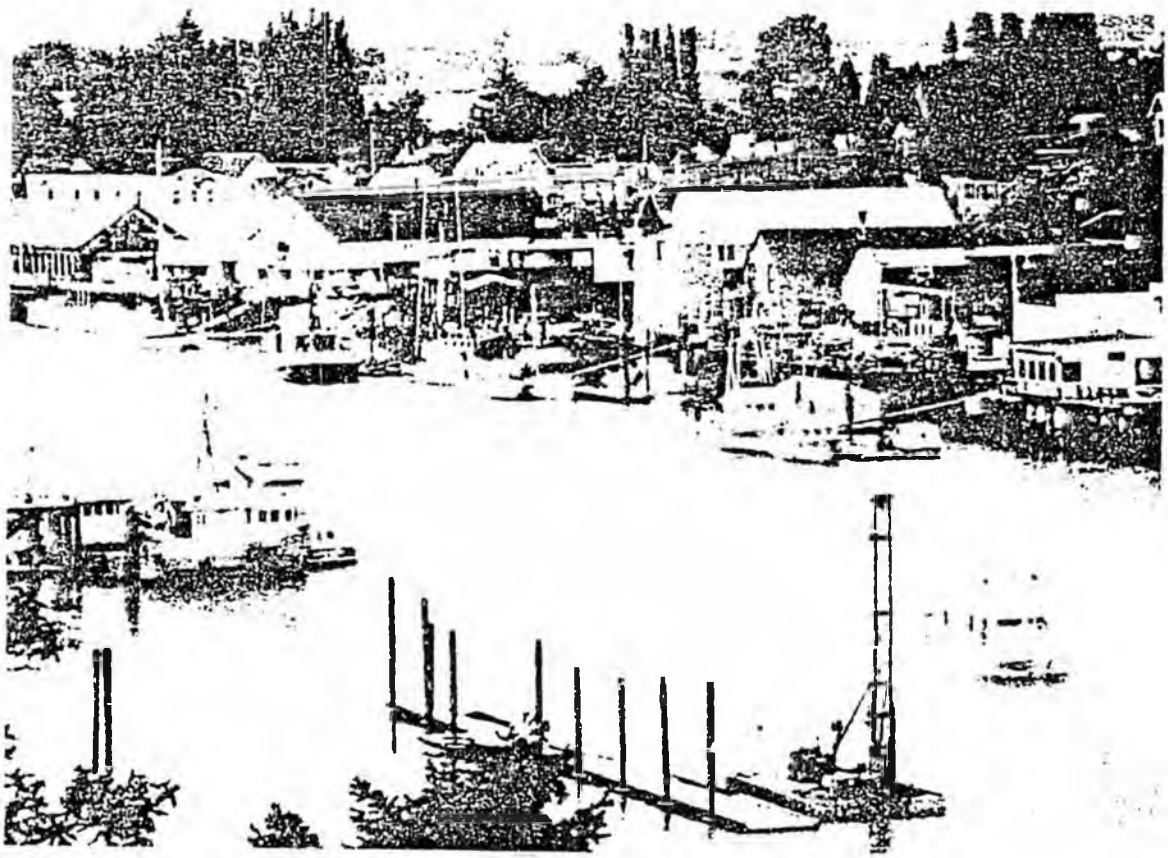
L. Permit Process. Many shoreline planners indicate the need for a streamlined permit process to reduce the length of the process and eliminate unnecessary paperwork. They feel that in some cases the cumbersomeness

of the administrative process outweighs the potential benefits of more careful review. The added time required for DOE review and approval of variances and conditional uses was a particular concern. Many jurisdictions want to minimize these DOE approvals and have found ways to "condition" use permits through their own review and approval process, and thus avoid the conditional use or variance process.

M. Other Local Shoreline-Related Regulatory Programs. Most local jurisdictions have enacted a number of regulatory programs which are closely related to shoreline management but are not included in their SMPs, such as flood protection, zoning and sensitive areas controls. For administrative efficiency, these programs are sometimes included in the SMP if they apply only to the shoreline area. For regulatory programs which apply throughout a jurisdiction, such as a sensitive areas ordinance, most planners suggest referencing them in the SMP and/or discussing them in a user's guide, rather than incorporating them in the master program. Concern was expressed both by local planners and DOE staff about expanding the scope of DOE's shoreline management review to include other local regulatory programs as a result of incorporating them in the SMP.

N. State and Federal Regulatory Programs. Shoreline development actions often require other state and federal regulatory approvals, in addition to local permits. Where development proposals require permits from more than one agency, some planners noted that decisions are sometimes inconsistent with the SMP in spite of previous concurrence with program policies. In addition, they said there is often confusion over the appropriate scope of each agency's review.

SHORELINE MASTER PROGRAM HANDBOOK



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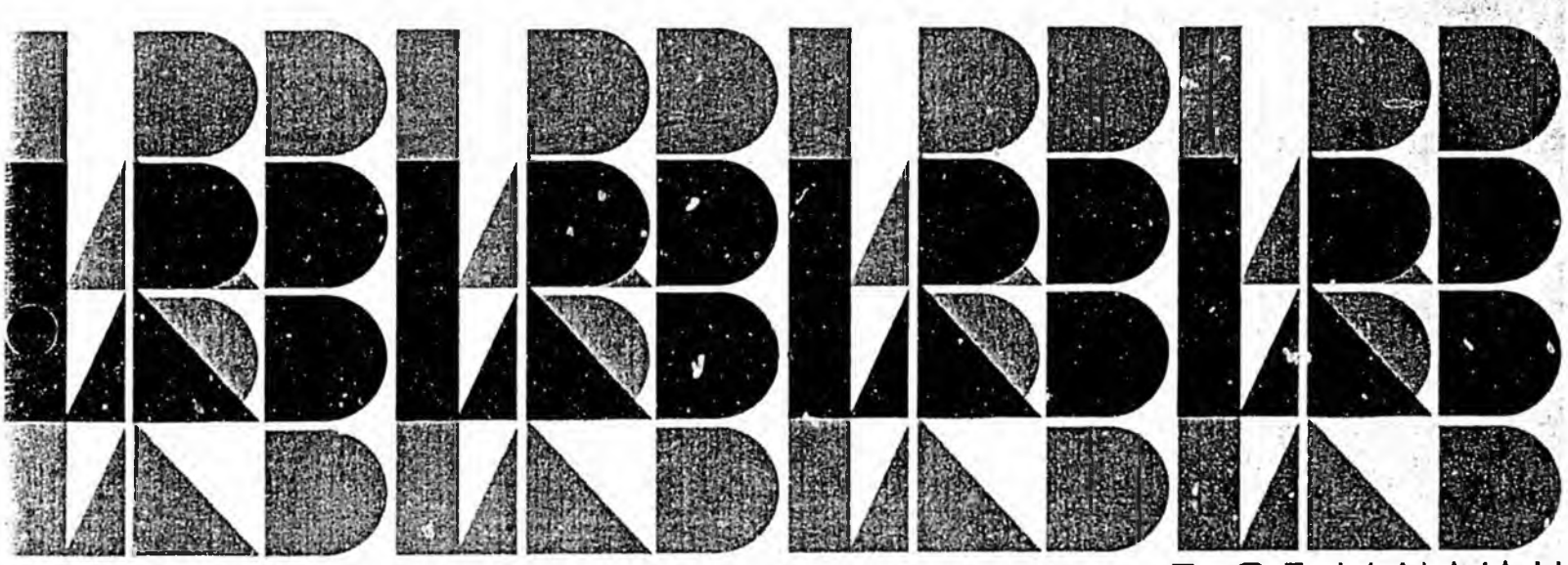
MARINE RESOURCES AND AQUACULTURE PROGRAMS IN THE STATE OF HAWAII



LEGISLATIVE REFERENCE BUREAU/STATE OF HAWAII

MARINE RESOURCES AND AQUACULTURE PROGRAMS IN THE STATE OF HAWAII

ANN MASAKO OGATA
Researcher

Report No. 3, 1982

Legislative Reference Bureau
State Capitol
Honolulu, Hawaii

FOREWORD

This report on Marine Resources and Aquaculture Programs in the State of Hawaii was prepared in response to Senate Resolution No. 186, adopted during the 1978 legislative session.

The report traces the role of the ocean and the practice of aquaculture in ancient Hawaii, and the surge of interest in marine and aquaculture affairs since the publication of Hawaii and the Sea in 1969; and sets forth the present status of the marine resources and aquaculture programs in Hawaii's state government.

The report was initiated, organized, and conducted by Lloyd K. Migita of the Office of the Legislative Reference Bureau until his departure from the Bureau. In mid-1982, Ann M. Ogata of the Bureau was assigned to update and complete the report.

We wish to express our sincere appreciation and gratitude to the following individuals for providing us with personal interviews and information required in the course of this study: Dr. John Craven, Chairman of the Marine Council, University of Hawaii; Dr. Noel P. Kefford, Dean of the College of Tropical Agriculture and Human Resources, University of Hawaii; Rose T. Pfund, Acting Associate Director of the Sea Grant College Program, University of Hawaii; Kent M. Keith, Deputy Director of the Department of Planning and Economic Development; Edgar A. Hamasu, Deputy Director of the Department of Land and Natural Resources; John C. Corbin, Manager of the Aquaculture Development Program, Department of Land and Natural Resources; Henry M. Sakuda, Director of the Division of Aquatic Resources, Department of Land and Natural Resources; Paul Y. Kawamoto, Chief of the Fisheries Branch, Department of Land and Natural Resources; Eugene S. Imai, Administrative Services Officer, Department of Agriculture; Wilbert Kubota, Food and Drug Inspector, Department of Health; Harry Murakami, Chief Engineer of the Harbors Division, and Staff, Department of Transportation; Artemio Delos Reyes, Section Head of Property Management of the Harbors Division, and Staff, Department of Transportation; David E. Parsons, State Boating Manager of the Harbors Division, Department of Transportation; Dennis E. Ruthrauff, Oahu District Manager of the Harbors Division, Department of Transportation; and Clarence Okamura, Assistant Chief for Administration of the Harbors Division, Department of Transportation.

Samuel B. K. Chang
Director

December 1982

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SUMMARY

This report, Marine Resources and Aquaculture Programs in the State of Hawaii, identifies and sets forth the marine and aquaculture programs of the State Departments of Agriculture; Land and Natural Resources; Planning and Economic Development; Health; Transportation; and the University of Hawaii. It touches as well upon the significance of the ocean in ancient Hawaii, and upon the early practice of aquaculture by the Hawaiians.

The report finds that substantial strides have been made in recent years by the State in defining and implementing its goals in these important areas of industry, and that no major reorganization of state programs is necessary at this time.

The report makes two recommendations to the Legislature to further the realization of the State's goals in these areas:

(1) The statutory designation of the Department of Land and Natural Resources as the lead agency for aquaculture; and

(2) The statutory creation of an Aquaculture Coordinating Advisory Council and an Ocean Resources Coordinating Advisory Council.

Chapter 3

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Part I. Findings

Senate Resolution No. 186 of 1978 was based upon the premise that the fragmentation of marine resources and aquaculture programs among various state departments and agencies could only lead to "a duplication of effort and possible conflicts regarding priorities, goals, and implementation."[1] The Resolution focused upon one possible solution to these concerns: the creation of a new State Department of Marine Resources and Aquaculture.

In performing this study, the Office of the Legislative Reference Bureau determined that a more useful approach would consist of first ascertaining whether the fragmentation of functions and activities in these areas constituted a problem in need of a solution.

The Bureau's findings on the issue of fragmentation are as follows.

1. Some fragmentation of programs is inevitable.

Hawaii's executive departments are grouped according to a mixture of functions and subject areas. Under this kind of organizational strategy, some fragmentation is inevitable. For example, departments organized according to broad functional responsibilities such as the Department of Planning and Economic Development, which by statute is charged with the development and promotion of industry (including fisheries development), and tourism,[2] will sometimes overlap the activities of other departments organized by subject area, such as the Department of Land and Natural Resources, which is charged with the management of the State's fisheries resources.[3]

2. Programs dealing with major natural resources tend toward diffusion.

Generally, it appears that programs dealing with major natural resources such as land or the ocean tend to be diffused to a greater extent than other subject area programs. In the case of land, a large number of state departments are involved in some aspect of land development, management, regulation, or conservation. For example, the Department of Land and Natural Resources manages conservation lands; the Department of Planning and Economic Development is involved with land use management and coastal zone management; the Department of Health administers sanitation, solid waste, and other land pollution abatement programs; the Department of Hawaiian Home Lands manages Hawaiian Homes Commission Act lands; and the Department of Land and Natural Resources and the Department of Agriculture cooperatively implement the agricultural park program.

3. Major organizational and reorganizational efforts have taken place since the adoption of Senate Resolution No. 186-78.

(a) **Establishment of the Hawaii Fisheries Coordinating Council.** The Hawaii Fisheries Coordinating Council was established by Act 282 of the 1980 legislative session,[4] for the purpose of advising the Board of Land and Natural Resources on fisheries matters and coordinating fisheries activities among the various federal, state, and county agencies and private industry.

The Council is charged with advising the Board of Land and Natural Resources on matters relating to fisheries development including:[5]

(1) Proposing and preparing programmatic fisheries development plans and policies;

(2) Coordinating all state fisheries activities as they relate to the federal and county governments, public and private organizations, and commercial enterprises;

(3) Coordinating state agency requests for federal grants and technical assistance;

(4) Promoting communication between industry and government sectors, including the consideration of problems, requirements, and available financial and technical assistance;

(5) Performing such services as may be required by the Governor and the Legislature; and

(6) Preparing and submitting an annual report to the Governor and the Legislature prior to each regular session.

(b) **Transfer of the Aquaculture Development Program to the Department of Land and Natural Resources.** The Aquaculture Development Program was transferred by the Governor from the Department of Planning and Economic Development to the Department of Land and Natural Resources in January 1981 to consolidate state aquaculture activities. Administratively, the Program was placed in the Office of the Chairman of the Board of Land and Natural Resources.

This transfer was consistent with a major recommendation of the State's aquaculture development plan, Aquaculture Development for Hawaii: Assessment and Recommendations, which set forth the need for a permanent aquaculture lead agency to consolidate efforts and provide a focal point to promote and expedite the development of aquaculture production in Hawaii.[6]

The Plan listed three important requirements to be considered in determining the most suitable lead agency for aquaculture: (1) involvement in economic development, (2) functions compatible with aquaculture and involvement with fisheries, natural resource management, and/or food production, and (3) adequate facilities and support services. The Plan found that the Department of Agriculture and the Department of Land and Natural Resources were the most logical candidates for lead agency, with no distinct advantage in selecting one department over the other.[7]

(c) **Reorganization of the Department of Land and Natural Resources' responsibilities in fisheries, wildlife, and enforcement into separate divisions.** This reorganization was accommodated by Act 85 of the 1981 legislative session.[8] Act 85 restructured Title 12 of the Hawaii Revised Statutes, Conservation and Resources, to: (1) transfer the management of terrestrial animals from the Division of Fish and Game to the Forestry Division, which was redesignated as the Division of Forestry and Wildlife, and (2) redesignate the Division of Fish and Game as the Division of Aquatic Resources.[9]

The Division of Aquatic Resources administers the State's programs in commercial fisheries and aquaculture, aquatic resources and habitat protection, and aquatic recreation. Act 85 defined "aquatic life" to mean "any type of species of mammal, fish, amphibian, reptile, mollusk, crustacean, arthropod, invertebrate, coral, or other animals that inhabit the freshwater or marine environment", including any part, product, egg, or offspring thereof; or freshwater or marine plants,[10] including seeds, roots, and other parts thereof. This definition brings marine as well as aquacultural resources under the jurisdiction of the Division, in accord with the State's efforts to consolidate aquaculture activities.

(d) **Transfer of the functions of the Marine Affairs Coordinator to the Department of Planning and Economic Development.** Act 302 of the 1980 legislative session transferred the Office of the Marine Affairs Coordinator to the Department of Planning and Economic Development for administrative purposes.[11] Act 281 of the 1982 legislative session abolished the Office and transferred all rights, powers, functions, duties, and positions of the Office of the Marine Affairs Coordinator to the Department of Planning and Economic Development.[12]

These powers and duties include the following:[13]

(1) Develop plans, including objectives, criteria to measure accomplishments of objectives, programs through which the objectives are to be attained, and financial requirements for the total and optimum development of Hawaii's marine resources, including plans, objectives, and criteria for the expenditure of State matching funds

for federally funded projects based on the needs and goals of the State;

(2) Conduct systematic analysis of existing and proposed marine programs, evaluate the analysis conducted by the agencies of state government, and recommend to the Governor and the Legislature programs which represent the most effective allocation of resources for the development of the marine environment;

(3) Assist those departments having interests in marine affairs, coordinate those activities which involve the responsibilities of multiple state agencies, and insure the timely and effective implementation of all authorized marine projects and programs;

(4) Establish a continuing program for informing the federal government, other state governments, governments of nations with interests in the Pacific basin, private and public organizations involved in marine science and technology, and commercial enterprises of Hawaii's leadership potential as the center for marine affairs;

(5) Coordinate the State's involvement in national and international efforts to investigate, develop, and utilize the marine resources of the Pacific basin;

(6) Develop programs to continuously encourage private and public marine exploration and research projects which will result in the development of improved technological capabilities in Hawaii; and

(7) Formulate specific program and project proposals to solicit increased investment by the federal government and other sources to develop Hawaii's marine resources and coordinate the preparation and submission of program and project proposals of State agencies.

The Conference Committee report attached to Act 281 stated that "Your Committee finds that if Hawaii is to capitalize on the immediate and long-term opportunities to develop and utilize marine resources, the total efforts of the State's planning, research, development, and promotion of the marine environment need to be effectively addressed."[14]

To implement Act 281, the Department of Planning and Economic Development has proposed establishing an Office of Ocean Resources, under the supervision of the Director of Planning and Economic Development, to bring a coordinated approach to marine activities in the State, and to ensure that Hawaii derives maximum economic and societal benefits from its surrounding marine environment.[15]

The Office would assume the former functions of the Office of the Marine Affairs Coordinator transferred by Act 281.[16]

4. Masterplans in the areas of aquaculture and commercial fisheries have been completed and are being implemented; an ocean management plan is nearing completion.

The State's aquaculture masterplan, Aquaculture Development for Hawaii: Assessments and Recommendations, has been in the process of implementation by the Aquaculture Development Program since January 1979. A major recommendation of the State's commercial fisheries masterplan, Hawaii Fisheries Development Plan, was the legislative establishment of the Hawaii Fisheries Coordinating Council in 1980.

A draft of the State's new ocean management plan is now being circulated by the Department of Planning and Economic Development's Hawaii Coastal Zone Management Program for review to various state and federal agencies. It is intended to provide consistency in management by setting forth objectives and policies, and could also provide a forum for conflict resolution as well as for the determination of priorities relating to ocean resources. The draft resulted from ten issue papers on fisheries management, marine conservation and preservation, mariculture, ocean thermal energy conversion, coastal energy facilities, harbors development, beach erosion, near-shore recreation, ocean dumping, and manganese nodule mining.[17]

Part II. Conclusions

The Bureau's conclusions are as follows.

1. The creation of a new State Department of Marine Resources and Aquaculture would not necessarily remedy any problems allegedly caused by the present organizational structure of the State's marine resources and aquaculture programs. A system to coordinate existing programs would effect a less disruptive yet effective alternative.

It appears that the major problem allegedly caused by the present organization of programs is one of coordination among the state departments having marine resources and aquaculture programs. Even with a new department, constant coordination efforts would be required among the state departments to maximize the benefits of the State's marine resources and aquaculture programs.

Many of the existing marine resources and aquaculture programs are so closely tied to major functions and expertise of existing departments that to separate them and place them in a new department would create more problems of coordination than previously existed. For example, health and sanitation concerns would still have to be addressed by the Department of Health, and

water and land development and land management issues would still need to be directed to the Department of Land and Natural Resources.

It is therefore neither necessary nor desirable to include all related programs that are diffused throughout the state government and that require policy, program, and procedural coordination, or technical assistance, into a new department of marine resources and aquaculture at this time. What is needed is a means of achieving such coordination while leaving existing programs in those locations where they can be administered most effectively.

2. The creation of a new State Department of Marine Resources and Aquaculture would be premature at this time.

The projections of the growth of the State's aquaculture industry have not been fulfilled, and the manganese nodule mining and ocean thermal energy programs are still in early stages of their development. Regarding commercial fisheries, Hawaii has historically ranked near the bottom among coastal states in terms of commercial fish landings, consequently requiring importation of most of its seafood products. Until these and other major marine industries have evolved, stabilized, and realized their full potential, the creation of a new department would be premature. This, of course, is not to dismiss the possibility that a new department may be justified at some later date.

3. Duplication and overlapping of functions and activities are not necessarily signs of waste and inefficiency; undesirable duplication and the possibility of conficts have diminished since adoption of Senate Resolution No. 186-78.

In 1969, Martin Landau first alerted administrative scientists to the benefits of redundancy and overlapping in administrative organizations. He found that:[18]

> At one and the same time, thus, redundancy serves many vital functions in the conduct of public administration. It provides safety factors, permits flexible responses to anomalous situations and provides a creative potential for those who are able to see it. If there is no duplication, if there is no overlap, if there is no ambiguity, an organization will neither be able to suppress error nor generate alternate routes of action. In short, it will be most unreliable and least flexible...
>
> "Streamlining an agency," "consolidating similar functions," "eliminating duplication," and "commonality" are powerful slogans which possess an obvious appeal. But it is just possible that their achievement would deprive an agency of the properties it needs most--those which allow rules to be broken and units to operate defectively without doing critical injury to the agency as a whole Accordingly, it would be far more constructive, even under conditions of scarcity, to lay aside easy slogans and turn attention to a principle which lessens risks without foreclosing opportunity.

Much of the undesirable and unnecessary duplication of efforts which was the impetus for adoption of Senate Resolution No. 186-78 has been alleviated by the organizational and reorganizational changes which have taken place since 1978.

The possibility of conflicts regarding priorities, goals, and implementation has also diminished with the publication of masterplans in the areas of aquaculture and commercial fisheries, which provided overall implementation guidelines for the State's programs in these areas by providing a structure in which all program components were identified, guidelines for development were formed, required financial resources were determined, and implementation schedules were developed.

4. The establishment of coordinating advisory councils would provide mechanisms for information exchange and aid the State's efforts towards coordination of programs.

Coordinating advisory councils composed of federal, state, and county government officials and individuals in private industry knowledgeable in the fields of ocean resources and aquaculture could advise the state departments with lead agency responsibilities on all matters relating to aquaculture and ocean resources, and generally promote communication between industry and government, and among governmental agencies. In particular, private industry council members can provide direct external review of the effectiveness of the State's programs. The importance of interaction with private industry was recognized in Hawaii and the Sea--1969:[19]

> For the State to advance boldly and wisely in the marine field, it must go outside the State Government to get advice on a regular basis from highly knowledgeable people having strong interests in a broad range of marine activities...
>
> In the relatively short time the Task Force has existed, it has made a number of important recommendations and contributions to the State's marine effort.

Part III. Recommendations

The State has made great strides in the past four years in defining and implementing its goals in the areas of marine resources and aquaculture. The benefits of these first steps, however, can only be enhanced by further action. Therefore, the Bureau makes the following recommendations to the Legislature:

1. The Department of Land and Natural Resources should be statutorily designated as the lead agency for aquaculture.

Although the Aquaculture Development Program and the Aquatic Resources Division of the Department of Land and Natural Resources have

been assigned the responsibilities necessary for the overall implementation and management of the State's aquaculture program, the statutory designation of the Department of Land and Natural Resources as the State's lead agency for aquaculture will clarify the Department's role as the agency with foremost responsibility for aquacultural activities.

2. An Aquaculture Coordinating Advisory Council and an Ocean Resources Coordinating Advisory Council should be established by statute.

Although informal coordinating committees in each of these areas presently exist,[20] statutory establishment of these two bodies will clearly set forth their powers, duties, and membership. Official establishment of the coordinating advisory councils is also important because of the number of members which should be included at a minimum, and to assure the performance of duties.

At a minimum, state departments with responsibilities in the field of aquaculture should be represented on the Aquaculture Coordinating Advisory Council, including the Department of Agriculture, the Department of Land and Natural Resources, the Department of Health, the Department of Hawaiian Home Lands, the Department of Planning and Economic Development, and the University of Hawaii; and state departments with ocean-related responsibilities should be represented on the Ocean Resources Coordinating Advisory Council, including the Department of Land and Natural Resources, Department of Planning and Economic Development, Department of Health, Department of Transportation, and the University of Hawaii.

Legislation appropriately patterned after Act 282 of the 1980 legislative session, which established the Hawaii Fisheries Coordinating Council, will additionally assure membership of the various industries and county government officials, and an annual report to the Governor and the Legislature.

Logically, the Aquaculture Coordinating Advisory Council should be administratively attached to the Department of Land and Natural Resources; and the Ocean Resources Coordinating Advisory Council to the Department of Planning and Economic Development.

Some relationships between pathogenic bacteria and salmon net pen culture

Pacific Fisheries Legislative Task Force, State Capitol, Olympia, Feb. 7, 1987

Dr. Arthur H. Whiteley, Professor, Department of Zoology, University of Washington

I intend in these few minutes to comment on one aspect only of pen rearing of salmon – the relationship to pathogenic bacteria and other agents of disease.

The growth of bacterial populations in a natural environment is limited by the availablility of nutrients. In a typical, natural marine environment the bacterial populations are relatively sparse. Given appropriate nutrients, either in the form of dissolved materials or sediments, the opportunity for growth in these populations will be much enhanced. It is generally agreed that salmon pen culture contributes substantially to the eutrophication of the environment of the pen – both in terms of soluble and finely suspended material, and in terms of larger particles that form heavy sediments on the bottom. In this way, the pens enrich the local environment for bacterial growth. Those bacteria already present in the water and substratum can increase. Any brought in with the introduced fish can increase as well. A variety of diseases can thereby be fostered by the pens. Some of these are of bacterial origin, some are viral, and some are due to organisms such as fish lice, parasitic worms, etc. The enhancement of the bacteria by nutritional enrichment works to the disadvantage of the penned fish. They are already stressed by the conditions in which they grow. They are therefore susceptible to bacterial invasion. Notably *Vibrio anguillarum* and *Renibacterium salmonarum* infect the penned fish and often kill them, and other vibrios and aeromonads are of major importance as salmon pathogens. *Vibrio anguillarum* produces disease in penned salmon in this State and in British Columbia. It also is ubiquitous in Norwegian waters, and is responsible for many of their fish farm diseases. With the advent of intensive fish farming in Norway, a new disease, the "hitra" disease, has appeared and now is responsible for 80% of the disease problems in the Norwegian fish farms. Its cause is uncertain, but vibrio species occur in connection with the disease

outbreaks (Håstein, 1986).

A significant question is whether these infections affect wild fish. Weston (1986) concludes that the evidence argues against such transmission. Others point out the difficulty of making such a determination because of the mobility of the wild fish and other complexities associated with working in a submerged, marine environment(Trust, 1986; Johnson, 1989; Staley, pers com.). It takes only a few minutes exposure for a fish - penned or wild - to become infected. Often the route of transmission is through the gills. The infected fish often die, but if they survive, they frequently become carriers of the pathogenic organism. Both viruses and bacteria can be shed through the feces of the fish, thus spreading the focus of contamination in the natural environment. Moreover, in certain cases (*Renibacterium*) the bacteria can be passed from a female to her eggs, where it associates with the yolk, and transmits the disease to her offspring (Trust, 1986). It is too early to conclude that there is no transmission from a pen to the general environment and to the wild fish there. On the contrary, it is the opinion of microbial ecologists that an infected fish pen would in all liklihood serve as a focus for the infection of fish in the environment, and from them for the transmission of disease to their offpsring (Staley, pers. com.).

In addition to pathogenic bacteria, the stressed salmon can serve as a focus for a number of serious viruses. These, too, may enter their host through the gills, and can be transmitted to other fish and to next generations (Trust, 1986). It is expected that they will be locally enhanced by the concentrations of wastes associated with fish pens (Staley, pers. com.), and this enhancement poses problems for the penned fish, and for wild fish as well. The danger that such viruses can be transmitted to wild fish is recognized by laws that prevent introduction of salmonids from the Columbia River system, which is infected by viruses, into any other river system in this State.

These pathogens and related ones that will multiply in the accumulated fish wastes, can serve as a reservoir of infection of marine <u>invertebrate</u> organisms as well. This, too, is a difficult field of inquiry because of the nature of the environment and the mobility of some of the organisms, and most information is derived from study of captive invertebrates. It is believed,

however, that animals living in degraded environments (which I assume would include under-pen locales) can be seriously disabled by such bacteria. Bacteria that degrade chitin, including *Vibrio, Beneckea* and *Pseudomonas*, cause shell disease in a host of crustacea, including spiny lobsters, tanner crabs, king crabs, various shrimp, and others of economic importance (Johnson, 1983). The species of *Vibrio* bacteria that infect crabs and shrimp include those associated with salmon pens or are present in local waters: *V. anguillarum, V. parahaemolyticus, V. alginolyticus.* (Johnson, 1983). Laboratory experience indicates that animals kept in clean sea water are difficult to infect, but those in the presence of sewage sludge developed shell disease. In addition to causing shell diseases, bacteria invade shrimp, crabs and other crustacea and cause internal infections. Again, the total relation of these infections to stress, to polluted environments, to salmon pen sewage is not resolved (Johnson, 1983), but we believe this relationship needs analysis in relation to establishing fish pens in the vicinity of shrimp and crab populations.

There is a well documented literature demonstrating that molluscan embryos and larvae - some of commercial significance - are subject to serious infection by these same species of vibrio bacteria. Abalone embryos and Pacific oyster (*Crassostrea gigas*) embryos and veliger larvae in hatcheries suffer serious mortalities from vibriosis (Sparks, 1985; Jeffries, 1984; Tubiash and Elston, 1984). It would be prudent to determine carefully the potential damage that may be caused by juxtaposing salmon pens to oyster and abalone culture facilities, and to native bivalve beds.

It would be of interest, also, to determine if vibriosis similarly affects these same kinds of molluscan larvae and embryos in the natural plankton, thereby affecting natural populations... Beyond that, it is important to know if populations of these *Vibrio* species or other pathogens, enhanced by sewage or fish pen wastes, infect other forms of invertebrate larvae or adults. I am thinking of the sponges, sea urchins, starfish and the host of other invertebrates which, though not of direct commercial value, are absolutely fundamental to the ecosystems of these waters and to their productivity. Their impairment would sound the death knell for these waters.

Some of these bacteria are pathogenic to man as well. Knowledge of the genus *Vibrio* is expanding rapidly. This genus, which includes *V. cholerae*, includes species that typically live in marine locales (Kelly et al., 1982). *V. anguillarum* appears not to infect humans. However, *V. vulnificus* and *V. parahaemolyticus* do infect humans. *V. vulnificus*, a recently recognized species, is a deadly pathogen that is carried in sea water. It is readily filtered and concentrated from sea water by oysters and clams and it is easily transmitted to humans when these bivalves are eaten. The results are often fatal. Other than through ingestion, humans can contract the disease through simple contact of sea water with open wounds or mucosal tissues. It is predominately a warm water organism, which suggests that our waters may be safe from it, but virulent strains of this species have been found in Oregon associated with fish, crabs and clams and in Japan associated with eels (Tison and Kelly, 1986; Kelly and McCormick, 1981; Tison and Kelly, 1984; Blake, Weaver and Hollis, 1980). A preliminary search for this species in the San Juan Islands has not revealed it, but its presence in warmer bays there, and in the Canadian Gulf Islands, or elsewhere in the Sound cannot yet be discounted (Kelly, pers com.). *V. parahaemolyticus* is, by contrast, commonly found around the San Juan Islands and doubtless is ubiquitous here (Kelly, pers.com.). It causes acute gasroenteritis in humans (Tison and Kelly, 1984; Blake, Weaver and Hollis 1980). This form of gastroenteritis appears to be transmitted exclusively through food, usually seafood (Blake, Weaver and Hollis, 1980). It can be a very significant infectious agent: in Japan, over a 10 year span, 24% of reported cases of food poisoning were attributed to this bacterium.

V. parahaemolyticus, thus, is present here, is a known pathogen of humans, and is transmitted through filter feeders such as clams and oysters. *V. vulnificus* is found nearby, and with further searching may be found in the Sound and Gulf. Simple contact with infected sea water will lead to serious infection. The former species, and probably the latter as well, thrives in heavy, enriched sediments such as sewage sludge. It can also be expected to grow in salmon pen sludge (Staley, pers. com.; Kelly, pers. com.).

It has been argued by associates of the salmon pen aquaculture industry that human diseases associated with these vibrics have been rarely found in the Puget Sound region, and therefore no danger is posed by them. Thus fish pen aquaculture is justified. It is good that the base line now, before salmon pens are well established, is essentially zero. The water is relatively clean, now, and the populations of these pathogens are within tolerable limits, using customary screening methods for detecting these pathogens. But a further complication is introduced by a recent paper (Grimes, et al, 1986). They find that when such pathogens as I have been discussing are introduced into marine waters, they rather quickly lose their identity as measured by conventional culture methods. They enter into dormancy, but remain viable though not culturable by traditional methods. Failure to find them using these methods could lead to overlooking a substantial, but cryptic source of serious pathogens in the environment.

The important question, then, is not whether these organisms pose a present health threat, or ecological threat. The proper question is: can these organisms, and this ecosystem, and these humans tolerate the eutrophic burden that will be imposed by a full blown fish pen industry? It is our belief that there are many too many questions that need resolution, of a public health nature, and of an ecological nature, before we proceed further.

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BLUE MUSSEL MARICULTURE

IN

KACHEMAK BAY, ALASKA

by

JAMES E. AND NANCY HEMMING

OTTER SEA FARMS

November 1984

With partial support from the Alaska Office of Commercial Fisheries Development

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INTRODUCTION

The blue mussel (Mytilus edulis) is probably the most common shellfish on beaches from Ketchikan to Bristol Bay, Alaska. In recent years the human consumption of this species in Alaska has been relatively low, perhaps due to fear of paralytic shellfish poisoning (PSP) that results from an occasional red tide or, more likely, because people are generally unaware of the gastronomic qualities of this gourmet species.

In 1982, the Alaska Office of Commercial Fisheries Development contracted Otter Sea Farms to study the feasibility of growing blue mussels, in Halibut Cove Lagoon near Homer, Alaska with the primary objective of assessing the potential of blue mussel aquaculture as a new commercial enterprise in Alaska. This report describes the techniques that were tested for raising mussels in commercial quantities. Included is a market assessment for southcentral Alaska and an evaluation of the regulatory process and its potential influence on shellfish aquaculture in Alaska.

THE AREA

The blue mussel culture project is located in Halibut Cove Lagoon. The lagoon is situated on the south side of Kachemak Bay approximately eight miles from the Homer Spit (Figure 1). The majority of land surrounding the lagoon is in State of Alaska ownership as part of Kachemak Bay State Park. A state cabin and warehouse and a private cabin are located at the head of the lagoon. These facilities, plus the cabin and warehouse associated with Otter Sea Farms, constitute the only development in the lagoon.

The lagoon itself is essentially a fjord with high, steep, rocky sides and an incised bottom configuration. The mouth of the lagoon is shallow with tidal rapids and, at low tide, the connection with Kachemak Bay is extremely narrow, bounded on the west by a rocky hillside and on the east by extensive

Table 2: Permits for Culture and Sale of Blue Mussels in Kachemak Bay, Alaska.

Authorization	Agency
Alaska Business License	Alaska Department of Revenue
Clam Shovel Permit	Commercial Fisheries Entry Commission
Section 10 Permit	U.S. Army Corps of Engineers
Critical Habitat Permit	Alaska Department of Fish and Game
Tidelands Lease	Alaska Department of Natural Resources
Section 401 Water Quality Certification	Alaska Department of Environmental Conservation
Paralytic Shellfish Poisoning Certification	Alaska Department of Environmental Conservation
Coastal Management Consistency Determination	Office of Management and Budget
Shucker-shipper Permit	Alaska Department of Environmental Conservation

CONCLUSIONS

1. A good mussel mariculture site should include:

   - close proximity to large populations of wild mussel seed stock.
   - protection from heavy wave action.
   - no winter ice.
   - excellent water circulation.
   - nutrient and plankton-rich waters.
   - excellent water quality.
   - proximity to transportation to market.

2. The raft/sock net culture technique appears to be more promising than the long line system of mussel culture.

3. PSP levels in Halibut Cove Lagoon have remained well below the toxic threshold; however, it will be necessary to test each shipment of marketable mussels to meet ADEC requirements. PSP should not limit commercial operation.

4. Given the relatively short shelf life of live mussels, the present method of PSP testing will decrease the usable time available to buyers by 24 to 36 hours. A quick, in situ test needs to be developed.

5. Locations for blue mussel mariculture installations must be in areas where no pollutants from industrial sources (including fish processing), domestic sewage, or petroleum products exists.

6. The current regulatory framework within the state is not equipped to handle shellfish aquaculture. Changes in, or additions to, existing statutes and regulations must occur in order to protect the mussel grower and his product.

7. Profitable mussel culture requires good growing conditions, low cost labor, efficient spat collection, and mechanized harvest methods.

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SMITHSONIAN INSTITUTION

Farming the seas, says Walter Adey, could double the world's food supply

THE BLUE REVOLUTION

BY KAREN MCGLATHERY

IMAGINE THE OCEAN as a huge field where millions of square miles could be used for growing and harvesting enormous quantities of food, with no polluting effects. This vision is hardly new. When the "green revolution" failed twenty-odd years ago and we first realized the land's limited capacity for food production, people turned with hungry eyes to the open seas, covering nearly three-fourths of the earth's surface. But scientists concluded that, with the exception of relatively small coastal areas and coral reefs, the ocean is a biological desert, incapable of massive food production. And so, says Walter Adey, "In the vast and alien oceans we are still the same hunter-gatherers that we were on land ten thousand years ago."

Dr. Adey, director of the Smithsonian Institution's Marine Systems Laboratory, is the architect of an ingenious new mariculture technique that challenges the conclusions of earlier researchers and suggests that large-scale farming in the open ocean is not only feasible but cost-effective. His system is based on the extraordinarily rapid growth of coral-reef algae—tiny aquatic plants that can be used in turn to raise grazing crabs and other valuable seafood. It may well lead to a "blue revolution" in worldwide food production, particularly in the tropics. And it's all happening partly because one day two years ago, thanks to Walter Adey, Ronald Reagan had crab for lunch.

The window of Adey's Washington office looks across the Mall to the Capitol. He smiles and leans back in his chair as he tells the story of that lunch. His success in the field growing coral-reef algae on artificial substrates (platforms), he says, had prompted him to think about harvesting a primary grazer like the West Indian spider crab, a Caribbean delicacy that is far more appealing to the local people than algae.

"I realized that this mariculture project had the potential of putting thousands of fishermen to work making ten times their present income, or more," he says. "But we needed money to get the project off the ground, and the government was an obvious source. So I talked with someone very high in the government--a person concerned with national security—and pointed out that since the Caribbean is a politically sensitive area, wouldn't it make sense to provide some economic support through this mariculture project—something that wasn't in the form of a gun? And I hit the right person. He asked me how much money I needed. I told him, 'A million bucks,' and he said, 'It's yours.' "

It wasn't quite that easy. The money had to be channeled through the Agency for International Development, a process that normally takes years. To cut the red tape, Adey and his friend had to get to the president, and they decided that the best way was through his stomach. Adey flew to St. Croix to buy some spider crab (also known as Caribbean king crab because it closely resembles its relative, the Alaskan king crab), and later that same day he marched up the White House steps, cooler in hand, and delivered three crabs to the chef, who agreed to make a last-minute change in the menu.

The next day's lunch was a success in more ways than one: three months later, Adey's money came through. He is now using the funds to establish, with the help of EARTHWATCH volunteers, a research laboratory on Grand Turk Island, which serves as a permanent base of operations for their mariculture work throughout the Caribbean.

THE IDEA of growing algae on artificial substrates in the open ocean had its beginnings back in the Marine Systems Lab at the Smithsonian's National Museum of

Karen McGlathery is assistant director of the Center for Field Research at EARTHWATCH.

Captain Adey and his lady have hopscotched throughout the Caribbean.

Natural History. There Dr. Adey has developed the world's first living coral-reef exhibit with more than three tons of coral rubble and over 300 species of plants and animals transported from the Caribbean. The 3,000-gallon system is kept alive by high-intensity lights, which simulate the tropical sun, and by an automatic wave generator.

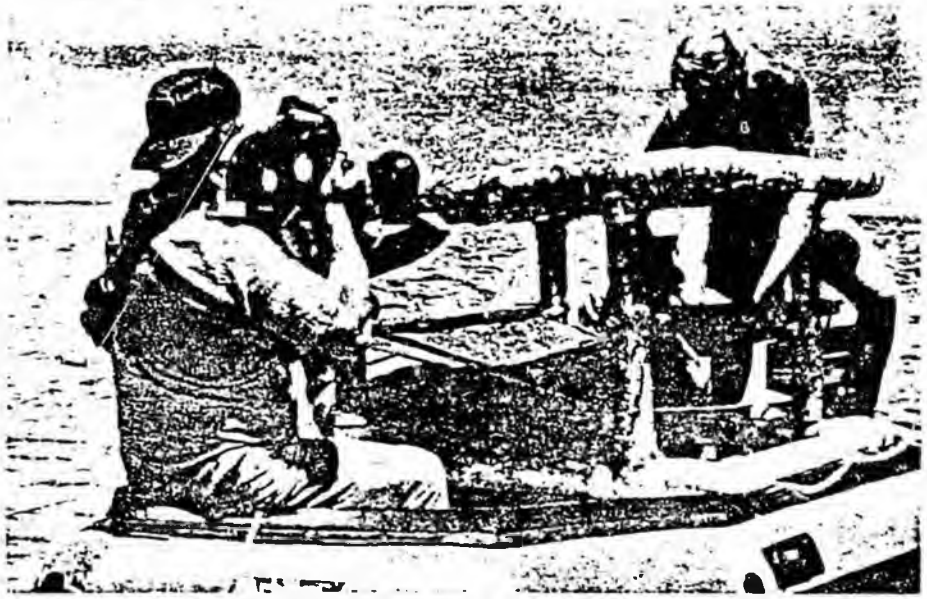
When it is "night" on the reef, water circulates through nearby trays containing algae growing on screens, which are illuminated by lamps. These algal "scrubbers" simulate the flow of fresh ocean water over the reef at night by removing toxins and nutrients from the water. In the absence of natural grazers, the algae grows so fast that it must be harvested once a week; the screens are scraped and the algae regenerates from basal parts that remain intact. "A year after we set up the exhibit," says Adey, "I realized that an awful lot of algae was coming off these screens. I thought to myself, if we can do this in an artificial system, why can't we do it in the field?"

Under Adey's direction, crews of students and EARTHWATCH volunteers have been working to perfect the technique of growing algae on artificial reefs—one-square-meter screens suspended in the water from rafts. The teams work from the Smithsonian's research vessel *Marsys Resolute*, under the command of Captain Walter Adey.

Coral reefs, those oases in the vast, nutrient-poor tropical seas, were thought to be richly productive only because they recycled nutrients so efficiently. By adjusting the screen type, water depth, light intensity, and harvest rate on his tropical algae farm, Adey has discovered that it is light, and not the tight recycling of nutrients, that is the limiting factor in coral-reef production. The algae's efficient capture of sunlight for photosynthesis and the continuous wave action together account for the productivity of both the natural and artificial reefs.

Natural reefs occur only in shallow waters, but all that is necessary to make Adey's mariculture process feasible in the open sea is a reflecting surface for the screens. "The real difference between the open ocean and the shallow water," explains Adey, "is not the nutrients, as everyone would propose; it's not a difference in the currents, although everyone would argue about it. Light is the difference, because in the deep water you don't have return reflection; it's only what hits directly on the screens." Adey envisions future anchor stations in the open ocean with numerous mariculture rafts attached to them.

Adey's algal production results to date are nothing short of phenomenal. The highest production rate recorded for single-celled phytoplankton in the open ocean, even under the most favorable conditions, is .3 to .5 grams of dry weight per square meter per day. And this amount is spread so diffusely over a huge area that there is no economic means of harvesting it. That's what led biologists to conclude that the oceans held no hope for massive food production. But Adey is now regularly achieving rates of more than 20 grams of dry weight per square meter per day—the equivalent of ten times the productivity of good Midwestern farmland. And he predicts that productivity can be increased by another 30 to 40 percent with only a few inexpensive modifications of his technique.



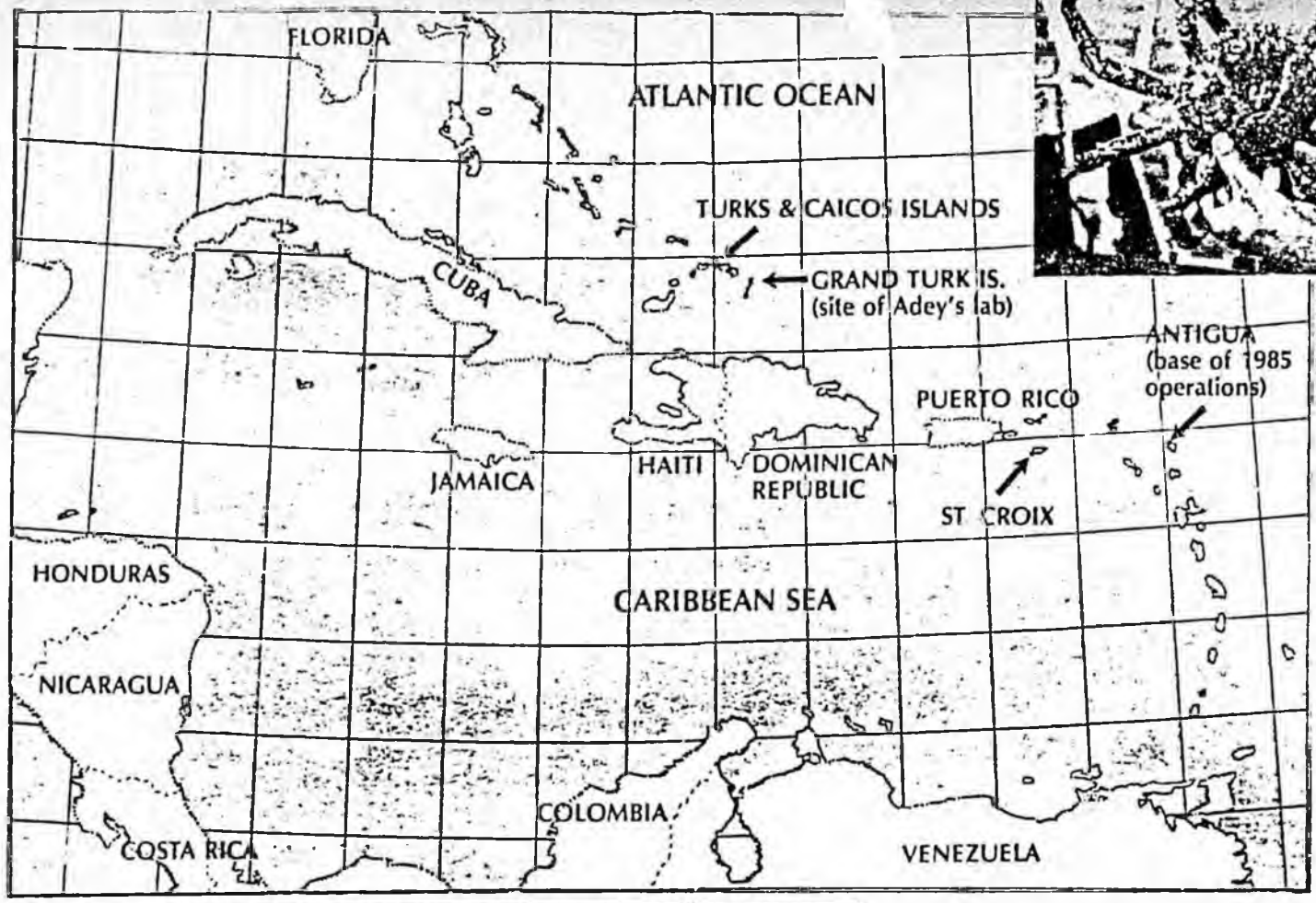
Volunteers scrape the algae harvest off a screen that has been suspended from a floating platform made of plastic plumbing pipe, while a video cameraman records the process for a recent Smithsonian TV documentary on Adey's mariculture project.

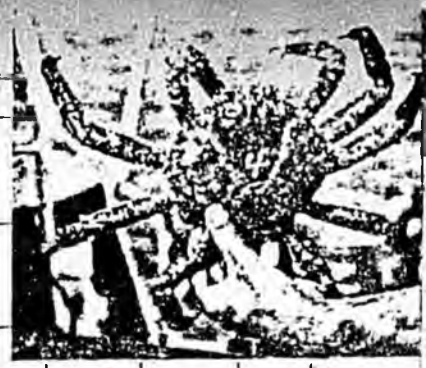
ALGAE are the key to Walter Adey's plan to establish Caribbean king crab fisheries, but it's the crabs that interest the local inhabitants. Though it's a prized seafood throughout the area, the king crab has never been harvested on any significant scale because it lives in the coral reef's deep crevices and comes out only at night to feed. It's not economically feasible to dive for the crabs; fishermen simply capitalize on the occasional stray that shows up in their lobster pots. The crabs bring $4 a pound at the dock.

Getting the crab's end of the mariculture project started was no easy job. It took three months for Adey's dive crew to locate enough crabs to start a hatchery at the marine lab on Grand Turk. When the crabs reach adolescence they are placed on the algal screens for fattening up; it then takes about a year for them to grow to edible size. It's possible that crabs raised in this way could satisfy the demand created by the now-collapsed Alaskan king crab market, which had reached $150 million per year, without the threat of overfishing or environmental degradation.

Support for Adey's work has come from all levels from the fishermen to the government, although in at least one case the traditional sex roles of the local culture have presented an obstacle. "It's Governor Chris Turner's personal feeling," says Adey, "that the Turks and Caicos fishermen are too macho and won't accept the process when they realize it's farming. Only women are supposed to farm, so they'll be the ones who end up doing the work—but in that culture the women won't go on the water."

Adey has agreed to try to adapt the process for use on land, and is experimenting with a series of terraced algal screens for the grazing crabs. He is not convinced, however, that the





An experienced navigator, Adey steers Marsys Resolute *on a safe course in tricky seas.*

Adey first tested turf algae's productivity at sea off Mayaguana. Last year's teams established a crab hatchery on Grand Turk (where Adey's laboratory is) and raised crabs at sea. This season Adey will expand crab—and possibly whelk—mariculture to Antigua.

land-based version will prove economical because of the large amounts of energy it requires.

Walter Adey is a maverick. He has succeeded in challenging assumptions that have been part of accepted biological theory for decades, and he is changing people's ideas about what drives the coral-reef ecosystem. He's been at this for years, but now people are finally listening. "It's interesting the way modern science works," he says. "It's become more group science. In the first place, the review and publication processes are such that you're not going to have any money to work with or have your ideas published unless you get people to agree with you. When you're challenging the basics that people have accepted all their lives it's exceedingly difficult to get the support you need. The result is that innovation is hard to come by. The problem of modern science is to find a way to allow innovation to get back into the research endeavor."

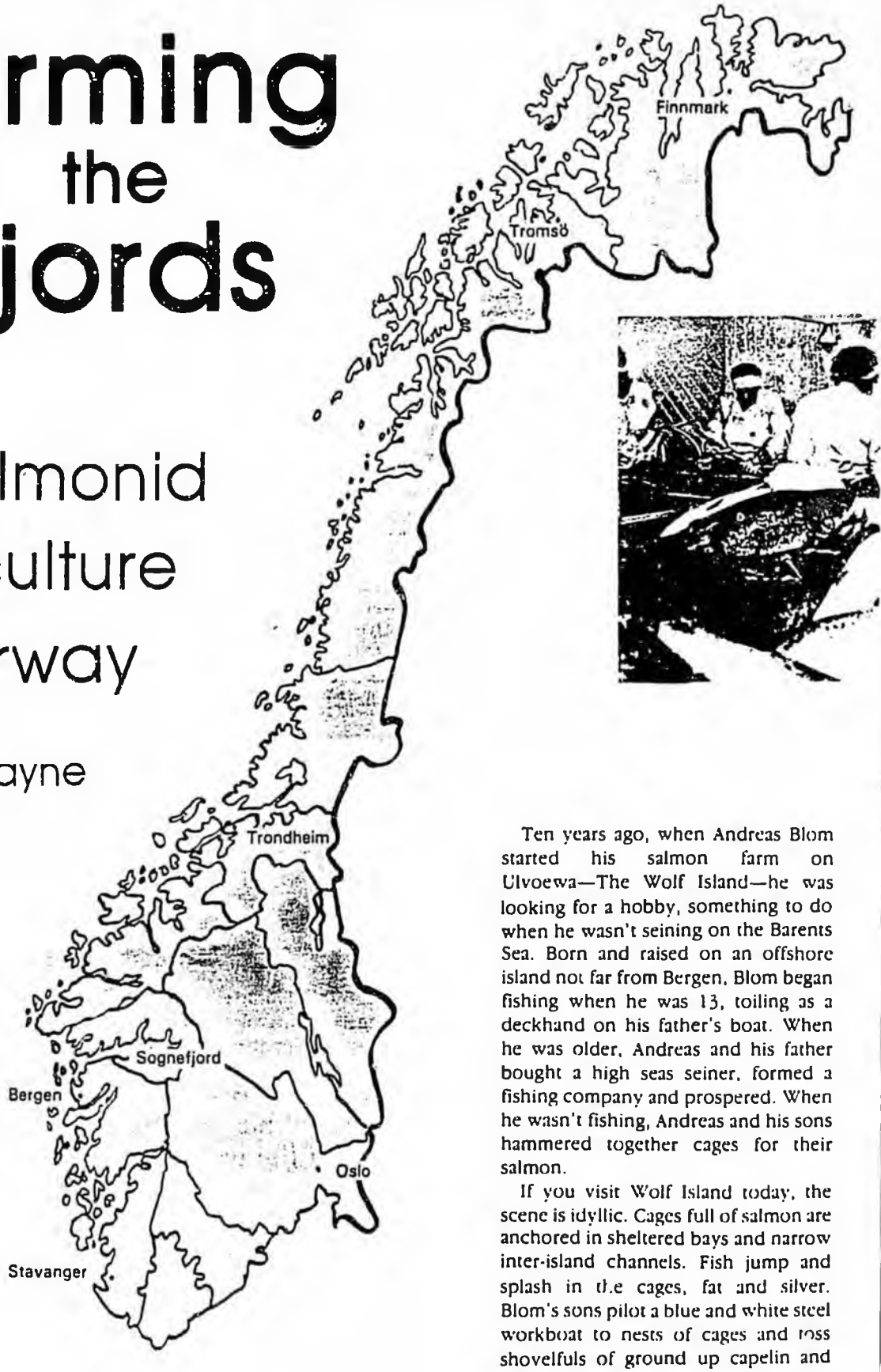
Adey plans to extend his research project throughout the Caribbean and into Central America, where several governments have expressed strong interest. His work has attracted the attention of officials in Antigua, the Dominican Republic, and Belize, among others. The Grand Turk marine lab and hatchery will also become a training center for fisheries officers and fishermen, and Peace Corps volunteers have been enlisted to help in the training program. Adey and his staff are expanding the research to include other edible organisms, including the whelk, parrotfish, and sea urchin, and there are many other possibilities.

Adey says his mariculture process is feasible anywhere in the tropics in the trade-wind belt of 5 to 30 degrees north latitude, and the same in the south—an enormous chunk of the ocean. There's even the potential to adapt the technique for temperate waters. "If we work out the bugs so that we can do it everywhere," says Adey, his eyes sparkling, "we are talking about doubling or tripling the world food supply."

Farming the Fjords

Salmonid Aquaculture in Norway

by Peter Redmayne



Ten years ago, when Andreas Blom started his salmon farm on Ulvoewa—The Wolf Island—he was looking for a hobby, something to do when he wasn't seining on the Barents Sea. Born and raised on an offshore island not far from Bergen, Blom began fishing when he was 13, toiling as a deckhand on his father's boat. When he was older, Andreas and his father bought a high seas seiner, formed a fishing company and prospered. When he wasn't fishing, Andreas and his sons hammered together cages for their salmon.

If you visit Wolf Island today, the scene is idyllic. Cages full of salmon are anchored in sheltered bays and narrow inter-island channels. Fish jump and splash in the cages, fat and silver. Blom's sons pilot a blue and white steel workboat to nests of cages and toss shovelfuls of ground up capelin and krill from loaded wheelbarrows into the water, boiling with frenzied feeders. When the fish are fat and the market is right, salmon are carefully removed

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Boxing Tokyo-bound salmon at A/S Mowi: Disposable diapers and a Copenhagen connection (far left). Andreas Blom's Wolf Island fish farm: After seining in the Barents Sea, a vote for the domestic life. In the foreground, Swedish technology creates an artificial current to keep the cages clean (left). Frozen blocks of krill and capelin, ground up and mixed with a binder, moist diets are preferred by about half of Norway's fish farmers (below).

from the cages, anesthetized and dispatched with a quick severing of an artery behind their gills.

Salmon are dressed on spotless stainless steel in a cement processing building a hundred yards down the shoreline from Blom's home. A poster, provided by the Norwegian government, hangs on the wall detailing the do's and don't's of fish handling. With the help of his two daughters and three sons, the fish are packed on ice in styrofoam boxes and ferried to a lorry which will deliver the fish to a SAS jet at the Bergen airport. Within 24 hours, after changing planes in Copenhagen, Blom's salmon may be served at a gourmet restaurant in Tokyo, New York or Paris. Farmed Atlantic salmon from Norway is even served in Seattle, home of the Alaskan salmon industry. It's expensive fish, but customers say the quality makes it all worthwhile.

For Andreas Blom, salmon farming has turned into something more than a hobby. The Blom family have their

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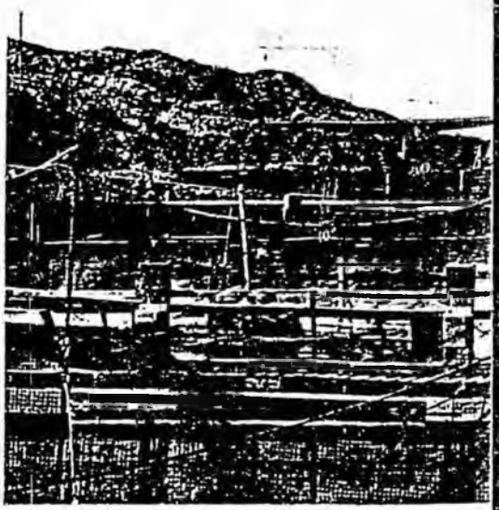


Bengt Wilson AS

hands full with a backyard business that grosses over half a million dollars a year.

Norwegians will tell you Blom's is a model farm, producing about 100 tons of Atlantic salmon a year. Almost 400 fish farms are scattered along Norway's long fragmented coast from Rogaland in the south, to Finnmark, north of the Arctic Circle. Norway's unique geography makes the country ideal for development of a large fish farming industry. The Gulf Stream arcs along much of the coast, warming the ocean water and keeping the countless coastal bays ice-free through the long dark winters. Offshore islands punctuate the coast, offering fish farmers protection from the winter storms marching in from the Atlantic Ocean with monotonous regularity.

Fish farming in Norway dates back to 1912, when the Norwegian government gave the go ahead to permit sea farming of rainbow trout. The industry faltered when the cages kept breaking apart and the fish escaped. Perhaps, a Norwegian newspaper suggested at the time, the fish farmers should try oysters since they would be less likely to escape from the fragile cages. The next serious attempts at farming in the ocean occurred in the late 1950s and early 1960s, again with rainbow trout. A strain bred by a University of Washington professor, Dr. Lauren Donaldson, seemed to adapt especially well and fish farming in Norway began in earnest.

While rainbows have been successfully farmed in the sea, the fish have yet to find a marketing niche outside of Norway, although many gourmets will tell you they prefer the flesh of sea farmed rainbows to farmed Atlantic salmon. The problem, says Johan Muri, Director of the Norwegian Export Committee for Fresh Fish, is the sea farmed rainbows (marketed as "salmon-trout" by the Norwegians) have been mistaken for the small (single-serving) rainbow trout which are farmed in freshwater in great quantities by such European countries as Italy, France and Denmark. Norwegian "salmon-trout" are bigger, weighing between 5-10 pounds. But size, Muri concedes, isn't the only problem the Norwegians have encountered trying to export their big rainbows.

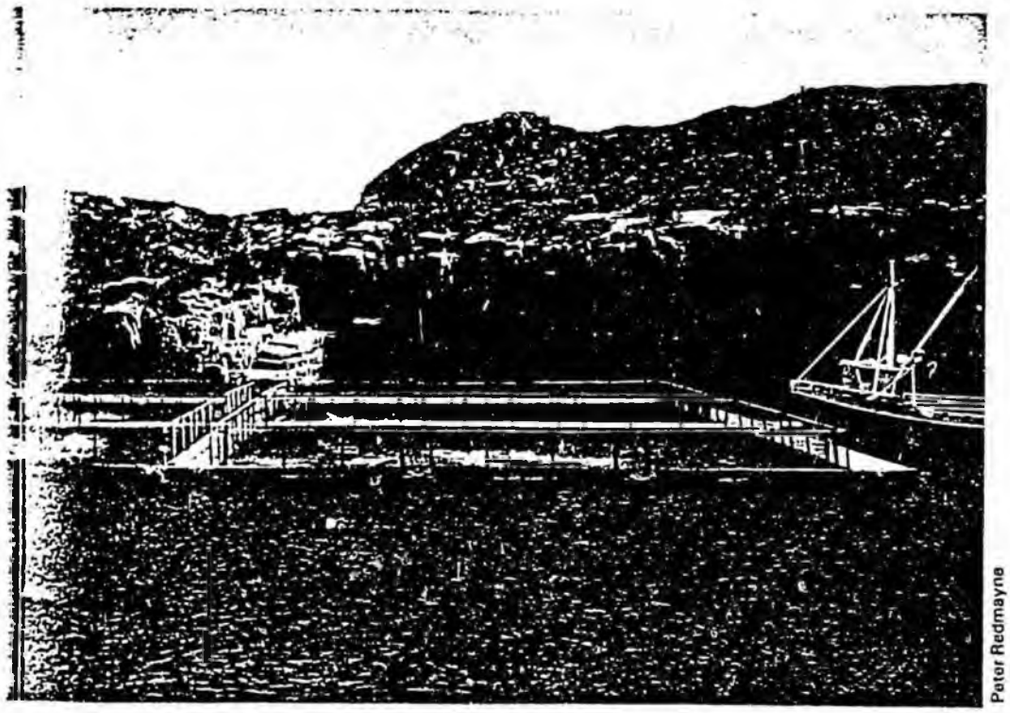
Freshwater trout farmers on the European continent have no desire to compete with the Norwegians and they have persuaded the European Economic Community to impose a stiff tariff on Norwegian ocean trout. Finding themselves on the outside looking in (Norway has declined to join the Common Market), Norwegian fish farmers began raising Atlantic salmon—a fish that has turned out to be considerably easier to market.

Although Atlantic salmon have only been intensively farmed for the last ten years and the technology involved in domesticating them is still in its infancy, Norway's production of farmed Atlantic salmon is impressive. In ten years, production has increased ten-fold.

By 1977, Norway's fish farmers produced more salmon than trout. And by the end of 1982, when production should reach 12,000 tons, Norway's production of farmed

Peter Redmayne

Cold-smoked salmon slices on the table at a food editor's banquet in Bergen: About half of Norway's farmed salmon is sold to European smokers (far left). A/S Mowi's Veloey farm: Fences across a bay and a thousand tons of salmon a year (left). Salmon feeding time at the Blom farm: For now, shovels and a wheelbarrow . . . next, computer-operated, solar-powered mechanical feeders (below).



Peter Redmayne

Atlantic salmon will exceed the total world catch of wild Atlantic salmon. In the next three years production is expected to triple again. Once it is convinced the markets are there, Oslo is expected to lift the lid on the number of salmon farming permits, increasing the number of fish farms by 50%.

"I am optimistic," says Thor Mowinckel, Managing Director of A/S Mowi, Norway's largest salmon farm, "and see no reason why Norway should not be able to produce and sell 100,000 tons of Atlantic salmon. The markets must be prepared for this increase and it cannot be done overnight."

So far, markets have not been a limiting factor for the salmon farmers. They can sell every fish they grow for about twice the price of troll-caught Pacific salmon. A shortage of salmon smolts has been more of a problem than a shortage of markets.

On its way to market, most of Norway's farmed salmon passes through Bergen, a city with a long tradition of fish trading. At one time Norway's capital and now the country's second largest city, Bergen boomed after the arrival of the Hanseatic traders in the 14th century. For the next two centuries, "the city between the mountains and the sea" controlled commerce in northern Europe. Salt cod, brought down from the north of Norway in ships rigged with one large square sail, was the foundation of Bergen's early trade. Six centuries later salt cod has been replaced by salmon from Norsk fish farms bound for the populations of the European continent.

So far, the bulk (about 85%) of Norway's farmed salmon has been bought by European smokers and gourmet restaurateurs. Until recently, observed one salmon exporter in Bergen last June, "the European market has pretty much had the Norwegians by the tail." But with production expected to triple in three years, Norwegian fish traders have been on the stump for new markets from Singapore to Seattle and have met with some success. "The Norwegians have so much production planned . . . they need the American market," the exporter said. "This year the Europeans became aware and scared by the Norwegians' ability to sell to the U.S."

Norwegians call Atlantic salmon (*Salmo salar*) "the only real salmon," as it belongs to a separate genus from the five species of Pacific salmon, *Oncorhynchus*. It was Atlantic salmon that first drew Scottish lairds across the North Sea to fish the fjords on their summer vacations. Wealthy Europeans, sailing from the continent on plush yachts followed. The steep green mountains plunging to the aqua blue sea impressed the visitors. A frequent voyager to the Sognefjord, Norway's longest fjord, Kaiser Wilhelm II was so

[continued on page 36]

Norway's Top Salmon Farm is Big Business

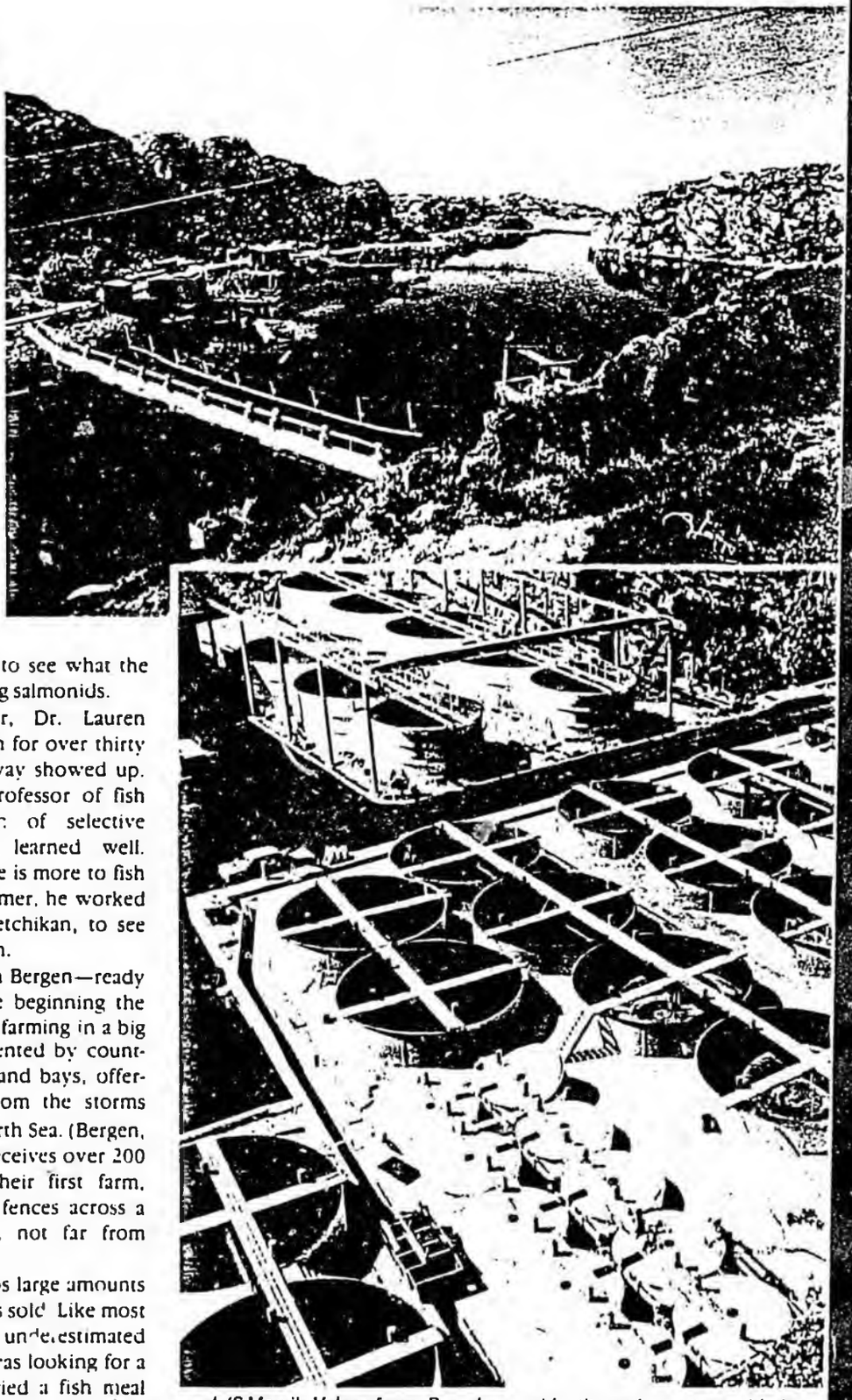
MOWI

IN 1965, WHEN HE WAS 21, Thor Mowinckel decided to become a fish farmer. Capital was available; his father had just sold the family's jam and marmalade business. So, in 1966, the young Norwegian said goodbye to Bergen and traveled to Seattle to see what the Americans had learned about raising salmonids.

Mowinckel's American mentor, Dr. Lauren Donaldson, had been breeding fish for over thirty years when the visitor from Norway showed up. The University of Washington professor of fish farming advocated the wisdom of selective breeding, a lesson Mowinckel learned well. However, Mowinckel realized there is more to fish farming than breeding. In the summer, he worked at the Waterfall Cannery, near Ketchikan, to see how Alaskan packers handle salmon.

By 1968, Mowinckel was back in Bergen—ready to pioneer an industry. From the beginning the Mowi Company went into salmon farming in a big way. The coast of Norway is accented by countless rocky offshore islets, islands and bays, offering protection to fish farmers from the storms which regularly roll in from the North Sea. (Bergen, located on Norway's west coast, receives over 200 inches of rainfall a year.) For their first farm, Mowinckel simply built concrete fences across a huge inter-island bay at Veloey, not far from Bergen.

The aquaculture business absorbs large amounts of capital long before the first fish is sold. Like most fish farmers, Mowinckel recalls, he underestimated the need for capital. By 1969, he was looking for a partner with deep pockets. He tried a fish meal company. They weren't interested in investing in a fledgling industry that had yet to show a profit. Too risky, they said. Deep in the hole, Mowinckel considered aborting his career as a fish farmer. He



A/S Mowi's Veloey farm: Brand name identity and a partner with deep pockets (top). The hatchery and smolt farm at Oeyerhamn: Vertical integration and reaping the rewards of selective breeding (above). Thor Mowinckel and salmon: An American education and a Norwegian commitment to aquaculture (right).

changed his mind, though, after he talked to Norsk Hydro.

Besides owning the country's extensive hydroelectric system, Norsk Hydro is a major investor in North Sea oil. "What better associate could we have found than Norsk Hydro," Mowinckel asks rhetorically, ". . . Norway's biggest concern?" By 1970, Mowinckel was on the road in Europe spreading the word about farmed salmon.

It wasn't an easy sale. The Europeans, it seemed, were skeptical. "They were suspicious about anything new," Mowinckel recalls, "and they associated salmon farming with broiler fowl production. Almost unanimously it was expected the salmon would be a cheap, inferior product." He was told the Norwegians handled their salmon poorly—not the way their customers wanted. Buyers took him into cold storages and explained how they wanted their fish to be handled. Again, Mowinckel listened and learned his lesson well.

In 1972, Mowi got the green light from the government and fenced off another bay. Although Mowi's second farm was only about half the size of the Veloey operation, together the two farms had the potential to produce several million pounds of salmon a year. By 1975, Mowi had turned the corner and posted their first profit. In the last five years, Mowinckel says, the company has enjoyed "healthy profits."

Bengt Wilson photos

One big reason Thor Mowinckel is a success story, says Dr. Donaldson, is because he understands the economic rewards of selective breeding and stock development. Unlike smaller farms, which buy their young salmon from smolt farms, Mowi raises their own smolts, giving the vertically-integrated company total control over its operation. Two fresh water hatcheries near Bergen incubate about 5 million eggs a year from Mowi's carefully chosen brood stock. Fish are bred for fecundity, resistance to disease and stress, and high growth rates. After taking what he needs for his own farms, Mowinckel sells the remaining smolts to other farms. He prefers selling smolts to farms that will sell the fish back to him when they are ready to be marketed. Mowinckel knows how to market as well.

While Thor Mowinckel understands the importance of selective breeding, he also understands the importance of selective marketing. Taking a cue from the marmalade business, Mowi has developed a brand name identity for their salmon. Each salmon that makes the quality grade is tagged with a green and white gill clip, bearing the Mowi name and company logo. According to Mowinckel, the guarantee of quality is worth an extra 5 krone per kilo (about 40¢/lb.) to his customers—more than enough to cover Mowi's added cost of advertising and printing four-color brochures.

Although his farms currently account for close to 10% of the total Norwegian production of farmed salmon, Mowinckel, young, ambitious, and aggressive, wants more. He would like to market another three or four thousand tons of salmon from other farms. He would also like to farm more fish in Norway, but Oslo has different ideas.

The Norwegian government would rather see more small salmon farms than more operations on the scale of Mowi's. Salmon farming, the government feels, is an ideal occupation for commercial fishermen displaced from the North Sea. To farm more salmon, Mowi had to leave Norway.

In 1981, Mowi bought an existing salmon farm on the Irish coast—good for another three or four hundred tons of Mowi salmon a year. Mowi also joined the rush to ranch Atlantic salmon in Iceland, entering a joint venture with an Icelandic company with an operation at Lön. Iceland's ample supply of geothermal water is ideal for raising smolts which are released into the ocean to return a year or two later, fully grown. The results, so far, have been encouraging, Mowinckel reports. A 5% return, he figures, will cover his costs, while a 10% return would make for "a healthy business."

After salmon, what's next for the 38-year-old Thor Mowinckel? He's committed to a future in aquaculture, he says, and is already at work on methods of farming flatfish and eels. And, he adds, he's "fascinated by shrimp."□

[continued from page 33]

taken with the place he returned one summer with a full naval escort and a massive statue of Fridtjov the Bold, a legendary Norse Viking. A large crowd gathered in boats of all sizes to watch the unveiling on the last day of July. But when the shroud was dropped, the Norwegians were not impressed.

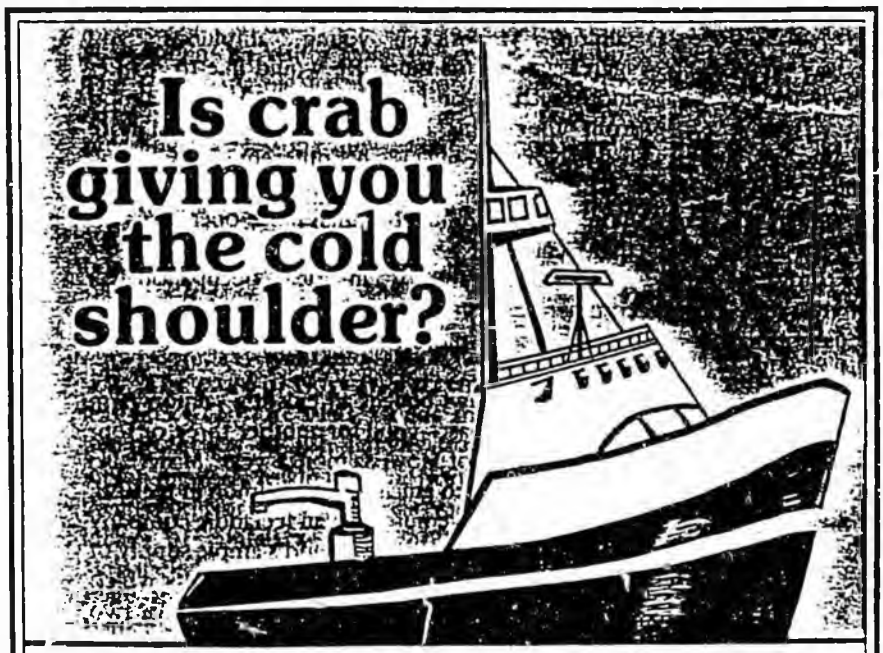
"True, it was a most generous gift," wrote historian Frithjof Saelen, "but the massive statue—more like a Wagnerian tenor than an old Norse Viking--and the Imperial bombast stuck in most Norwegian throats."

Acid rain and high seas gillnetters have taken their toll of Norway's wild Atlantic salmon runs. With numerous river systems flowing into fjords along the country's lengthy coast, Norway has historically had a large number of distinct salmon runs, a definite advantage to geneticists in their efforts to engineer a domesticated Atlantic salmon.

Peter Redmayne

Bergen's waterfront fish market: Live cod, salmon steaks, shrimp and tourists.

In the wild, Atlantic salmon spend their first three years swimming in riffles where the river's current is not too strong, but the water is well-oxygenated. After smoltification, the fish migrate to the open sea to feed on fat oily fish like capelin, sand eels or herring. Shrimp and squid are consumed as well, depending on the age of the salmon. Biologists believe salmon that fatten fastest feed in the teeming waters of the Norwegian and



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Managing the Market

Odd Steinsbø spends a lot of time these days exhorting fish farmers. He wants them to harvest more salmon in the winter and spring, before the summer glut of wild salmon hits the fresh market. Left to their own devices, farmers tend to grow their fish as big as they can, harvesting them in the summer just before they start to mature. But if they continue to do that, with all the farmed salmon coming out of Norway, they'll collapse the market, Steinsbø explains.

As Managing Director of the Trondheim-based *Fiskeoppdrætternes Salgslag* (Fish Farmers' Sales Association), Steinsbø is an educator helping his members to learn the rewards of playing the market. When the Norwegian Parliament passed a law in 1978 creating the FFSA, the idea was to establish control in the marketplace. Whether he wanted to or not, every fish farmer in Norway was now required to join and sell his fish through the Association.

Norwegian fish farmers can't just sell their fish to anybody. After reviewing their confidential disclosures, FFSA has approved about 60 exporters (including a dozen or so of the largest fish farms) to buy farmed fish. The exporters have their own association as well, and once a year both associations meet and set a minimum price for farmed fish.

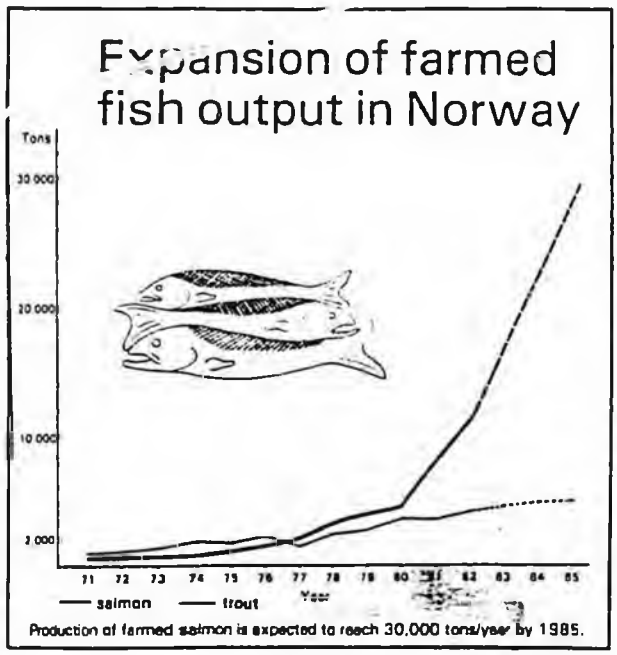
FFSA extracts a 2.5% sales tax (1.25% from both the farmer and buyer) to pay for its overhead which includes a computerized tracking system for farmed fish and smolt raised in Norway. The Association relays the information to the farmers to keep them abreast of the latest market developments. If it looks like a glut of farmed fish may occur, the Association (through its ties with a fishermen's bank) can obtain preferential financing and is prepared to step in and buy up any surplus and freeze it. Fish farmers are paid half the money up front and the balance when the frozen fish are sold.

FFSA spends the bulk of its budget promoting farmed fish. Advertising campaigns, trips to Norway for food editors and in-flight smoked salmon sandwiches are all part of the strategy. An important part of the promotional campaign (about half the budget) is a concerted effort to get Norwegians to eat more farmed fish. If the Norwegians eat it, FFSA thinks it adds credibility to their export campaign.

When Norwegians fly on SAS, their national airline, they may see an ad in the in-flight magazine touting farmed fish. During the flight, passengers receive a snack box containing an open-faced lox sandwich. Another pitch for fish greets the passengers as they open the snack box and see an ad on the underside of the boxtop lids. With a population of four million (the size of greater Philadelphia), it takes a much bigger market than Norway to absorb all that farmed fish.

Export trade is the lifeblood of most Norwegian business, a reality that was apparent to Terje Korsnes while growing up in a coastal fishing village. Recruited by Seamark Corporation, a Boston seafood importer, Korsnes moved to the U.S. in 1977 to develop markets for Norway's salmon farms. Korsnes took a cautious, intelligent approach. "We identified an opportunity early on and said we have to go at it in a small way . . . and try to build an identity for the product."

The identity was quality and steady supply—for a price. Test marketing started in 1978 and it soon became apparent restaurants and delicatessens were in the best position to market the high-priced farmed salmon. By 1981, Korsnes says, the U.S. market was buying 50 tons of farmed salmon a year. "It was interesting to see how immediate the repurchase was," he recalls. "People were disappointed unless they could get Norwegian salmon." Then last winter, sales really took off. In the first six months of 1982, 400 tons of Norwegian salmon were sold in the U.S. and Seamark (along with Intersea of New York which imports Mowi salmon) had the lion's share of the American market.



Production of farmed salmon is expected to reach 30,000 tons/year by 1985.

Seamark imports farmed salmon from Hallvard Leröy A/S, a Bergen fish exporter with a long tradition of selling fresh Norwegian fish in Europe. Leröy used to export Mowi salmon before Mowi got so big and started exporting their own. Now, with investments in several fish farms and an extensive supply network along much of the Norwegian coast, Leröy can deliver fresh farmed salmon "practically every week of the year."

With production of farmed salmon expected to triple in three years, the question on the seafood industry's mind is: "Just what do the Norwegians plan to do with all that farmed fish?"

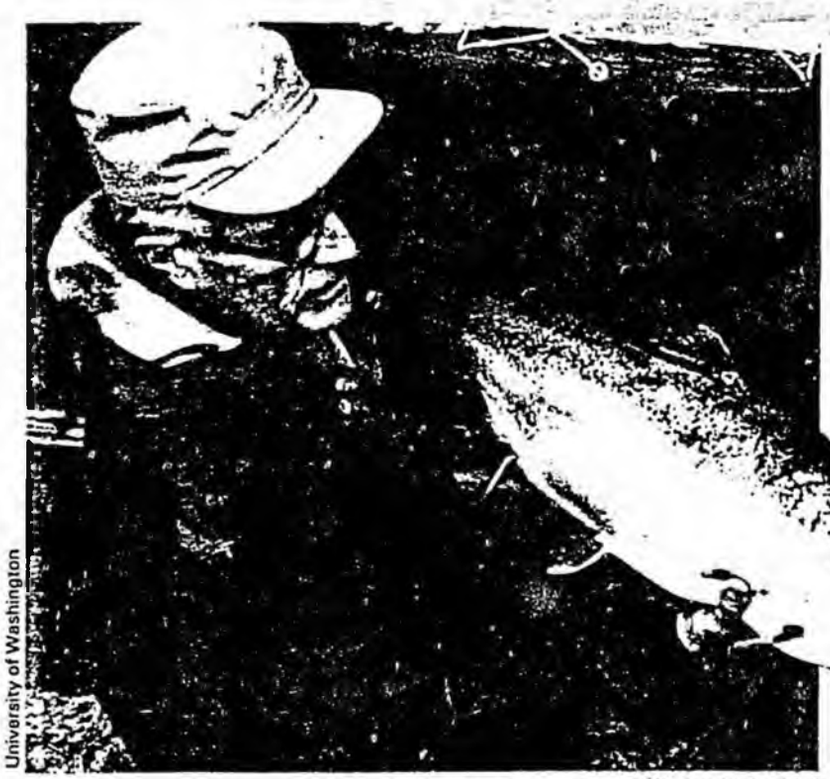
"It's impossible to guess what might happen," answers Terje Korsnes who predicts the U.S. market should be good for 50 tons a week most of the year and about 10 tons a week during the summer months when fresh wild salmon is available. That still leaves a lot of farmed Norwegian salmon to market.

Vacuum packed convenience items may be one answer, according to Kjell Landaas, Managing Director of Norway Foods Ltd., a consortium of Norwegian food processors. Sold in supermarkets, the frozen vacuum packs may include a sauce; however, the product is still in the developmental stage. Whatever the ultimate marketing strategy, one thing appears certain: production from the Norwegian fish farming industry will only expand as markets are developed, and the United States, a big market with a growing devotion to quality seafood, is the key. ☐

Barents Seas. Because the fish feed in northern waters, biologists explain, wild Atlantic salmon seem to grow faster in colder water—a characteristic that is of considerable importance to salmon farmers.

After only one year at sea, some precocious salmon mature and return in the fall. Called "grilse," they are relatively small, weighing 4-8 pounds. Most wild Atlantic salmon stay at sea two years before returning and usually run between 9-15 pounds. A small percentage of Atlantic salmon remain at sea longer than two years, but rarely more than four. These fish occasionally exceed 30 pounds, but normally run between 18-30 pounds, although the record for a net caught Atlantic salmon exceeds 100 pounds.

Genetic studies of Atlantic salmon have shown considerable variation between fish, depending on their river of origin. One river system, for example, may consistently have a higher percentage of fish that stay at sea for more than the normal two years. Another river system may have a high percentage of grilse. Or fish from one river may have a faster than average growth rate. This natural variation among the species gives Norwegian geneticists certain



University of Washington

Donaldson and 'Susie'—'the most productive animal that ever lived.'

Dr. Lauren Donaldson: The Grand Master of Salmonid Aquaculture

The king salmon return in the fall to a plywood fish ladder outside his Lake Union office window on Portage Bay. Although "home" is the University of Washington campus in urban Seattle and the fish must swim through a set of locks to reach fresh water, Lauren Donaldson maintains this is the most successful chinook run in the country. Fertilized eggs from the fish are air-freighted around the world, multiplying growing runs in Chile, Japan, New Zealand and the Great Lakes.

A Minnesota native, Donaldson remembers being taught that king salmon would only return to big wide streams after swimming up big wide rivers. Donaldson's kings swim in from Lake Union through a 12-inch gap in the plywood ladder. He also remembers listening to biologists explain why a sockeye run could never be established on Seattle's other urban lake, Lake Washington. Last summer, weekend anglers and Indian gillnetters caught thousands of his Cedar River reds at the south end of Lake Washington, near Boeing's 727/757 plant. The run used to be better, before environmentalists cleaned up the lake, removing some of the food for the sockeye fry. Donaldson's fish have also helped establish thriving resident freshwater pink and chinook (king) salmon runs in the Great Lakes, to the delight of local sports fishermen. The professor credits much of his success with salmonids to not always going by the book. Salmonids, he explains, are "fantastically adaptable" fish.

Lauren Donaldson arrived at the University of Washington in 1930 with his wife and young son Jack. He had been a high school science teacher in Montana, but he wanted to be a fish farmer in Seattle. After arriving on campus to attend graduate school, he was informed that the College of Fisheries had been downgraded to the School of Fisheries. He also learned the university didn't have any of its own fish—a situation Donaldson rectified in short order. For his first experiments in selective breeding, the aspiring fish farmer selected a local species of *Salmo gairdnerii*: the ordinary rainbow trout.

The rainbows Donaldson began experimenting with normally tipped the scales at a pound and a half at age four. Females were expected to produce something less than a thousand eggs per spawning. Since 1932, Donaldson has selectively bred rainbows: females for fecundity and males for size. The rainbows were bred to have small heads and big bodies. Donaldson even bred a strain of albino rainbows.

One of his favorite rainbows was Susie—the mother of Lot 240. In 1969, three-year-old Susie spawned 23,489 eggs which were fertilized with the sperm from a pair of two-year-

advantages in their efforts to select a stock of Atlantic salmon which will thrive in captivity. It also makes Trygve Gjedrem's lob more interesting.

In Norway, government research agencies make an attempt at paying their own way. It is a policy that tends to keep their research oriented to the real world. Scientists have a hard time selling their programs unless industry perceives the research to be to their advantage. In the case of Norway's salmonid research program, there really hasn't been much of a problem. According to Trygve Gjedrem, director of the salmonid research program, the two research sites at Sunndalsøra and Averøy cover 75% of their operating costs by selling smolts to fish farmers. Genetically engineered, his smolts are in great demand, Gjedrem says.

Genetic technology is one big reason the Norwegians have a head start in making salmonid aquaculture a profitable business. It is a science that requires considerable time. With Atlantic salmon, for example, it takes four years, or one generation, to get results from an experiment. Although Gjedrem and his colleagues have only been experimenting with Atlantic

old males, each weighing over ten pounds. Although other females broke Susie's egg record, Donaldson refers to the fish as "the most productive animal that ever lived." Within two years the total weight of the surviving offspring from Lot 240 (only 17% died) was 196,000 pounds—nearly 100 tons of fish from the eggs of one female's single spawning. Results such as these do not go unnoticed.

Not long after Boeing delivered its first 707, Donaldson started using the jet airplane to establish both himself and his salmonids around the world. In the early 1960s, he took some of his rainbows to Norway and left them with Dr. Gunnar Rowlefson, a colleague at the Bergen Aquarium. Some time later he took a call from the excited Norwegian who told Donaldson he had thrown the rainbows in salt water and "they were growing like hell." Calling the fish "salmon-trout," the Norwegians used the rainbows to develop their fish farming industry.

From the tip of the southern hemisphere to the tip of the northern hemisphere, Donaldson has helped establish thriving salmon runs. In Chile, his king eggs have helped introduce a run which grows red and fat on Antarctic krill. The Chilean chinooks are ranched and the industry has tremendous commercial potential, Donaldson believes. The professor from the University of Washington has also made good friends in Japan and Russia by lending a helping hand.

Japanese salmon ranchers release over a billion chum fry into the North Pacific every year, mostly from the northern island of Hokkaido. Using a relatively simple hatchery technology, the Japanese welcomed home over 21 million salmon last fall. According to one salmon aquaculturist familiar with the chum runs in Japan, the operations ". . . are extremely viable from an economic standpoint . . . for every dollar they spend on growing fish, they generate $20 in raw product back." To the north of Hokkaido, on Sakhalin Island, the Russians have even bigger plans. They want to eventually release 3 billion salmon fry (chum and pink) into the North Pacific. In both countries, the salmon are used for domestic consumption. The Japanese like the chums fresh or salted, while the Russians like to smoke their fish whole.

In Japan and Russia, many of the salmon ranches are cooperatives run by displaced commercial fishermen who find life ashore more agreeable and profitable than life on the high seas.

Lauren Donaldson takes pride in the mushrooming successes of commercial salmon farmers around the world. He should. Some of the industry's most successful commercial operations are run by his former students. At one time, Donaldson himself, along with his son Jack (now the Director of the Oregon Department of Fish and Wildlife), gave fish farming for profit a try. The two were instrumental in forming Oregon Aqua Foods, a private salmon ranching company founded in 1971 which releases cohos and chinooks from the Oregon coast, the only Pacific coast state where private-for-profit companies are releasing salmon smolts into the ocean.

Although private and public non-profit salmon ranching is going on in the remaining Pacific Northwest states and Alaska, for-profit enterprises have been stalled by the political pressure applied by commercial fishermen and state fish politics. The fishermen think private salmon ranching is the reinvention of the fish trap, a device which effectively limited commercial fishing in the past by putting the fish directly in the hands of the processors. Biologists argue that the Pacific Ocean will hold only so much salmon, implying that private runs would compete with existing stocks for food. While the Japanese and Russians send billions of fry to forage in the Pacific, private-for-profit salmon ranching operations in the U.S. release less than a hundred million smolts a year into the same ocean.

Oregon Aqua Foods is a long way from paying its bills in spite of large infusions of capital (including a $7 million hatchery) from the Weyerhaeuser Company which bought the struggling venture in 1975 "lock, stock and barrel." Donaldson believes that the financial picture would improve for private salmon ranchers using a mixed stock approach, if they take the time to develop a brood stock and if the fish are not all picked off by commercial salmon trollers, sports fishermen and seals. "In Iceland," Donaldson explains, where a growing number of private companies (including Weyerhaeuser) are developing Atlantic salmon ranching, "they'll hang you" if you catch a salmon in the sea.

At the age of 79, Professor emeritus Lauren Donaldson still comes to the office every day as he has for the last 52 years. These days he goes home at noon. He looks out at the raceways, full of plump young rainbows, from his ground floor window on Lake Union. His information is still much in demand. The Chinese want their own salmon program, and they want the professor of fish farming to stay for a month in September. Donaldson will give them two weeks. A Rose Bowl poster is hanging on his office wall; the former high school athletic coach explains he doesn't want to miss all those Husky games.

And the kings come back in the fall. He wants to be there "hollerin'" to make sure the future fish farmers select the best fish for breeding. His students will enter a growing industry full of opportunity. "Fish farming is just too efficient," Dr. Lauren Donaldson explains; if you have to hunt in the ocean, he adds, "you just can't compete." □

'In just one generation geneticists have obtained a 15% improvement in growth rates . . .'

salmon for ten years, the results of their work are already beginning to pay off. In just one generation, Gjedrem says, geneticists have obtained a 15% improvement in growth rates by selecting for fast growing fish. Drawing on the large gene pool, scientists are breeding for resistance to disease and stress, rapid growth rates, early smoltification, and delayed sexual maturation. Scientists can even select for fish that assimilate the natural pigment astaxanthin found in crustacea such as shrimp and krill. Some fish retain the pigment better than others giving them the deep red flesh consumers will pay extra for.

The scourge of the salmon farmer, grilse, can be selectively bred against. But better yet, they say, is a fish that never matures: a sterile salmon. With a sterile fish, a salmon farmer would be free to market his fish at whatever age and size he deemed appropriate. To a geneticist, it's all a question of diploids and triploids—a reference to a chromosomal makeup. Normal Atlantic salmon are diploids. Triploids are relatively rare; they have a high frequency of sterility. The trick is to make diploids into triploids and there may be an answer.

A short heat shock (about 30°C appears to do the job) to the newly fertilized egg apparently results in a significantly higher percentage of sterile or triploid fish. The heat treatment also seems to be more successful with females.

Salmon farmers will tell you their fish tastes better. "You know, the small differences," one explains. Wild salmon are normally caught in bays and river mouths, long after their instincts have turned from food to sex. Changes in their flesh, subtle at first, have begun. Farmed salmon, on the other hand, are fed a high fat diet and colored with krill; then they are starved for several days and slaughtered. Some farmers feed their fish relatively expensive food, but they have figured how to get their money back on the other end. Explains one farmer who pays more for capelin frozen at sea by Russian trawlers because the quality is better: ". . . This is a very costly procedure, but we like to stick to this diet as long as we feel our customers are willing to pay a price

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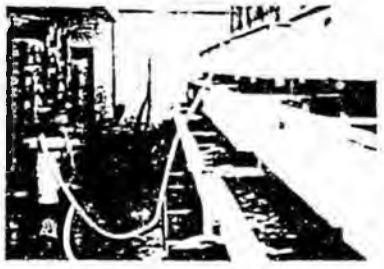

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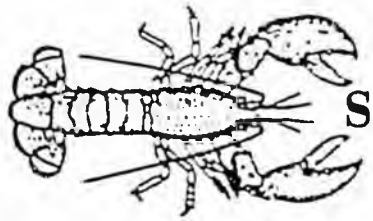

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Before salmon are harvested, they are starved for at least seven days, cleansing their digestive systems. If a farmer has been using antibiotics, the treatment must be stopped at least two months before the salmon are harvested. Laboratory tests are required before each harvest, to ensure no traces of antibiotics remain.

After the salmon are carefully removed from their cages, they are placed in a water-filled box, lined with a plastic tube. Carbon dioxide (CO_2) is injected into the water, knocking the salmon out. Once knocked out, they are dispatched with a quick severing of an artery behind their gills. The salmon are then put into a tank with running water where they bleed to death. Depending on the location of the packing plant, salmon are either gutted at the farm or at the packing plant if it is nearby. The general consensus in the salmon farming community is salmon should be gutted within two hours after they are put to death and before rigor mortis sets in.

At the packing plant, salmon are laid on ice in polystyrene boxes which are commonly lined with disposable diapers to absorb ice melt, preventing flesh from lying in water where it can lose water soluble proteins. In the summer, salmon are cooled to 0°C (32°F) before they are packed on ice to prevent the ice from melting in transit. The Fish Farmers' Sales Association is attempting to standardize the type of boxes used for packing. Each box is stamped with the farm's serial number so any quality complaints can be traced to the farm of origin.

Most of Norway's farmed salmon is transported by road and ferry to reach markets in Europe within 48-72 hours from the time the fish leave the water. The rest of the salmon is moved by air freight (almost exclusively on SAS) to markets all over the world. Dubbed the "Salmon Airlines System" by people in the industry, SAS has invested considerable time and money perfecting the critical product distribution system, including designing special air freight containers to keep the product at a constant 32°F.

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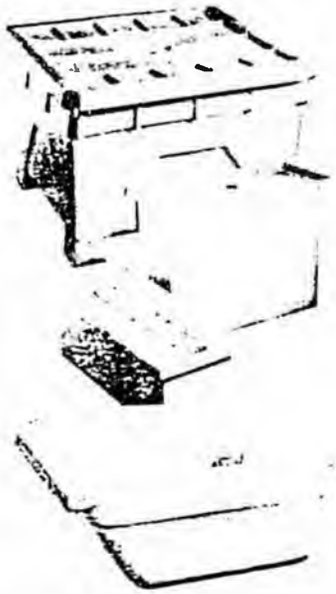

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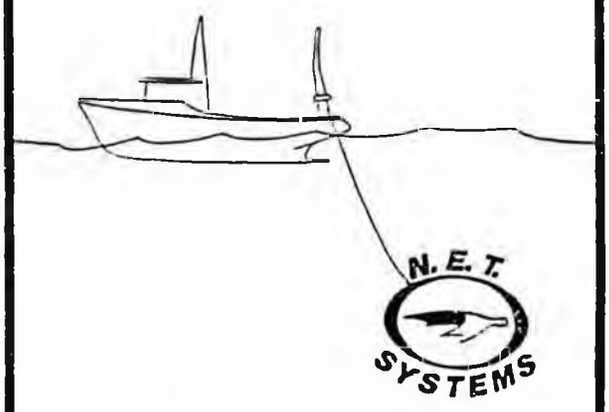

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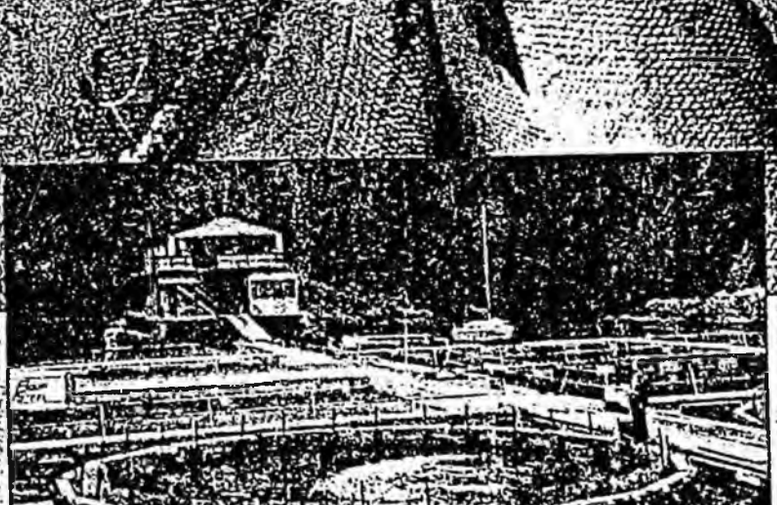


RICK JAMES

The major unanswered question: Will the coho produced at farms such as this small "mom-and-pop" operation (inset) on B.C.'s Sunshine Coast hurt the market for troll-caught silvers (large photo)?

FEATURE OF THE MONTH

Farmed Salmon in British Columbia

Just how will salmon farming fit into the West Coast fishing industry? Right now British Columbia is grappling with that question, and finding there are no easy answers.

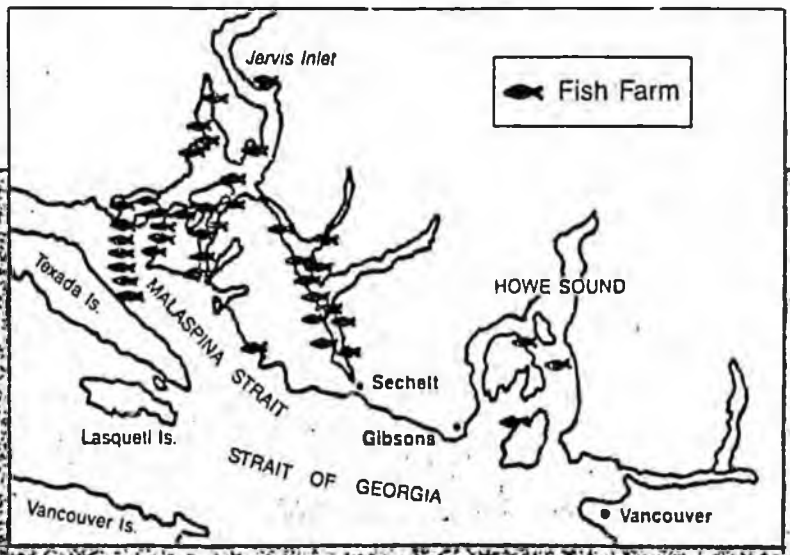
by Mary Murphy

Salmon farming is beginning to have an impact in British Columbia. While output is still low, especially by European standards, the industry is growing rapidly. Is it a promising addition to a beleaguered economy, a complement to the existing salmon fishery—or a threat to it's existence?

Only a dozen or so of these pen-rearing operations are harvesting fish, but about 60 more are fully licensed and at least half of these have fish in the water.

The highest concentration of salmon farms is in the "Sunshine Coast," the area just north of Howe Sound and the city of Vancouver. There are some on Vancouver Island and a scattering near Prince Rupert, with many more expected in sheltered places in various parts of the coast. Jim Fralick, the province's aquaculture coordinator, says that 120 of these facilities could be in operation by next summer.

In 1984, British Columbia's output of farmed salmon was a little over 100 metric tons. Figures for 1985 aren't yet available, but production was expected to be larger. Output should increase considerably in a year or two as new farms begin to harvest fish. Coho and chinook are the only



The center of B.C.'s salmon farming is the "Sunshine Coast," the area just north of Howe Sound and Vancouver. There could be as many as 120 salmon farms in operation by the summer of 1986.

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Pacific species presently being farmed, though a few aquaculturists are trying to grow imported Atlantic salmon as well.

Officials in both the federal and B.C. governments believe the industry shows promise. The province has boosted aquaculture in slick television ads, maintaining it will help provide the new jobs needed so badly in British Columbia as the province's resource-based economy has struggled with double-digit unemployment rates since 1982.

Much of the technology of salmon farming was developed in Norway, where the industry has been spectacularly successful since its introduction in the early 1970s. Ironically, the Norwegians benefited a great deal from Canadian research and development, since the Canadian's Department of Fisheries and Oceans has long been a world leader in hatchery technology.

Fish farming is also well-established in Scotland and other areas of northern Europe. Japan is rapidly increasing its pen-reared production as well. Now aquaculturists in Canada, the United States, Chile and New Zealand are trying to capture part of the expanding world market for fresh fish.

There are three distinct operations involved in salmon farming. In Canada, farmers buy most of their eggs from government hatcheries. During the first phase, the eggs are hatched and the fry cultured until they reach the smolt stage.

This is followed by the "grow out" period, when the fish are raised in net pens and fed a specially manufactured diet until they reach market size. Often these two operations are performed at different sites and by different firms. Some farmers specialize in smolt production, selling their product to others who perform the grow-out functions. A few also concentrate on brood stock development. It is hoped that eventually the industry will become more or less independent of government hatchery programs.

The third phase involves processing and selling the salmon. Typically, aquaculturists slaughter, gut, pack and ship their fish very carefully and quickly, to ensure quality and freshness. Meticulous handling, year-round supply and reliability of size, taste and texture account for the product's appeal. In British Columbia as a rule, farmers market their fish independently, either to brokers or directly to restaurants and stores. Markets are mainly in the Vancouver area and the western United States.

According to Tom May, president of the Mariculture Association of B.C., aquaculturists currently receive the following prices (in U.S. dollars): $2.08 per pound for pan-size coho, $3.58 for 4-6-pound fish and up to $4.30 for 6-9-pound chinook. Farmers are now aiming to bring more of the large, high-valued product to market.

A buoyant spirit characterizes many B.C. fish farmers today, a sense that—while serious challenges face them—their time has arrived.

Brad Hope, one of the industry's most successful entrepreneurs, exemplifies this. In 1984 he declined an investment offer from a large, multinational corporation. Instead, he merged his Tidal Rush Marine Farms with another local aquaculture firm, Pacific Aqua Foods, to form a vertically integrated company.

Hope watches the industry's rapid growth with bemused concern. "On the Sunshine Coast everybody is either salmon farming or their brother-in-law is *going* to be salmon farming."

He recognizes that the sudden influx of investors and entrepreneurs, many of them inexperienced and undercapitalized, will lead to an industry shake out as many of the newcomers fail. Aquaculture will benefit in the long run, he says. "We'll end up with more sophisticated fish farmers and more sophisticated investors," and, he says, greatly increased production to satisfy the tremendous demand he envisions.

This process will probably also lead to higher concentration levels within the industry. Now it is mostly made up of small- to medium-sized companies and investors. Some large multinationals are involved, with many more showing interest as fish farming becomes established. Norwegian investment is especially likely, as the aquaculture giants of

Scandinavia look around for new coastlines and new markets to develop. British Columbia, with its clean water and sheltered inlets, is particularly attractive.

Canadian resource and manufacturing industries are, on the whole, very dependent on outside capital. Both the federal and provincial governments are actively courting foreign investment, particularly since the Mulroney government declared Canada "open for business" last year.

This bothers Hope, a man who displays a maple leaf in his company's logo. "I find it frustrating that a big foreign company can come in and talk one hundred jobs and get more consideration [from the government] than 10 Canadian companies talking 10 jobs each."

Nevertheless, according to Hope, a technological constraint will ensure that smaller, domestically-owned businesses can thrive. "I think it's going to be very difficult for multinationals to come in and completely control the industry, particularly the growing out of fish. It's so intense on net pen sites. They've found in Norway that if you get too large in any one space, you run into disease problems."

Hope is confident that aquaculture can co-exist with the commercial fishery. He foresees a cooperative marketing structure developing. During the summer fishing season when farmers get their best growth, the fresh market will use good quality commercial fish. As soon as the season is over, the market will plug into farmed fish. Under this scenario, the market for both industries will increase.

Michael Hunter, president of the B.C. Fisheries Council, an umbrella organization of fish companies, agrees that the two industries can be complementary. "Fish farming could be an adjunct to the commercial fishery. Our existing infrastructure could offer aquaculturists a cost advantage, in terms of things like cold storage and processing plants . . . Our investors would have to agree, of course." Like Hope, he sees the availability of fresh salmon in the off-season leading to a larger overall demand for fish.

Hunter maintains there will be little direct competition from European farmed salmon in Canada's export markets—even in the frozen sector, an area which would appear to be especially vulnerable. "Theirs is a new market, finding new niches, particularly in restaurants. It's not the market that B.C. has serviced or ever plans to." He believes currency fluctuations pose a more serious marketing problem than supply increases.

In any case, demand for canned salmon will still be entirely satisfied by the traditional industry. Pen-rearing facilities could never produce this product as cheaply and efficiently as the fishery can. Nor are fish farmers presently able to grow the sockeye, pinks and chums that are canning staples.

According to Hunter, the Council expects world demand for canned fish to remain stable. In other words, the market for fresh fish will not grow at the expense of the canned sector.

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Because British Columbia's fishing industry still depends most heavily on canned products, the fish processing companies do not foresee a serious competitive threat from fish farming. Although Hunter declined comment, it seems likely that some processors will invest in aquaculture developments of their own and in this way diversify both their products and their markets.

Will the effects of this new industry be as beneficial to the commercial fishery as its promoters and even the Fisheries Council suggest? Many fishermen doubt it.

Leading the attack on fish farming are the United Fishermen and Allied Workers Union and its newspaper, *The Fisherman*. According to assistant editor Jim Sinclair, the union has called for a federal and provincial moratorium on further licensing of fish farms until five conditions are met.

First, there must be a guarantee that the industry will not be controlled by multinational corporations and banks. Second, no undue pressure must be placed on wild stocks of salmon eggs needed for spawning. Third, the Salmon Enrichment Program must be fully implemented. Fourth, aquaculture cannot be used as a trade-off for lost fish habitat. Fifth, there must be no move to privately-owned hatcheries or ocean ranching.

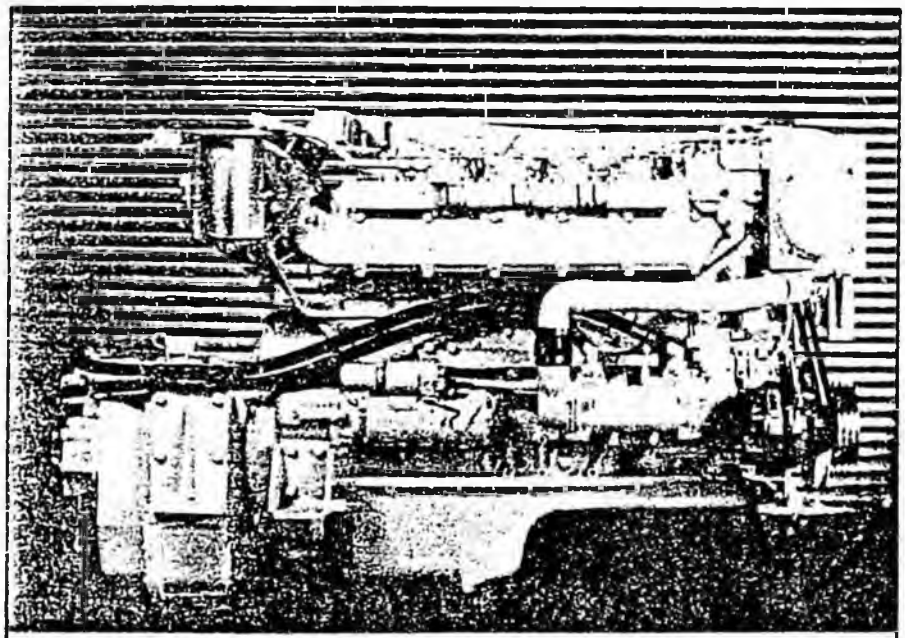
Since adopting this policy, the union also expressed concern about possible disease transfers from penned to wild stocks. It is particularly worried about the importation of the "exotic" Atlantic species, despite the DFO's assurance that only certified "disease-free" eggs are being used.

Aquaculture is often promoted as an industry that can provide off-season work for fishermen, as well as employment for those displaced by fleet reductions. The union, however, maintains that the employment projections made for the industry by the provincial government, among others, are greatly exaggerated.

Salmon farming, in particular, is a capital-, not a labor-intensive activity. The Science Council of Canada, a government-funded think tank, has promoted the industry's development, but predicts that only about one person-year of direct employment will be created for every 20 tons of production. Even an enthusiast like Brad Hope admits that indirect employment from feed and equipment manufacturers and suppliers, transport companies, etc. is likely to outweigh direct job creation.

The union also wonders what impact aquaculture will have on fishery markets and faults the federal government for not doing more research. "Even the DFO admits a study should be done on the effects of farmed fish on our markets," said a recent editorial, "but the department hasn't got around to it yet."

But probably more .c ibling to the union and many others in the industry is the issue of "privatization." The UFAWU believes that fish farming could lead to corporate control over habitat and fish stocks, the decline—or death—of the common property-based fishery, and the genetic deter-



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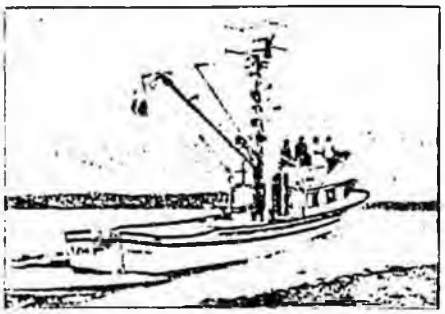

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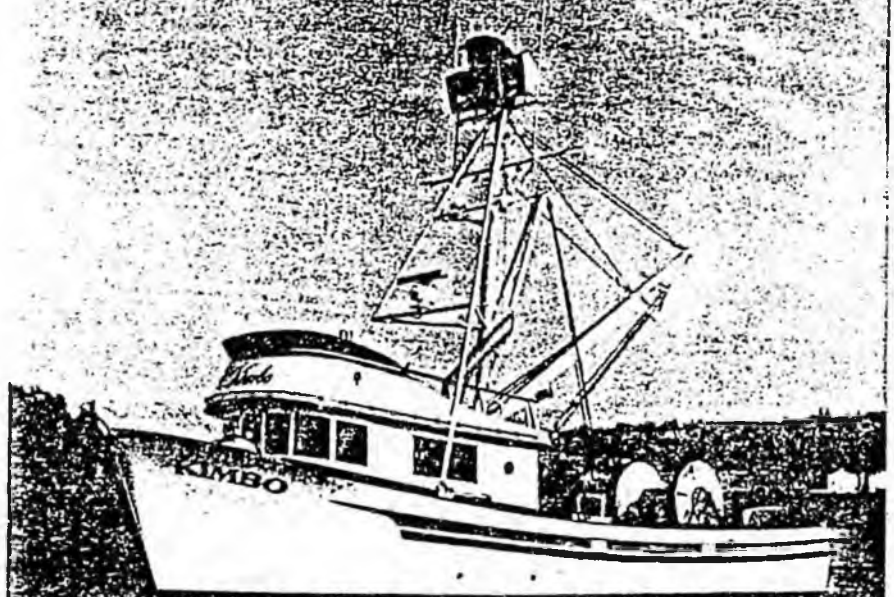

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ioration of salmon. The last item in this gloomy scenario could occur because of an increasing reliance on biologically-engineered species, whether "farmed" (raised in pens) or "ranched" (allowed to go out to sea).

The union wants more funding and effort put into protecting and improving fish habitat and less emphasis on "high tech" aquaculture projects, even those that are government-funded. It believes public control over fisheries is essential to maintain vigorous, genetically diversified wild stocks, as well as the industry which depends on them.

Sinclair dismisses the argument that private management would be more efficient than a common property arrangement. "That's saying that the public is so stupid it can't manage the resource," he says. "Show me an industry where private companies run a resource that meets the long-term needs of society."

Not everyone in British Columbia's commercial fishery is so militantly opposed to fish farming. According to Fred Pendland, president of the Pacific Gillnetters Association, fishermen must learn to live with the new industry. He does not see pen-rearing operations leading inevitably to private management and ocean ranching schemes. He cautions, however, that Canada must be careful to protect its wild, public stocks, especially as the world comes to rely more and more on domesticated, inbred species. "Canada nurtures its wild stocks and must continue to do this. If we maintain genetically diversified salmon, we'll have a long-term advantage over other producers."

Penland, like people in the fishermen's union, is concerned about the effects fish farming could have on markets. He worries that a large influx of farmed fish, plus the hatchery-reared stocks that Japan, the United States, Canada, and others are putting into the ocean, could disrupt world supply patterns and help to lower prices to fishermen. This concern, however, isn't universal either

Since trollers have the largest stake in fresh and frozen salmon markets, they are the ones likely to be first affected by supply increases of farmed

products. This doesn't worry David Elliott, executive director of the Pacific Trollers Association.

His organization has no position on the development of pen-rearing operations in the province, though it, too, is opposed to ocean ranching. Elliott says that world demand for high quality fresh and frozen salmon is so large—and growing rapidly larger—that wild salmon will continue to command high prices, despite the addition of farmed fish to the market.

Certainly the most positive response to fish farming comes from the Prince Rupert Fishermen's Co-op, a major fishermen's organization and British Columbia's second largest processor as well. The Co-op has a farm in operation in Miller Bay, near Prince Rupert, where both chinook and trout are being reared.

According to Co-op President, Paddy Greene, the facility is a pilot project "to check on the industry's viability." If it is successful, the Co-op plans to develop a chinook brood stock and establish a marketing program for off-season fresh fish.

Greene rejects the negative attitude of many B.C. fishermen toward salmon farming. "I think we're burying our head in the sand if we think it's going to go away," he says. "It's happening all around us." He believes the aquaculture industry could offer "great potential for small, coastal communities."

Nor does Greene think the industry's growth should be checked in order to protect sales for B.C. fishermen. "There's going to be a lot of farmed salmon on international markets, whether B.C gets into it or not. . . . If done properly, aquaculture could enhance the market for fishermen."

Whether British Columbia experiences a significant disruption in its export markets due to fish farming appears to depend on the following: how much world demand for high quality fish increases; how supply expands to match (or exceed) this increase; how well the industry competes in terms of both cost and quality; and exchange fluctuations, both of the Canadian dollar and other relevant currencies.

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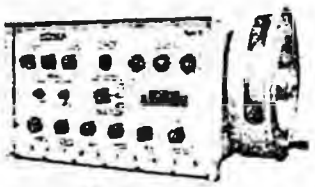

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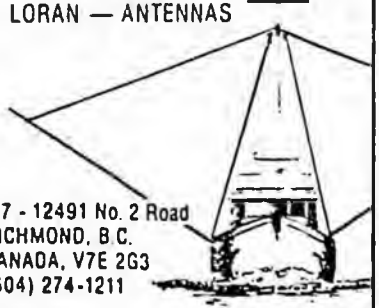

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5. Provide water of high quality.
6. Avoid stressing the fish. Be lenient when handling and sorting.
7. Provide routine health supervision and control.
8. Provide preventative treatments (vaccination, anti-parasite management) on a regular basis.
9. Provide immediate and correct treatment in cases of disease.
10. Properly dispose of all dead fish.

Demand is difficult to predict, but there is some information on supply possibilities. In just fifteen years, Norway has increased its production from almost nothing to about 30,000 metric tons, more than 4 percent of total world production. The industry there expects to produce 80,000 tons by 1990. It has been estimated that Norway could be putting 200,000 tons into world markets by the year 2000. (Current world production is now about 700,000 tons.) Should these figures materialize, Norway—with virtually no wild salmon fishery at all—will become a major player among world producers.

Russell Mylchreest, an economic adviser for the DFO, warns that, in theory at least, B.C. frozen salmon producers could be hurt by this large year-round supply of farmed fish on world markets. "I don't know if demand can expand as fast as the supply appears to be going . . .," he says. "A hundred thousand metric tons coming on stream in about five years [from Norway and other producers] has to have some effect on price."

Mylchreest says that British Columbia's emerging fish farming industry will have little impact on the commercial fishery's markets, at least for some time. In fact, it could be vulnerable to competition from Norway. "A lot depends on where Norway sends its fish," he observes. "If it sends most of it to Europe, it may not affect our aquaculture industry too much." A strong assault by Norway on British Columbia's "natural" markets in the United States and Asia could be hard on the developing industry, however. "It looks like Norway's costs are a lot lower than their selling price," he notes, making it possible to drop prices considerably if competition required.

Mylchreest stresses that these are preliminary observations. He is working on a study on the marketing prospects for B.C. farmed salmon. Results should be out this spring or summer and will likely have implications for the commercial fishery as well.

It is apparent that development of fish farming raises important issues, both in Canada and the United States. For the first time, this industry is being established in an area—the northwest coast of North America—which already supports a viable in-shore salmon fishery, based on common property.

Will fish farming serve to stimulate overall market demand for seafood, thus benefiting the established industry? Or will the two compete for markets? Will selective breeding and technological innovation produce larger, hardier salmon? Or will domestication cause genetic deterioration and introduce disease to wild stocks? Will privately-owned aquaculture operations provide government with a convenient excuse to limit its support for fisheries protection and enhancement, with fishermen suffering directly from such a policy? Or will *both* industries—and the general public—recognize the crucial role that healthy wild stocks play in the West Coast economy and in world fish production?

These and other questions don't have clear answers yet. But, while we ask and wonder, fish farming isn't going away. Somehow it has to fit into an already complex and contentious environment, the West Coast fishing industry.

FARMED FISH: Do They Really Compete?

by John van Amerongen

Competition for salmon markets is a lot like musical chairs— nobody loses as long as there are enough seats to go around. The big question come 1990 is whether there will be enough salmon markets for all the salmon produced, given the astronomical production figures currently being tossed about by salmon farmers and those who keep an eye on them.

The growth potential of the Norwegian salmon industry is now beyond debate. In 1971 Norway produced a mere 100 metric tons. By 1985 Norwegian farmers produced 34,000 mt. There's no reason to doubt they'll produce at least 80,000 mt. of Atlantics by 1990. That same year Canadian farmers are expected to market 30,000 mt. of coho and chinook. And that has wild harvesters legitimately nervous. The Canadian projection alone is 6,000 metric tons more than the total wild catch of coho and chinook salmon in Alaska in 1986.

Whether or not the frenzy of activity in B.C. will bear full fruit in 1990 is still speculation, but the potential is certainly there (see related article p. 32). And now that salmon mariculture is seeing a resurgence of activity in Washington State and proposals are making their way to the Alaska Legislature as well, analysts are focusing on a key question.

"The key question," according to Steven White, former director of Prince William Sound Aquaculture Corp., "is will they compete with or complement wild salmon?"

White addressed the question January 13 as part of the University of Washington's Fisheries Research Institute seminar series on floating marine aquaculture.

Unfortunately, White admitted from the onset, "I can't answer it." It's one of those questions, he said, that creates "a lot of heat and very little light.

"Terror," he noted, "creates a lot of heat."

The audience of fisheries students remained relatively calm as White alternately turned the heat on and off the wild salmon industry. After citing the terrifying farm production figures, White eased back a bit, noting optimistically that seafood consumption has been rising steadily.

U.S. consumers are currently eating about 15 pounds of seafood a year, White said. By 1990 we'll be consuming about 20 pounds a year per capita, and that, he said "is a great opportunity for all of us."

"If production would stay stable," he said, "we would assume higher prices for our fishermen."

But the light at the end of the tunnel faded as White reminded everyone that production was not stable, and that as European and Canadian farmed production increased, so too would their exports to the U.S. Not only will their production increase, said White, but the production of farmed catfish and shellfish will increase as well. So too, he said, will hatchery releases from state and non-profit facilities. By 1990, said White, "2.6 billion fish will be released into the wild...a 245 percent increase since 1982."

There are two ways to look at it, White explained. "Pessimists believe competition is going to be the result...increased demand will be met by increased production and drive down the price."

The optimists, said White, believe that farmed and wild salmon will complement each other in the marketplace. "High priced and high quality imports will create a taste in consumers' mouths that will create an explosion in the market," he said, assuming the role of one whose glass was half-full instead of half-empty.

But White had a problem with the up-beat view that wild and pen-reared salmon will walk hand-in-hand to economic glory. There's "no evidence," he said; "I can't find anything concrete that makes me believe that is going to be the result."

Still, White had almost as much difficulty finding evidence to confirm that the sky was falling. What he did find was a recent study co-authored by Ron Rogness of the North Pacific Fishery Management Council and the School of Management at the University of Fairbanks, and Dr. Biing-Hwan Lin of the Department of Agricultural Economics at the University of Idaho. The title of the Rogness-Lin study is "The Marketing Relationship Between Pacific and Pen-Raised Salmon: A Survey of U.S. Seafood Wholesalers."

According to White, the survey was taken as preliminary research for a master's thesis on the subject in conjunction with Alaska Sea Grant. Now that the authors are busy elsewhere [away from the University of Alaska at Fairbanks], White doubts that the research will be completed. Nevertheless, the survey does reveal some interesting information.

In July of 1985, Sea Grant sent out surveys to 925 seafood wholesalers and distributors in Boston, New York, Chicago, Los Angeles, San Francisco, and Seattle. About 24 percent (127) of those surveyed responded to a series of questions dealing with their salmon purchasing decisions.

Of central concern to White were the survey questions aimed at the "substitutability" of wild and farmed salmon. If there's no substitutability, the argument goes, there's no competition.

The responses concerning pan-sized coho, the variety raised by Domsea Farms in Puget Sound, offered no particular cause for alarm among wild salmon harvesters. The "overwhelming majority" of respondents said they did not consider the small silvers a legitimate substitute for wild Pacific salmon. If anybody has to worry about pan-sized coho, it's the farmers of rainbow trout.

And if you can believe the survey, the bulk of frozen Pacific salmon appears to be on its own in the marketplace as well. Only 15 of the 57 respondents viewed fresh pen-reared Atlantics and frozen wild Pacifics as substitutes. Since only about three percent of the Alaska harvest is sold fresh, the authors concluded that "97 percent of the harvest...would be more or less unaffected by the pen-raised Atlantics."

That's good news unless you happen to be a troller. "...It should be noted," the authors caution, "that a significant portion of the troll-caught chinooks and cohos in Southeast Alaska is frozen and marketed to white tablecloth restaurants which is one of the primary markets of fresh pen-raised Atlantic salmon; the 15 (out of 57) votes for the substitutability between fresh Atlantic and frozen Pacific salmon should therefore not be discounted."

Still, the authors weren't particularly worried about the overall impact of fresh Atlantics on the domestic market for Alaska-caught fish. According to Rogness and Dr. Lin, "...the results seem to suggest that much of the concern shown by many commercial salmon fishermen in Alaska may be somewhat unwarranted."

Like it or not, the survey suggests two separate market niches for fresh farmed and frozen wild-caught Pacific salmon. In automotive terms, one is viewed as a BMW, the other is a lot like riding the bus.

The situation for fresh wild-caught fish seems to be different. The overwhelming majority of respondents (49 of 62) said that pen-raised Atlantics were a legitimate substitute for fresh wild Pacifics. But legitimate substitutes are no always the same, as the Rogness and Dr. Lin discovered.

Two questions in the survey asked respondents to list the advantages of each variety over the other.

Asked what advantages pen-raised Atlantics had over wild Pacifics, the characteristic most often cited was availability year round (28), followed by freshness or quality (26), consistency (19), size (12), price (11), and shelf life (6).

Asked what advantages wild-caught had over farmed, the most common response was price (27), followed by flesh characteristics — color, firmness, fat content (19), availability of large fish (5), volume of supply (2), and ease of ordering (1).

Price appeared to be the most motivating factor in choosing wild over farmed, while year-round availability and high quality were the best reasons to buy farmed fish, according to the survey. Four respondents could find no advantages of pen-reared over wild, while eight could see no advantages of wild over pen-reared. In automotive terms, they are both good cars —one a BMW, the other a Ford Thunderbird. Ford has a better idea as long as the sticker price is right.

How long wild salmon can maintain a price advantage over pen-reared fish is another key question addressed by Mr. White at the FRI seminar. Trollers would understandably like to see the price of wild salmon rise, and salmon farmers aren't anxious to see the price of pen-raised fish fall. As the world supply of salmon increases, however, it's going to be more and more difficult to keep the prices apart and avoid a head to head battle in the marketplace.

Right now transportation costs and the relative inefficiency of the small farms have kept the cost of Norwegian salmon up. The falling value of the dollar in world currency markets is helping, too. When British Columbia comes on line in 1990, however, the situation could be very different. As one industry wag put it, "The Canadians have never met a market they couldn't dump."

White put it another way: "There's a great potential for oversupply." British Columbia is planning to produce 'a lot of product," White said, "...and there's no indication that product has any market set up for it."

This may have been music to the ears of fishermen who are looking for a gigantic shake-out to put the salmon farming industry on its gills. But White saw it differently.

"Which industry is going to survive the Crash of '89?" White asked. "If the farms crash," he said, answering his own question, "we'll go down with it."

One might think White's best advice to the fisheries students in the audience would have been to pack up their pee-chees and head it on over to the School of Dentistry. But he didn't suggest that. Perhaps all the doom and gloom was just a test to see who was really serious about a career in the salmon industry.

His conclusion offered a ray of hope, even if the light at the end of the tunnel turns out to be Madison Avenue.

The salmon industry, said White, is in a state of transition. "The biological hurdles," he said, "are pretty much over.

"The next problem," said White, "is how [the salmon] can be marketed to keep the [aquaculture] industry alive and maintain the commercial fishing industry."

To accomplish this White suggested 'a conciliation' between wild harvesters and farm producers. "Our real target is not each other," he said, noting that salmon sales are completely eclipsed by beef and chicken. "They're the targets, not each other."

—*John van Ameronge*n

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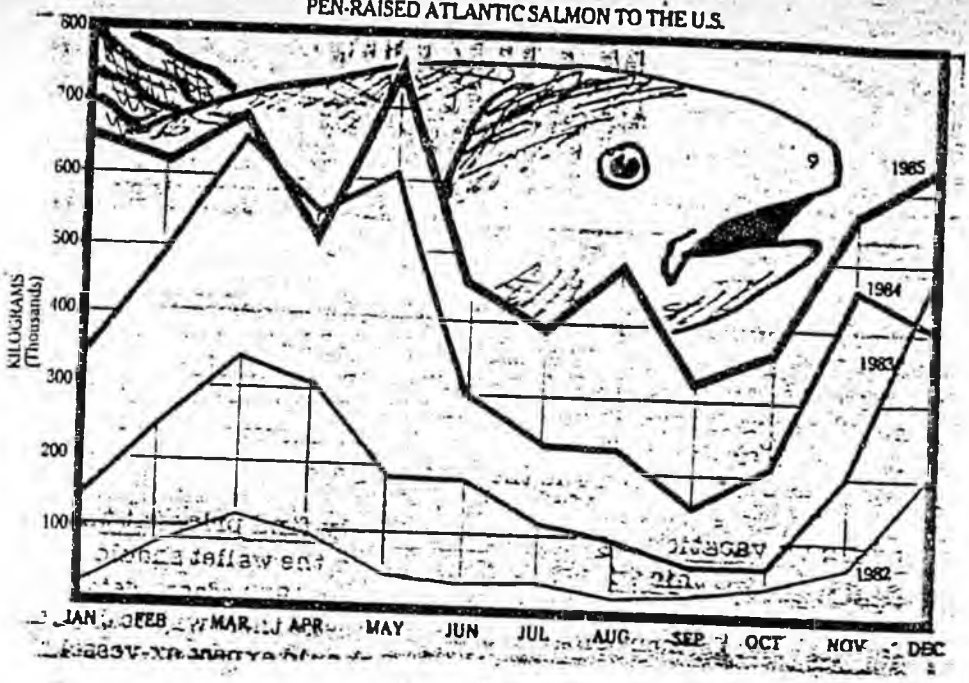


Alaska Fisherman's Journal Feb '87

Salmon Farming Goes Crazy in B.C.

by Clark Miller

Salmon farming in British Columbia— they're calling it a Gold Rush, an out-of-control frenzy of production that will glut the world market and plunge prices in two years. Is it really that hazardous?

Vance Lipovsky thinks so. He is director of aquaculture development for British Columbia Packers, Ltd., in Vancouver, B.C. He says production of farmed salmon in British Columbia will hit 30,000 tons by 1990— in 1984 it was only 107 tons. Meanwhile, prices to producers will dive below $3 a pound—right now, they're between $3.50 and $3.75.

Kicking off a series of lectures on aquaculture at the University of Washington's School of Fisheries last month, Lipovsky said, "It's impossible to keep up with the industry up there... and the pace will not change." In 1985, there were 45 farms. Last year, there were 106 farms. This year there are perhaps 150, with more than 500 applications pending.

"In the three or four years British Columbia will be the largest exporter of salmon to the U.S.," he predicts.

Orders for salmon cages are backed up for six months. B.C.'s 20 hatcheries are charging 65 to 79 cents each for smolts (there ten to twenty more hatcheries on line, Lipovsky says).

The provincial government slowed things down with a 30-day freeze on licenses in October, in order to ask a few questions, but basically decided there are no compelling reasons to interfere with something that is boosting the economy of a traditionally depressed area with 69,000 miles of wilderness coastline. "A month later, it was business as usual," Lipovsky said.

One question asked during the moratorium involved the impact of aquaculture on wild salmon prices. The answer in Canada was, None.

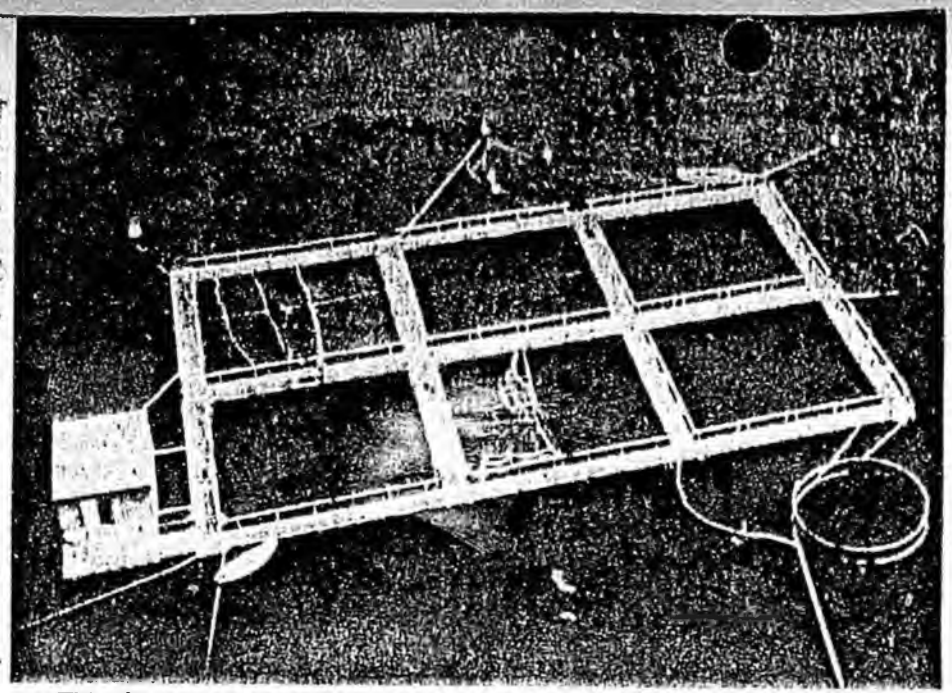
One way of measuring the growth is the number of smolts that are reared each year. In 1984, the number was 1.5 million. In 1985, it was 5 million. In 1986, it was 14 million. This year it will be 30 million. Figuring 50 percent mortality (35 percent is typical, even lower in the north), a million smolts yields about 1,000 tons of salmon. Therefore, 1990's harvest should easily reach 30,000 tons; the B.C. government predicts 40,000, with a potential value to farmers of $352 million.

Will the market be able to absorb that amount? "Markets are the big unknown," says Lipovsky. "Only the markets will limit us."

Lipovsky thinks the future will be a mixture of successes and failures. In addition to softening prices, he's worried about the high price of feed and a predicted shortage of skilled labor. He told the mostly student audience that employment prospects in aquaculture look very good in B.C. for the next five years at least.

"1991 will be the first crash of the industry," he predicts. Then the "merger... phase" will begin; Lipovsky expects to see bargains on farms in two years.

Forty percent of the investment so far is Norwegian, Lipovsky speculates. Norwegian applications for sites began mounting in 1984.



This photograph from a Norwegian equipment supplier shows a typical small Norwegian fish farm. B.C. farmers have no such size restrictions.

Have the commercial fishermen of B.C. become involved? No, Lipovsky said, the lifestyle is too harsh (he wasn't joking— he said the stresses of living in these isolated wilderness areas is taking its toll on participants, especially women).

The B.C. government makes it easy to get into this business: $100,000, interest-free loans; grants; no environmental impact statement required for sites. You can claim virtually any wilderness site for $150, as long as it's a mile and a half from the nearest salmon farm (that's one of the new rules, non-retroactive; formerly, it was only a half mile). Annual rent on government land is only $200 per acre.

This massive buildup of salmon farming includes some problems. The fish— chemically neutered coho and feminized chinook— aren't growing as fast as they should, and no one is sure why. Inventories are mysteriously low— farmers accuse the hatcheries of shortchanging them. Much of the feed has been low in quality, but now farmers are being offered high-fat, extruded feeds (at 40 cents a pound, expected to climb to 60 cents by 1990).

Some stress-related diseases have cropped up, as well as some minor hassles with algal blooms. However, Lipovsky gave the impression that the government finds very little to worry about with aquaculture so far.

One of the paradoxes of the business, according to Lipovsky, is that farmers are mostly growing 4-6 pounders, even though the greatest market-size need is for 6-9 pounders (restaurants prefer the big fish for "steaking"). The reason— the price of feed. Physical growth is rapid and economical during the first 24 months, especially for coho; continued growth, however, cuts profits.

"Coho will be the fish of the future because of its fast growth rate," Lipovsky said.□

Alaska State Legislature

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Representative Ronald L. Larson
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TO: Representative A. Herrmann

FROM: Representative R. Larson RL

DATE: March 25, 1987

RE: Information on Mariculture

For your information I am passing along an article on Mariculture. This article was provided to our office by a concerned constituent.

I would appreciate its being included in the Resources Committee packet. Thank you.

UFA NOTEBOOK

'Salmon Can Wait'

Alaska Mariculture

The feverish surge of interest in salmon farming in British Columbia, which has been likened to the Klondike Gold Rush, seems to be spreading to Alaska. Identical bills have been introduced this session in both houses of the Alaska legislature which would permit pen rearing of salmon.

UFA has been interested in mariculture problems since at least 1985. At their annual meeting that year, the Board of Directors noted that pen rearing of salmon was a rapidly growing industry that was already having impact on traditional domestic and export markets for Alaska salmon, with potential for even greater market penetration in the future. They requested the State of Alaska perform a thorough study of the biological, economic and sociological problems and potentials of salmon pen rearing in Alaska. To date no such impartial studies have been done.

The increasing interest in beginning this industry in Alaska was discussed at some length at the determined that there are many potential problems with pen rearing salmon which must be addressed by state government before the industry is allowed to begin.

UFA's concerns about mariculture were expressed in a resolution issued by the Board at the close of this meeting. They conclude with a request that the State of Alaska take no action on legislation and development of salmon mariculture until such time as specific issues are addressed. The issues of concern cover a wide range.

*State funds and services for DEC, DNR, and FRED division at DF&G, already cut back due to shrinking revenues, will have to be further reallocated to address salmon farming. For example, the farms must be inspected periodically by state officials for maintenance of health and resource protection standards. Many of the salmon farms will be in remote locations, increasing travel costs to the State. It will require staff time to issue and monitor permits for operation.

tained. Since the industry depends on freshness of its product, transportation needs must be met: the remoteness of the farming sites will require additional transportation routes which must at least be addressed by state government, even if subsidies are not requested. Money and staff time for these activities must be taken from existing programs. As yet no realistic fiscal note has been developed to identify the cost to the state incurred by management of the proposed activities.

*Competition for market with wild salmon will increase. Troll-caught fish are already in direct competition with pen reared salmon. Optimists believe the demand for fish will continue to rise and there will be substantial markets for both farmed and wild salmon. Increasing international participation in salmon farming, however, indicates there may soon be a flood of farmed product on the market. The commercial fishing industry now needs marketing efforts which the state is unable to fund. UFA foresees additional problems if forced to compete with farmed Alaska salmon. UFA, however, is not opposed to mariculture of shellfish or aquatic plants and, indeed, sees these operations as offering great potential for the state's economy.

*Water and land use of traditional fishing, hatchery, rehabilitation, and smolt rearing and release sites may be locked out as permits are granted for establishment of salmon farms. Many of the land use permits that have been granted for oyster farming (shellfish is the only form of mariculture now allowed in Alaska) are not being used, and there is concern that speculators are establishing claim to desirable sites, intending to use them when salmon farming is allowed. The State has done no planning to determine the best locations for these farms, and

February. The Board of Directors prevention will have to be main-

no controls have been proposed. Alaska has thousands of miles of coastline but there could easily be conflict between homeowners and salmon farmers, as has occurred in Washington. There may also be conflicts with the tourism industry and with sport fishermen, both of which are important activities for Alaska's economy.

*The potential for disease contamination of the wild stock has not been explored at all. In 1985 Norwegian fish farms were forced to destroy 2,900 metric tons of farmed salmon due to contaminated stock, but since Norway doesn't have its own salmon runs, no one knows what the effects might have been on wild fish. This is an area of serious concern to the commercial fishing industry.

*Many proponents of pen rearing salmon are touting the industry as one which can be done by small as well as large operations. They present it as a boost to the economy of Alaska's coastal villages and suggest that "mom and pop" operations can be as successful as those of a large corporation. In fact, current evidence indicates this is far from the case. Because of the high costs of fish food, brood stock, and establishment of adequate transportation facilities, in addition to the length of time it takes to produce the first saleable product, it will be almost impossible for any small operation to succeed. Weyerhaueser, Sealaska and some multi-national corporations which have expressed interest in beginning the industry in Alaska may be among the few operations which can actually be viable.

A recent report by the House Research Agency of the Alaska Legislature titled "Aquaculture in Alaska" mentions these and other concerns, but does not discuss them in any detail and presents few or no solutions to these potential problems. There is a feeling around the state that salmon farming is the wave of the future: it can't be stopped so the only choice is to jump on the bandwagon. UFA disagrees with this sentiment and offers a suggestion: if Alaska must become involved in pen rearing salmon then it should take this chance to do it right the first time. We have excellent international examples of successes and problems before us and we would be wise to emulate the good and avoid the bad. This can be accomplished only through careful study and planning.

The House Research Agency report states that there is only a narrow window of time for Alaska to join the pen reared salmon industry, after which it will not be economically feasible to begin. UFA disagrees with this position: it feels there will always be room in the marketplace for a competitive product. In the meantime it is essential that studies be done and safeguards be developed to ensure that Alaska's already healthy commercial fishing industry is protected.□

The New York Times
Business

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Section 3

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Prospects

Of Debt and the Dollar

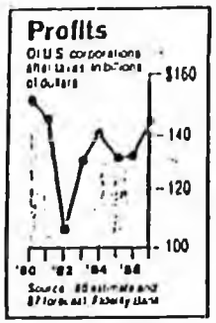
It was no accident that six of the so called Group of Seven industrialized nations finally met last weekend to discuss the dollar, says Gert von der Linde, chief economist at Donaldson, Lufkin & Jenrette. The meeting came right on the heels of Brazil's announcement that it will suspend interest payments on its $109 billion in international debt — a plan, says Mr. von der Linde, that has introduced a new threat to the dollar.

If American banks cannot collect on debt owed by Brazil or other South American nations, he says, foreign investors could lose confidence, withdraw their dollar deposits and sell the dollars on international markets — thus weakening the currency further.

But the G-7 meeting "prevented substantial decline in the dollar," Mr. von der Linde said. And the participants' pledge to intervene in the future if the dollar dips too low should help neutralize the Brazilian factor. "With the threat of intervention, the potential negative that Brazil represents is at least postponed, if not eliminated," he said.

Plumper Profits

One reason for the stock market's soaring rise is that investors are anticipating fatter corporate profits in 1987, says Mickey D. Levy, chief economist at Fidelity Bank in Philadelphia. Mr. Levy predicts that profits this year will be 9 percent higher than in 1986.

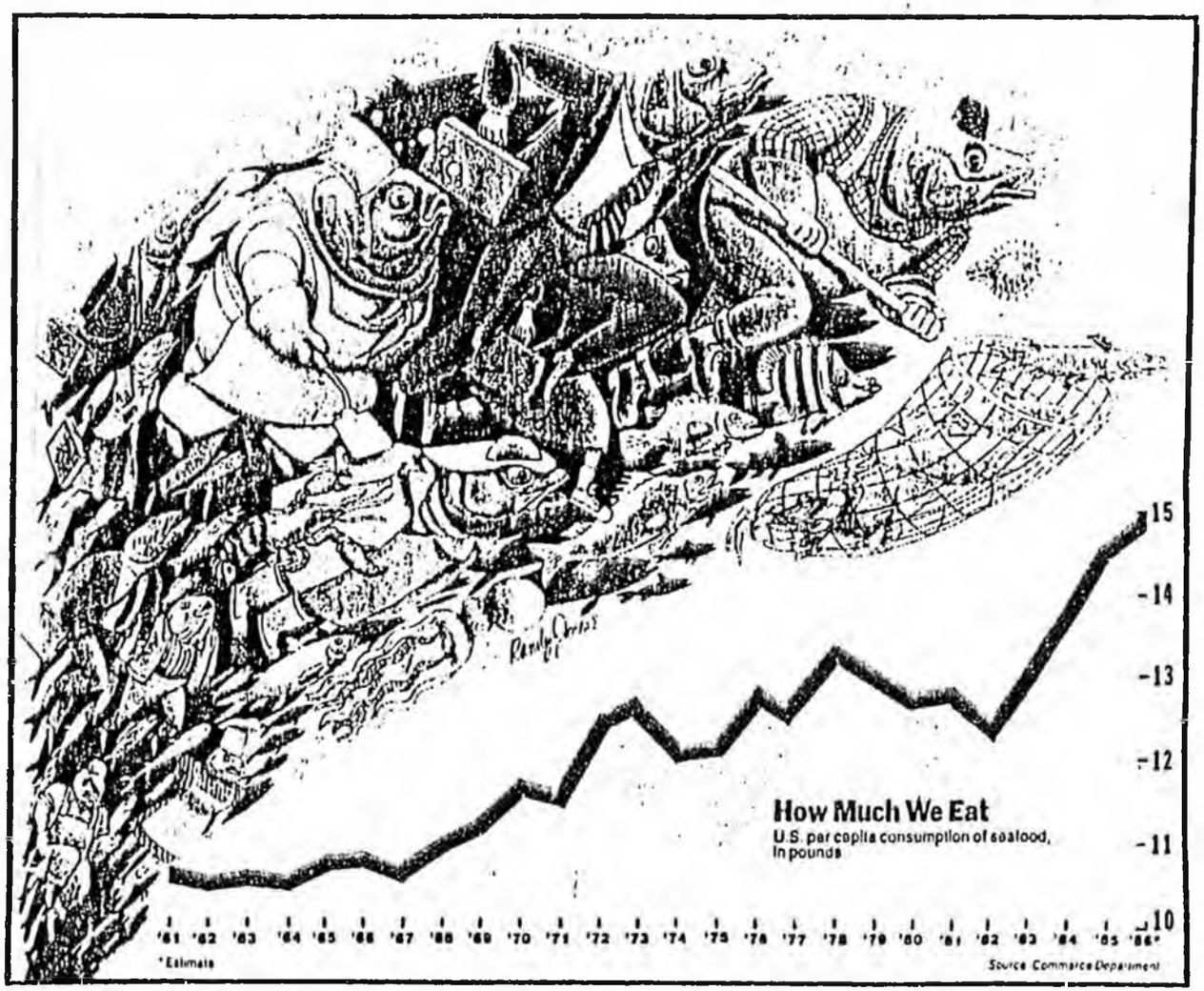


The weaker dollar is at the heart of the expected improvement, he says. The dollar's diminished value makes imports more expensive, and this, in turn, raises demand — and prices — for American-made products. Since labor costs are likely to remain relatively low — major wage settlements are not expected until 1988 — profit margins will increase.

Where will profit gains be the greatest? Probably among companies that have have been hurt by foreign competition during the strong-dollar years — chemical and pharmaceutical corporations, for instance. Such companies are poised for greater profitability, says Mr. Levy, since by now "they have trimmed their inventories, lowered their operating costs and reduced their break-even points."

Passport Discrimination?

Across America, the Fish Are Jumpin'



maybe some lobsters or some shrimp,' and that would

Seafood businessmen like to say that consumers

It's a bigger business than chicken. Even tilapia and skate wings sell.

By N. R. KLEINFIELD

DURING Steve Connolly's early days in the seafood business back in the late 1940's, he was accustomed to getting the brush-off.

Working as a salesman for a Boston fish wholesaler, he would go out on his rambling pilgrimages to supermarkets and restaurants and, as he recalled, "I'd tell them I was selling fish. They'd say, 'Well, maybe some lobsters or some shrimp,' and that would be it. All the time, I'd hear, 'We don't use much fish. Now get going. The meat man just walked in.' "

Five years ago, Mr. Connolly founded his own wholesale company in Boston, called Steve Connolly Seafood. When his salesmen make their rounds, he said, the reaction is, "You're selling seafood? Sit right down. Take the best chair. I want something of everything you've got." His company sold $8 million worth of fish its first year and $25 million last year.

The seafood industry has changed drastically. As Americans have become bewitched by things like orange roughy, tilapia and opakapaka, the business has gone from mom-and-pop dimensions to sizable operations like Mr. Connolly's that do $10 million to $40 million in fish sales annually. With something like 4,000 seafood wholesalers and processors in the country, no one dominates the fish industry, though consolidation is beginning to occur.

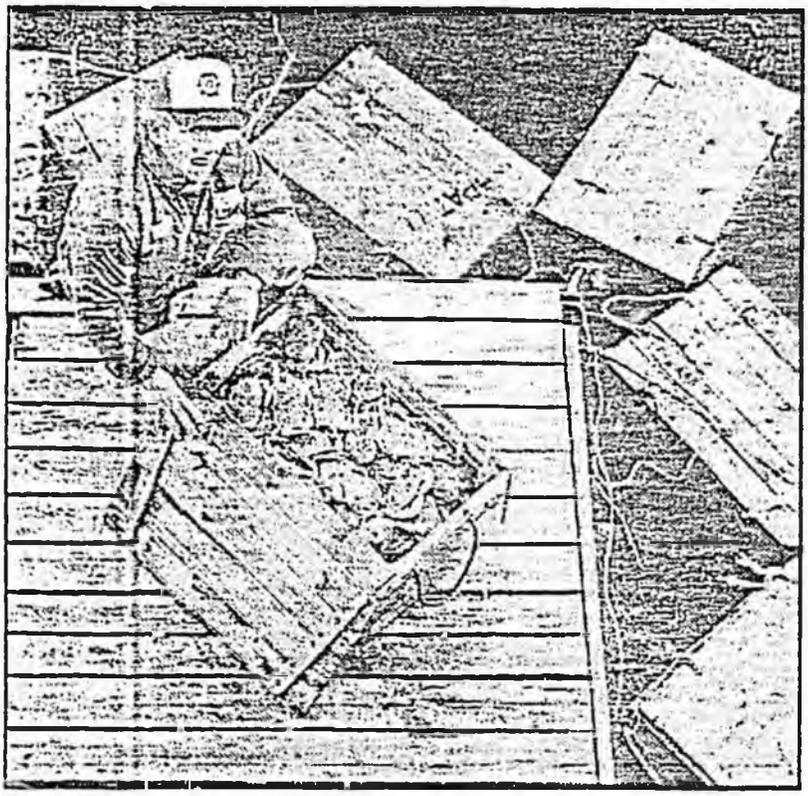
Seafood businessmen like to say that consumers have developed a penchant for just about anything that swims. To meet this demand, the 61-year-old Mr. Connolly has been fairly crafty in marketing peculiar fish products. Even he, though, is sometimes startled at what people will eat. His latest offering, for instance, is skinned skate wings (skate is a flat fish with the broad-winged body of a ray fish). It is tough to remove a skate's skin. Some people accomplish it by taking pliers and yanking it off. A few weeks ago, however, Mr. Connolly succeeded in adapting a machine normally used to skin liver to shave off skate wings.

"I think the wings are going to work well," he said. "They're cheap and so I see them having a wide appeal. Skate could really go."

Only a decade or two ago, fish had a dull image. It was something to eat grudgingly on Friday or when the budget was too strapped for a sirloin. Various fac-

Continued on Page 8

The Fish Are Jumpin' All



The New York Times/Steve Liss

Culling live crabs at the dock for Connoily's Crabs in Gloucester (left). The crabs are shelled by machine.

Continued from Page 1

tors, however, have conspired to lift it from a food associated with penance to an everyday staple, and even a gourmet treat. Most of all, the concern for healthier diets has prompted consumers to gravitate to meat substitutes, like fish, that are low in calories and in fat. The steady spread of aquaculture, the science of raising fish on watery farms outside of oceans, has increased the seafood stock; some 12 percent of total American fish consumption now comes off farms, four times the amount in 1975. And wider use of airplanes to transport fish and better refrigeration equipment has introduced more fresh species to inland parts of the country.

These factors, says the National Marine Fisheries Service, have pushed per-capita seafood consumption up from 10.9 pounds in 1966 to 12.9 pounds in 1976 to 14.5 pounds in 1985. Expectations are that consumption may approach 30 pounds by 1990. That is still well shy of chicken, in the 59.5-pound neighborhood, and beef, at a dwindling 79.

Nobody, though, expects fish to catch poultry or meat. Not enough fish swim in the world's waters for that to happen, even though America imports more than half its seafood. And most fish do not grow quickly enough for fish farms to meet huge demand. If chicken eating goes up, farmers can toss more eggs into the incubators and within weeks chickens are plump enough for market. Fish, however, can take two or three years to mature, at sea or on the farm.

"To increase per-capita consumption by one pound," explained Lee Weddig, the executive vice president of the National Fisheries Institute, a trade association, "you would need to catch 700 million additional pounds of fish in the water. The total amount of cod and haddock caught in New England is about 100 million pounds. So you see the problem."

Nevertheless, the taste for fish and the preoccupation with health, have elevated seafood to a roughly $16 billion annual business — compared with $12 billion in revenue for chicken, which is cheaper, and $44 billion for beef — and encouraged a lot of companies to take a new look at it.

Now you can visit any burger outlet — McDonald's, Burger King, Wendy's — and find fish. There is also a growing network of fish specialty chains like Long John Silver, Sea Galley and the Red Lobster. Supermarkets, meanwhile, are opening new and sizable seafood sections. And big corporations like Ralston Purina, W.R. Grace, Campbell Soup, Weyerhauser and Con Agra have gotten into fish farming. One group of companies has applied its energies to producing imitation fish products.

Demand keeps climbing even though prices of some species have reached the $7 to $10 a pound range. New, inexpensive varieties, however, are hitting the market, some selling for as little as $2 a pound. Fish are not enough that "trash fish" like monkfish that used to be dumped back are now being served in expensive restaurants and at classy dinner parties.

• • •

Kroger's feels it is as plugged-in as the wisest supermarket chains to middle American tastes. It was one of the first to discover fresh seafood — even though its 1,050 stores are largely sprinkled through the Midwest, where not a lot of fish swim.

Kroger will fly red snapper in from Taiwan, if that's the only place it can get enough. The chain even has its own fresh fish distribution warehouse, handling 72 varieties, in Greensberg, Ind.

Kroger's got into fresh seafood in 1977, and is steadily adding departments to all of its stores. It has gotten up to store No. 491. Its sales are growing by 15 percent a year, according to Bill Parker, a vice president. "It's probably the best growth category we have," he added. Fish, moreover, generally command higher markups than meat and poultry, Mr. Parker said. And the supermarkets realize that there is an enormous opportunity to be mined, since fish have predominantly been a restaurant product. According to surveys, two-thirds of the seafood sold is consumed at restaurants, though fish people believe the pendulum is starting to swing toward home preparation.

Grand Union took enough care with its new seafood departments that it hired Milton Glaser, a well-known

Alaska Mariculture Association

Testimony to House Resources Committee Regarding CSHB 108
Rodger Painter, Executive Director

Since the issue of just who is interested in mariculture has been raised, I thought it might be appropriate to start off by telling you who I represent because the members of my organization are very interested in sea farming. Nearly all members are residents, and most are individuals, although nine Native corporations, two municipalities, one fishermen's group and a handful of Alaska businesses also have joined. The biggest single component of our individual members are commercial fishermen.

AMA's board of directors is composed of a city mayor, a vice-mayor who is managing a scallop farming project, vice-president of a native corporation, an oyster farmer and a legislative aide who fishes during the summer.

The common bond is that we believe that mariculture represents one of the state's best economic opportunities. This opportunity could mean literally thousands of year-round jobs in rural communities, tens of millions of dollars in outside investment capital, significant new sources of local and state revenues, and an economic boost to our sagging state economy from the private sector.

AMA believes mariculture development could help stimulate Alaska's economy, and it won't be at the expense of the fishing industry or other Alaskans. In fact, the seafood industry would be a primary beneficiary of mariculture in Alaska by fuller utilization of our processing plants, demand for fish feed, improved air freight services, and new off-season opportunities.

The year-round supply of seafood generated by sea farmers also could help protect Alaska's dwindling share of world seafood markets. Many of our processors already purchase foreign farmed salmon, scallops, shrimp and other cultured products to satisfy the needs of their customers. And, consumer demand for fresh seafood is continuing to increase at phenomenal rates, so imports of foreign products also will continue to climb.

Since the committee has been inundated with statistics, I have prepared a number of handouts for you to review at your leisure. I'll keep my testimony limited to issues raised during committee debate and some proposed solutions.

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The question has been raised whether Alaska has a limited window of opportunity to enter sea farming. The answer in our opinion is no, but the longer we wait to get involved in opportunities like salmon farming the more difficult it will be to succeed. This is particularly true for smaller-scale investors.

Concern has been voiced about the potential for a glut on world salmon markets foreclosing Alaska's opportunity. While there certainly is a lot of farmed salmon headed toward the marketplace, consumer demand also is rising dramatically. Remember, U.S. seafood consumption grew by 21.5 percent or 609 million pounds in only four years.

We believe there is tremendous potential for growth of salmon markets in the United States. American per capita consumption of salmon climbed from .1 to .4 pounds between 1980 and 1984. This represents a very small percentage of the total seafood market, and can be improved through vigorous marketing, continuity of supply and product diversity. We believe there can be a very successful marriage between wild and farmed Alaska salmon to penetrate untapped Midwest and Southwest markets.

When looking at the market for farmed salmon, it also may be useful to examine the experiences of other fish farming industries. Market analysts projected demand for farmed catfish at about 20,000 metric tons or 44 million pounds a year when the industry was initially started. Catfish production now stands at 200,000 metric tons or 440 million pounds. Similarly, market experts originally predicted a 20,000 metric tons a year demand for Norwegian farmed salmon. This year's Norwegian salmon farming production should double that amount.

The marketplace is volatile and each investor will have to weigh the risks. Our experiments with the Alaska Renewable Resources Corporation taught us that government should not attempt to make those kinds of decisions for the marketplace.

There's been a lot of discussion about how Alaska should not duplicate the disasters of the Canadians and the need for orderly development. We must learn from B.C.'s good decisions as well as its mistakes. The Gillespie Report's primary recommendation was that the government continue to support salmon farming because the 70 existing farms already employ 375 people directly and spend $50 million annually on services and supplies. The farms represent a total capital investment of $75 million in areas with traditionally depressed economies.

We agree that the industry should develop in an orderly fashion, and we endorse the policy goals adopted by Governor Cowper as a sound approach.

We must caution that if you support development of an industry with maximum opportunity for small growers, you must keep this objective clearly in mind while rewriting House Bill 108. The more difficult you make the regulatory process, the more difficult it will be for small farmers to become involved.

An important issue raised during committee discussion has been use of the state's tidelands and public waters. Can mariculture occur in a manner that doesn't displace existing beneficial uses of these waters? We are convinced they can. The state should require that mariculture permits be found compatible with existing uses and the public be given adequate notification of proposed mariculture permits.

We also believe sea farming is no different than any other new use of public lands and waters. While we're not asking for preferential use of the tidelands, we don't want to be treated differently than other tidelands users.

We support the following changes to House Bill 108:

1. Tightening of the definition of who's allowed to hold a tidelands permit for mariculture. The present language allowing companies licensed to do business in the state does not adequately restrict permits to Alaskans.

2. Development of a mariculture tax designed to ensure Alaska gets a fair return on use of common property resources such as tidelands and public waters. Tax proceeds should be shared with local governments.

3. Tidelands management language ensuring protection of existing uses of public waters and adequate notification of the public.

4. Revision of the aquatic farm stock acquisition process to allow the commissioner of fish and game to protect existing uses of fishery resources. The Board of Fisheries should make decisions on stock acquisition permits that might affect allocations.

5. Restrictions on the size of salmon farms and number of permits held by individuals or companies to ensure that control of the industry is not concentrated in too few hands. This must be done in a careful manner to avoid strangling an industry before it gets a chance to start.

We also urge the committee to consider directing state agencies to adopt as interim standards siting criteria for salmon farms developed by the State of Washington. These criteria provide strong protection of the environment and wild stocks.

Important to keep in mind as the committee is deciding how to deal with CSHB 108 is the attorney general's opinion saying mariculture including salmon farming is legal. The decision is yours on how this fledgling industry should take shape and be regulated. No action will result in a gray legal situation inviting the courts to decide those issues without adequate guidelines to protect the public interest.

Alaska Mariculture Association

Mariculture Development and Alaska Processors

Alaska has some of the world's largest seafood processing capacities, but most of these plants remain idle or under-utilized for much of the year. Mariculture offers the opportunity to utilize these plants on a year-round basis, lowering overhead costs, providing more stable work forces and allowing Alaska companies to be more competitive in markets seeking continual supplies of fresh seafood.

Cultivation of shellfish--oysters, mussels, scallops--offer the opportunity for Alaksa processors to diversify product lines, while salmon farming can provide a flow of fresh product during the off-season for commercial fishing. The year-round nature of mariculture also will help improve transportation services and lower the cost of moving product to the marketplace.

Mariculture also will provide a good market for fish food made from the waste generated at processing plants.

The complementary nature of mariculture to commercial seafood production is apparent in British Columbia where processors report an increasing flow of farmed salmon into existing processing facilities. A recent report prepared for the B.C. government said the B.C. Fisheries Council which represent major fish processors in the province "reported that a trend was beginning whereby many processing companies were joint venturing with fish farms to market their product, thereby using the excess capacity of existing plants. Government sources indicated that over 50 percent of farm salmon had recently been contracted for processing by the major unionized companies."

A recent article in the magazine Canadian Aquaculture points to a growing interest among processors in fish farming. "I think salmon farming could be the biggest thing in the seafood industry," said Harry Guenther of J.S. McMillan Fisheries. Guenther said the company plans to develop hatcheries to supply salmon farms, pick up grown fish from the farm sites, and provide processing and marketing services.

"Right now we all have underutilized production capacity," Guenther said. "Fish farming means these assets can be operated 12 months a year."

(over)

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B.C. Packers, the largest processor in the province, also is processing and marketing farmed salmon. Explains company officer Vance Lipovsky: "B.C. Packers is in the business of selling fish. It's not important whether it comes off a boat or from a farm as long as it's of high quality."

Another example of the compatibility of fish farming and seafood processing comes from the east coast of Canada where Connors Brothers Limited has expanded into salmon farming. "We've taken an idle fish plant and turned it into a hatchery and feed plant," said a Connor Brothers spokesman. "Aquaculture allows us to keep employees we might otherwise have to lay off and provides additional employment opportunities as well."

The Prince Rupert Fishermen's Cooperative, B.C.'s second largest processing company, provides a clear example of the opportunities for both processors and fishermen. The House Research Agency reports that groups of six to eight fishermen are forming partnerships with local entrepenuers to finance and operate salmon farms. Cooperative members have 10-20 farms under development. The coop operates hatcheries and a feed mill to service farms of members and to sell surplus production to others. The cooperative processes and markets the wild and farmed production of its members. These fishermen also are experimenting with oyster and mussel farming.

In explaining his support for mariculture development, one Southeast Alaska processor recently told the Alaska Mariculture Association that he wants to operate his plant, retain his local work force and supply customers seeking fresh fish on a year-round basis. Despite his efforts to buy all the troll salmon available during the winter fishery, he was able to purchase only 500 pounds of product the previous week. Naturally, the worker were sent home, the plant sat idle and the customers bought fish elsewhere.

Alaska Mariculture Association

Alaska Mariculture and Seafood Markets

Development of mariculture in Alaska could strengthen the competitiveness of Alaska seafood in the world marketplace. By broadening the diversity of products and providing year-round supplies of premium quality seafood, sea farming will help Alaska take better advantage of the growing appetites of consumers for fish and shellfish.

Seafood consumption in the U.S. grew by 609 million pounds or 21.5 percent during the past four years for which statistics are available (1982-85), but nearly all of that growth came from increased imports of foreign products. In fact, imports of foreign fish and shellfish increased by 14 percent in 1985 alone. The U.S. fisheries trade deficit amounted to a staggering $5.6 billion that year.

The growing consumer demand for seafood in the U.S. and throughout the world is being filled by aquatic farm products. Global aquaculture production in 1983 was 22 billion pounds and accounted for about 12.2 percent of the total world supply of edible fish and shellfish. Experts say aquatic farming production will reach 48 billion pounds by 2000.

At the same time, commercial fishing production in the U.S. is declining slowly and world fisheries landings have stabilized. World aquaculture production is expected to grow by 5.5 percent annually over the next 25 years, while fisheries landings are anticipated to increase by .5 percent annually.

Development of oyster, mussel and scallop farms would bolster Alaska's ability to offer a variety of high quality fresh seafood, while salmon farming could allow seafood distributers to offer year-round supplies of fresh Alaska salmon. A long-term strategy of supplementing commercial fisheries landings with supplies of cultured seafood is Alaska's best hope of remaining a major force in world markets.

Another important market consideration for Alaska in mariculture development is the potential impact of farmed salmon production in the state upon commercial fishermen. A close look at the discrete markets for Alaska's diverse salmon industry reveals that farmed salmon competes with a very small segment of our wild salmon production.

(more)

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Farmed salmon sales in the United States are directed at buyers willing to pay a premium for year-round supplies of high quality fresh seafood. Canned salmon and lower-value fresh and frozen products (pinks and chums) do not compete with farmed salmon. The deep red flesh and stronger flavor of sockeye salmon provides a secure market niche for Alaska's most valuable salmon species.

The premium quality U.S. markets being penetrated by foreign farmed salmon are important to only a small portion of Alaska's salmon production. Alaska's troll salmon production which supplies the bulk of premium quality salmon marketed in the "white tablecloth" restaurant trade accounted for less than 4 percent of the total value of Alaska's 1985 salmon production.

While farmed salmon has had a dramatic impact on European markets for Alaska's premium quality chinook and coho catches, the effect in the United States is very unclear. A 1986 survey of U.S. seafood buyers by the Marine Advisory Program showed that distributers and brokers, by a three-to-one margin, do not regard farmed salmon as a substitute for frozen Pacific salmon. This is significant since the Alaska Seafood Marketing Institute estimates that only three percent of Alaska's salmon production is sold on fresh markets.

Also important to keep in mind is that demand in the U.S. for seafood is rising so rapidly the market appears to be prepared to handle tremendous new volumes of product. And, foreign production of farmed salmon will be streaming into the U.S. from the 13 other countries now involved in salmon farming, regardless of what happens in Alaska.

A Scottish marketing research report said farmed salmon provided slightly more than six percent of the world salmon supply in 1985 and is expected to increase its total world market share to about 14 percent by 1990. The Alaska House Research Agency in a 1987 report to the legislature said, "By 1990, total farmed (salmon) production is expected to dominate world trading in both fresh and frozen premium products."

The additional amount of farmed salmon an Alaska industry is likely to produce will have an insigificant influence on any market competition between world supplies of pen-reared salmon and Alaska's wild catch. If the premium quality markets for Alaska's commercial fishing salmon production is to be affected, then these impacts will occur whether or not Alaskans are involved.

The House Research report on salmon farming summed up the situation like this: "...the question of whether or not pen rearing of salmon should be allowed in Alaska misses the crux of the issue. Rather, the basic question is whether or not Alaska will use its comparative advantages as a producer of farmed salmon to compete in growing domestic markets."

Alaska Mariculture Association

STRAIGHT TALK ABOUT MARICULTURE DEVELOPMENT IN ALASKA

Q. I've been hearing a lot about mariculture development in Alaska. What is it all about anyway?

A. Mariculture--or sea farming--is a rapidly growing industry throughout the world that produces food, pharmaceutical and industrial products. Interest in Alaska focuses on the cultivation of high value fresh products to supply growing premium quality seafood markets. The productive, unpolluted waters of Alaska's many sheltered bays and fjords are considered some of the best mariculture sites in the United States. These sea-farming operations offer tremendous opportunities in coastal Alaska to develop year-round jobs. This is particularly important in rural communities where there are few other realistic, stable sources of new local employment. Literally thousands of non-petroleum dependent jobs could be created.

Q. What kind of jobs and how many will be created? Are we talking about another industry that will employ many non-residents and provide few local benefits?

A. One of the most attractive features of mariculture is that it will offer year-round jobs which are likely to be filled with local residents. Many mariculture operations, particularly shellfish culturing, are ideally suited for family enterprises. Finfish farming is more likely to involve a range of businesses from family operations to medium sized farms employing up to ten people. These businesses also will create new opportunities for local processing plants, light industrial manufacturing of equipment such as nets and pens, and new markets for fish and fish wastes to be used in production of fish food. The increased exports of fresh seafood products also could help lower transportation costs for all Alaskans. The number of new jobs that could be achieved under development of the full potential of sea farming in Alaska is difficult to estimate. A 1987 study for the legislature projected "a total employment effect of about 1,920 jobs and a payroll of $48.8 million" for salmon farming alone. This would provide more resident jobs than the present Alaska logging industry and nearly double the resident payroll.

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Q. Isn't mariculture something new and untested?

A. Fish farming probably originated in China about 600 B.C. and oyster culturing thrived in ancient Rome and Gaul. Recent advances have led to an aquaculture explosion around the world. The federal government estimated the 1983 world production of aquaculture seafood at about 22 billion pounds; this is expected to increase to 48 billion pounds by the turn of the century. Commercial fishing landings are expected to remain relatively stable during the same period. This production from aquatic farms will become increasingly important to keep pace with projections for increased consumption of seafood.

Q. How do we know it will work in Alaska?

A. Alaska already has nearly a dozen sea farms producing oysters, one producing mussel farm, and a recently concluded agreement between the State of Alaska and Japan calls for the development of seven scallop sites on Kodiak Island to test the feasibility of scallop farming in Alaska. The agreement also covers a feasibility study of giant kelp (Macrocystistis) farming in Sitka. Experiments conducted in Southeast by the state and federal governments have proven the feasibility of pen-rearing king salmon to marketable size in a competitive period of time.

Q. I'm concerned about salmon farming. Can you tell me more about it?

A. There currently are about 15 countries currently producing pen-reared salmon. Worldwide production of farmed salmon increased from 27 million pounds in 1981 to 97 million pounds in 1985. This is expected to grow to 314 million pounds by 1990. These dramatic increases are reacting to a strong and growing demand in the marketplace for fresh, high quality seafood. Seafood consumption is growing rapidly throughout the world, and no where faster than in the U.S. Americans ate 609 million more pounds of fish in shellfish in 1985 than they did in 1982 which represents a 21.5 percent growth in only four years. Since domestic commercial fishing production declined over the same period nearly all of the increased sales were enjoyed by foreign producers. In fact, America's seafood trade deficit increased by 14 percent in 1985 alone to climb to a staggering $5.6 billion.

Q. Even though the market is growing, the increases in farmed salmon production sound like they might hurt our salmon fishermen.

Sales of farmed salmon in the U.S. are directed at markets for premium quality fresh seafood; the Alaska Seafood Marketing Institute estimates that only three percent of Alaska's salmon catch is sold on fresh markets. A 1986 survey of major U.S. seafood distributors conducted by the Alaska Sea Grant Program and the University of Alaska reveals that few buyers consider

farmed salmon to be a legitimate substitute for frozen wild salmon. Markets for Alaska's great volume of lower value salmon species (pinks and chums) and virtually all canned production clearly are unaffected by the high value farmed salmon. Likewise, existing markets for frozen sockeye salmon appear to be unthreatened. The only area of market impact on Alaska fishermen from farmed salmon is the "white tablecloth" restaurant trade which is primarily filled by troll salmon. Trollers accounted for about four percent of the value of the 1985 salmon catch. The relatively minor impact of farmed salmon on prices for wild salmon is underscored by recent figures from the Alaska Department of Fish and Game. The 1986 Alaska salmon catch of 123.5 million fish was worth $385 million to fishermen or $15 million more than value of the previous year's harvest of 144.6 million salmon.

Q. <u>This information appears to suggest that farmed salmon is having little impact on markets for wild salmon, and there is a growing demand for premium quality salmon. How can we take advantage of this opportunity?</u>

A. To take full advantage of the growing markets for premium salmon Alaska should move forward on two fronts. First, we need to more aggressively promote our premium quality salmon products, both fresh and frozen. A pilot project for a Premium Quality Seal Program was tested in 1986 by the Alaska Seafood Marketing Institute and Department of Environmental Conservation using frozen troll-caught salmon. If successful, this project could forge the way for the needed promotional effort. Secondly, Alaska should move forward with the pen-rearing of salmon so we don't miss out on this important opportunity for growth. Millions of dollars have been pumped into the Norwegian economy from 740 salmon farms and 250 hatcheries. This fact has not gone unnoticed by Alaska's neighbors--British Columbia and Washington State--who are aggressively promoting salmon farming. The market opportunities will be filled by others if Alaska fails to act.

Q. <u>Have salmon fishermen in other countries become involved in salmon farming?</u>

A. Yes. More than half (55 percent) of the applicants for Norwegian salmon farming permits between 1973 and 1978 came from a fishing background. The Prince Rupert Fishermen's Cooperative in British Columbia provides an excellent example of how fishermen can take advantage of fishing and farming. Groups of six to eight fishermen are forming partnerships with local entrepenuers to finance and operate salmon farms. Cooperative members have 10-20 farms under development. The Prince Rupert Cooperative operates hatcheries and a feed mill to service farms of members and to sell surplus production to others. The cooperative processes and markets the wild and farmed production of its members. These fishermen also are experimenting with oyster and mussel farming.

Q. How about impacts on our wild stocks? Won't exotic diseases be introduced, and what about the potential for sea-farmed fish and shellfish to escape and intermingle with wild stocks?

A. The State of Alaska already has recognized the need to ensure that cultured fish and shellfish do not pose a health risk to wild stocks. The state has implemented the most stringent cultured fish health standards in the nation. These regulations apply to the existing private nonprofit salmon ocean ranching program and to mariculture operations. The impressive track record of Alaska's ocean ranching program demonstrates that salmon, other finfish and shellfish can be cultivated in public waters without risk to wild stocks. These proven regulations are a model for health management systems at mariculture facilities. Mariculturists are very concerned and careful about the prevention of disease because it is critical to the profitability of sea farms that production losses be very minimal. State government will play major regulatory and extension agent roles in ensuring that mariuclture operators have adequate health management systems to maintain the health of the cultured species while protecting wild stocks. A 1986 study by the University of Washington concluded that disease from farmed fish "does not appear to be transmitted to the wild population." The study went on to say, "The potenital consequences of the interbreeding of escaped and wild organisms, if any at all, are unclear. However, for salmonids at least, the potential magnitude of the problem would seem minimal" when compared to the impacts of present ocean ranching programs.

Q. Mariculture operations obviously require continual sources of brood stock. Where will it come from? Will it impact existing fisheries and enhancement programs?

A. Sea farms will require dependable sources of disease-free brood stock. During initial development of a salmon farming industry, brood stock will be acquired through purchases of surplus eggs from private or public hactheries. This can be replaced by private hatcheries developed by salmon farmers. Some shellfish farms--mussels and scallops--will require the collection of brood stock from wild sources. Brood stock taken from these common property sources--hatcheries or gathering from the wild--will occur only if a surplus exists.

Q. I'm concerned about pollution. Will sea farms create accumulations of waste that will pollute our waters?

A. Clean water is a primary concern of mariculture operators as most cultured species are very susceptible to pollution. One of the reasons Alaska is so attractive as a mariculture center is its clean and pure waters. A recently completed study by the University of Washington of salmon farms and shellfish operations in Puget Sound said there appears to be little risk of adverse environmental impacts from mariculture. Only farms located in

areas of very poor circulation pose any danger of accumulations of organic rich debris threatening sea life.

Q. If mariculture is such a natural for Alaska and could be so beneficial why are there so few sea farms?

A. Alaska has lagged behind other areas primarily because of the strength of its natural fisheries resources; mariculture development has been pioneered in countries where the natural stocks have been depleted. The strong market demand for cultured seafood has sparked considerable interest in Alaska in recent years. Individuals and companies interested in mariculture in Alaska have encountered the normal problems facing the development of any new industry. In this case, those problems have been exacerbated by the lack of a state policy on mariculture development and the resulting void in direction to regulatory agencies. The many Alaskans interested in mariculture have found that permitting processes presently exist only for oyster farming.

Q. Does this mean Alaska needs to develop a new layer of regulations and bureaucracy to deal with mariculture?

A. No. Existing permitting processes can easily be adapted for mariculture licensing, and the industry will require little in the way of new government services. Mariculture supporters are primarily interested in getting the state to provide a regulatory climate conducive to development of stable, profitable businesses.

Q. Who will be able to participate in mariculture anyway?

A. Mariculture is open to everyone. No limited entry system or other artificial legal barriers have been erected. As mentioned earlier, there is great opportunity for many small-scale businesses, many of which will primarily require sweat equity investments.

Q. You've convinced me. How do I find out more about mariculture and get involved in this wonderful opportunity?

A. The Alaska Mariculture Association has been formed to advocate policies leading to the development of a stable, year-round mariculture industry, and to assist businesses develop into profitable operations. The AMA will provide members with information pertaining to the permitting and regulatory system, markets, sources of investment capital, quality assurance practices, research, suppliers and other issues of concern. Memberships start at only $25 per year.

Alaska Mariculture Association

Costs of Entering Salmon Farming vs. Fishing

One of the issues raised during discussions of mariculture development is the high cost of entering salmon farming. The Alaska Mariculture Association (AMA) believes the costs of establishing a salmon farm are comparable to many fishing operations in Alaska.

An economic feasibility study of salmon farming prepared for an Alaska corporation estimated the initial capital and operating costs of establishing a small (110,000 pounds annual production) at $243,000. The study estimated the initial cost of a larger farm (440,000) at $896,000.

According to the fisheries consulting firm of Garner and Williams, following are typical initial costs of entering the Bristol Bay salmon fishery, including the purchase of a new vessel and permit.

Estimated Costs of Entering the Bristol Bay Drift Salmon Fishery

Vessel, electronics, gear	$120,000-200,000
Permit	130,000
Insurance (4% of vessel cost)	4,800-8,000
Groceries	2,000
Fuel	2,000
Transportation/miscellaneous	5,000
TOTAL	$263,800-347,000

The cost of entering the Bristol Bay salmon fishery should be considered a mid-range fishing investment. The following examples of capital costs taken from the classified ads show a wider range on entry costs. The vessel costs are for used boats.

Vessel/Gear/Permit Costs for Some Alaska Fisheries

Power troller (44' wooden) with permit	$87,000
Prince William Sound gillnet (28') w/permit	110,000
Cook Inlet salmon seine (36' fiberglass) w/permit	157,500
Steel seine vessel w/SE salmon permit	289,500
w/SE salmon & herring permits	589,500
w/False Pass salmon permit	500,000
AK Peninsula drift/longline (46') w/salmon permit	550,000
66' steel crabber/longliner w/refrigeration	350,000
53' steel seiner/crabber	400,000
108' steel joint venture dragger	1,950,000

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

Bob & Donna Meyer
907-946-1234

M T C
Meyers Trading Co.
Fish Buying • General Store

Meyers Chuck, Alaska 99903

March 7, 1987

Representative Adelheid Herrmann
Alaska State Legislature
Pouch V (MS 3100)
Juneau, Alaska

Dear Representative Herrmann:

I am requesting your support of HB 108 because strong legislative leadership is needed if Alaskans are to participate in the "Blue Revolution" (see House Research Agency Report 87-8: Aquaculture in Alaska).

Aquaculture offers remote coastal communities like Meyers Chuck an opportunity to diversify their economies, which are based generally on fishing and logging. For example, during the past ten years, the volume and value of salmon harvested at Meyers Chuck decreased by nearly 50 percent as a result of market conditions and changes in harvest regulations. Because of the depressed lumber market local residents have been unable to enter this industry and have had to move from the community or seek financial assistance from the state in order to remain.

Aquaculture can ameliorate the effect that the volatile fishing and logging industries have on local economies by providing off-season employment for fishermen and loggers as well as year round employment. As stated in the aforementioned report, employment in aquaculture if it is allowed to develop in Alaska may exceed that provided by the logging industry.

Many of your constituents are involved in the salmon industry and are concerned about the effect of salmon farming on their traditional markets. Rightly, they should be concerned, because regardless of what the legislature decides pursuant to aquaculture, the industry is and will continue to compete with high quality pen reared fish from Europe, South America, New Zealand and parts of the Pacific Rim. I am concerned that by concentrating their efforts on resisting development of an Alaska based salmon farming industry, they are hiding from the need to improve the quality and marketing of wild caught salmon (which is needed if the industry is to maintain its market share).

Thank you for your consideration.

Sincerely

Robert M. Meyer

Resource Development Council
for Alaska, Inc.

807 "G" Street, Suite 200, Anchorage, Alaska 99501-3440
Box 100516, Anchorage, Alaska 99510-0516 – 907/276-0700

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EX-OFFICIO MEMBERS
Senator Ted Stevens
Senator Frank Murkowski
Congressman Don Young

March 2, 1987

The Alaska Legislature
Juneau, AK 99811

re: Mariculture legislation

Dear Alaska Legislator:

The Resource Development Council supports HB 108 and SB 106 as a means of diversifying the seafood industry and creating resident employment through mariculture development. It is important that we have legislation in place which addresses all types of mariculture projects.

Existing law bans many forms of aquatic farming in Alaska. We must legalize all shellfish, sea vegetable and finfish operations if we are to take advantage of the market opportunities that mariculture presents.

Mariculture products compete in markets completely separate from commercially caught and processed seafood products. By penetrating these new markets and introducing consumers to new, high-quality Alaska seafood products, all Alaska seafoods will benefit from a more positive image.

Mariculture operations require full-time, year-round labor forces. Not all regions of the state will be suitable for mariculture, but where it is feasible, it can provide a much-needed expansion and stabilization of local employment. For some communities where traditional fisheries are declining and little or no opportunities exist in other industries, mariculture may be the brightest spot on the horizon.

HB 108 and SB 106 provide a framework within which all areas of mariculture can be developed with concern for the environment and existing fishery activities. The Resource Development Council supports passage of these bills to help diversify and stabilize Alaska's economy.

Sincerely,

RESOURCE DEVELOPMENT COUNCIL
for Alaska, Inc.

Paula Easley

Paula P. Easley
Executive Director

MAR 23 '87

Adelheid Herrmamm, Representative
Alaska State Legislature
P.O. Box V (MS 3100)
Juneau, Alaska
99811

February 23, 1987

Dear Representative Herrmamm:

As a partner in a private, non-profit salmon hatchery and "hopeful-to-be" participant in a mariculture operation, I have a personal interest in HB-108. As a professional economist in Alaska since 1971 and a resident since 1963 I am convinced that your support of mariculture in Alaska is in the public interest.

Many people who have an interest in mariculture do not expect state loans, gifts or other forms of "help". What we do expect and hope for is a simple approach that will remove the bureaucratic pitfalls and redundant state "processes" that required over four years of persistence and dedication to obtain just the permits for one of the private non-profit hatcheries.

What we ask for is a cleared path that we can walk on in pursuit of our entrepreneurial interests. I cannot afford another four or five years of expense, labor and opportunity cost.

It is predictable, I suppose, but disturbing that the regional aquaculture associations have solicited proposals from lobbyists to mount a campaign designed to prevent passage of legislation that will allow for private mariculture operations.

Your expertise and leadership will prove invaluable in allowing the mariculture industry in Alaska to prosper and grow. Alaska is a small part of the international fishery economy, but the potential exists to become very significant. If you will assist by making sure that we are allowed to pursue our goals the potential may be realized.

I will look forward to your response and contribution to enabling legislation.

Respectfully,

Michael A. Brigan
1435 I ST.
Anchorage, Alaska
99501

March 3, 1987

The Honorable Adelheid Herrman
HOUSE OF REPRESENTATIVES
P. O. Box V
Juneau, Alaska 99811

Dear Representative Herrman:

I am 23 years old. I was born and raised in Alaska. I have commercial fished for the past 6 years, as a decknand in both the Bristol Bay and Cook Inlet salmon fisheries, and I have longlined for halibut. I am writing to voice my support of House Bill 108, the mariculture bill. As a young Alaskan, I seek employment in a field that will provide me with security and a sense of permanence. More specifically, I have reached the point where I wish to obtain my own commercial fishing operation, yet, prohibitively high start-up costs prevent me from doing so.

The limited entry system has created an economic barrier that prevents many Alaskans like me from participating in the salmon fishing industry in an owner/operator capacity. It requires anywhere from $100,000 to $500,000 to break into today's salmon fishery at a successful level. Over half of this start-up cost derives from the exorbitant value placed on limited entry permits.

Traditionally, Alaskan fishermen have been a symbol of independence. In the past, they have prided themselves on being their own bosses, on making a living from Alaska's waters. Recently, however, the economic barriers erected by limited entry have created an exclusive fishery that excludes many Alaskans, both white and native, from participating in a traditional livelihood. Young, aspiring commercial fishermen have been denied access to a natural resource that is the common property of all Alaskans. Currently, over 20% of all limited entry salmon permits are held by non-residents. Additionally, most fish processing plants are owned and operated by Seattle-based firms. Obviously, with such a high percentage of nonresident fishermen and processors, much of the revenue generated by Alaska's salmon fishing industry leaves the State. Alaska's commercial salmon fishery no longer offers

an alluring sense of independence. Since going limited entry, the salmon industry has transformed into an economically exclusive enterprise. For me, and many like me, the commercial salmon fishery is a closed door.

A second problem which plagues Alaska's salmon fisheries is a short, but intense fishing season during which huge volumes of salmon must be harvested and processed in a matter of weeks. High volumes of fish result in a poor quality product. The fish are thrown about, are walked upon, and in some instances, remain aboard tenders for as long as 48 hours without being processed or refrigerated. Despite precautionary measures taken in transporting and processing the product, salmon are severely bruised by seine nets and gill nets before they are even removed from the water. Because of poor quality, 97% of Alaska's salmon are sold on the frozen and canned market.

A mere 3% of Alaska's salmon are sold on the fresh market. Alaska's fresh salmon production is caught by a handful of Southeast troll fishermen whose low volume fishery enables them to maintain a high standard of quality. As a result, they are rewarded with a sale price that is as much as four times the price of salmon destined for the canned market.

Fish farms will produce a similar, premium product and will cater to this same fresh market. Only fish farms will be able to supply fresh fish on a year-round basis. Southeast troll fishermen contend that fish farming in Alaska will undermine their markets. Such is not the case. Southeast troll fishing cannot possibly meet the rapidly growing demand for fresh salmon. Presently, demand is so great, yet U.S. production is so low, that the United States must import the majority of its fresh salmon from salmon farms in Norway. Secondly, the southeast troll fishermen will not be displaced by Alaskan fish farmers. Instead, foreign suppliers will be forced out of U.S. markets as Alaskan fish farms begin to fill the demands of a fresh market.

Fish farming is an industry that is taking root throughout the world. Norway and Japan, world leaders in fish farming, already have developed worldwide markets for

pen-reared salmon. France, New Zealand, Great Britain, Chile, and Canada are rapidly following suit. Although many commercial salmon fishermen sincerely believe that salmon farming in Alaska will destroy their livelihood, this is not the case. Japan, for one, has shown the opposite to be true. In Japan, fish farmers and commecial fishermen coexist successfully. And, closer to home, Washington state has demonstrated similar cooperation between farmers and fishermen. Besides, if commercial fishermen's concerns over competition from Alaskan fish farms were truly warranted, then should they not be equally concerned about competition from foreign fish farms? The fact is, the rest of the world will develop mariculture industries regardless of what Alaska decides to do. Fulfulling this country's fresh market through pen-reared domestic salmon rather than through pen-reared foreign salmon will ultimately secure this country's salmon markets for Alaska's commercial fishermen and fish farmers alike.

Finally, fish farming can bolster Alaska's depressed economy. It can provide new opportunity for stranded commercial fishermen like me. More importantly, a mariculture industry can directly employ thousands of Alaskans on a year-round basis, and can indirectly employ thousands more in the fields of engineering, construction, transportation and marketing.

Governor Cowper, in his State of the State address, stressed the need for Alaska to break away from its dependence on oil. He emphasized the need to diversify Alaska's economy to ensure fiscal strength in the future. The mariculture industry provides one such opportunity to diversity. Alaska, with its clean waters and limitless coastline, is ideally suited to support a multimillion dollar mariculture industry. The time to act is now. As policymakers and fellow Alaskans, I urge you to support House Bill 108. Mariculture in Alaska can pick up where oil left off by providing high quality, fresh seafood products that can be marketed worldwide and throughout the year. Together, Alaska's fish farmers and commercial fishermen can develop international markets that will propel them to the forefront of world salmon production and will give new

dimension to Alaska's proud title of "the salmon capital of the world."

Sincerely,

Thomas C. Pease

Waterfour Industries Ltd.
R.R. 1 Site 6 Comp. 4
Denman Island, B.C. V0R 1T0

MAR 25 1987

March 26, 1987

The Honorable Adelheid Herrmann, Cochair,
House Resource Committee

Attention: Deborah.

Madam Chairman and House Resource Committee members:

Due to the particular topics scheduled on March 24th much of the results of my experiences in salmon farming went unsaid. I would like to make the following statements in hopes of assisting Alaska to begin developing of what many of us believe to be one of the best economic opportunities Alaska has -- aquaculture. The following opinions are that of the General Manager of a salmon farming venture that is in the process of developing 10 sites with annual sales of US$25 million within five years, relative to some B.C. ventures, not a particularly aggressive plan.

1. Salmon industry evolution. Salmon farming has become an important part of world salmon marketing. It will not cease to exist. If Alaska chooses not to become part of it, other nations will applaud. Along with their salmon farmers, other countries processing plant workers will work year around, as will their draggers, net, feed and equipment makers, marketers and many others.

2. Farm size: Aquaculture is a very competitive economic endeavor, Alaska has to come from way behind over a dozen other nations in technical, financial and in infrastructure matters. Aquaculture cannot be expected to have much of a chance if made to bear, however well intended, legislated inefficiencies -- such as farm size restrictions. (Two sizes appear to be the most viable -- small, perhaps family based, operated by someone who already lives on or near a site, who combines with other small farmers in purchasing and sales, and larger, corporate based clusters of five-ten farms. Big corporations have not, thus far, done well in aquaculture.)

The result of making the same mistake Norway has made in limiting the volume of net pens allowed is too high of fish density. The result of that is increased costs due to disease resulting from stress, increased point source organic loads, and overall much greater financial risk.

3. Markets: What harm that has been done to Alaskan salmon fishers, for the near term has already been done. (Norway alone produces more farmed Atlantic salmon than the total U.S. catch of coho and chinook combined, all states, all gear types.) In regards to salmon farming, what Alaska does or does not do will not matter for many years in international farmed salmon markets. If no discernible difference exists, and if a net increase in jobs are to be realized, then we should have it. Additionally a consistent supply of fish, commercially harvested in the summer and commercially farmed in winter will result in year around jobs -- the best way to "Alaskanize" the fishing industry that I know of.

4. Supply of domesticated smolts. Each small farm will need about 10,000 smolts, large farms, 100,000-plus. It is suggested that strong urging be given to ADF&G-FRED Division to at least supply eggs, and that provisions for converting local PNP corporations to private-profit hatcheries (with loan payback as a condition) be provided for. (The IRS status of PNP hatchery corporations must be carefully considered.)

It is also suggested that domesticated broodstock be prudently allowed into Alaska, in small numbers, for a restricted period of time while we are testing and selecting local stocks. Without fish stocks long held in captivity, Alaska will have a difficult time catching up. (See the latest Canadian regulations for a guideline -- enclosed.)

5. Ongoing research and development/training. No new species of aquatic organism has recently been brought into cultivation without extensive R&D efforts. The model that appears to work best is typically university-based, with a state providing the facility and the researchers finding the actual research project funds. Combined with community college efforts, workers can also be trained at the facility.

6. Unnecessary/duplicated controls. There already exists a plethora of studies in which no major problems have been found -- at least none that compare with the question "What is the effect of commercial or intensive recreational fishing?". Many agencies already have a myriad of laws and regulations, just ask someone who has been through the maze already. Pollution (salmon are a pristine water organism so that problem is self-correcting), shipping lanes and safe harbors, traditional fishing grounds and other land use conflicts and a number of other potential problem areas already have a number of concerned agencies. As your know all too well, these times of decreasing budgets. Imposing additional demands upon state agencies, when existing statutes and regulations already protect the public interest due to vague concerns, serves no one.

7. Financing. Salmon farming is capital intensive due to the two-three year period at start-up with no revenues. To start even a small farm can easily require $50,000 or more. A moderate-sized farm can require $2 million. Banks do not readily loan monies for new ventures in start-up industries. The only source of financing that I know of from financial institutions comes from countries already well established in salmon farming. (The best source is Norway.)

You do not have an easy task ahead of you, but Alaskans need the work.

Thank you for your time,

Curt Kerns

Curt Kerns, General Manager

Federal-Provincial Policy for the Importation of Live Salmonids into British Columbia

In recognition of the commercial and recreational value of wild and cultured native salmonid stocks in British Columbia and the Yukon Territory, it is essential to protect their genetic integrity and freedom from exotic diseases.

Therefore, no importations of fish belonging to the family Salmonidae will be authorized by Federal or Provincial fisheries management agencies which are not in compliance with this policy, effective on date of signing.

General:

1. Approved importation of live salmonids must comply with the Canadian Fish Health Protection Regulations (CFHPR).
2. Only surface-disinfected, fertilized eggs will be imported. No live fish or unfertilized eggs or milt will be allowed.
3. Only Atlantic salmon (Salmo salar) and non-anadromous rainbow trout (Salmo gairdneri) will be considered for importation.
4. Importation of rainbow trout will be considered only from brood stock that was hatched and reared in Canada and continental U.S.A.

Atlantic Salmon:

5. As of April 1, 1987, egg imports will be limited to 100,000 eggs/year/licence and allowed only from brood stock that has been held at the source facility (hatchery and sea pen), separate from other stocks, for one full generation. This means that consideration could be given to F_2 Atlantic salmon from Canada and the U.S.
6. No direct importation of Atlantic salmon eggs will be permitted from continental Europe, from the southern hemisphere, or from countries in which viral hemorrhagic septicemia (VHS) is known or suspected to occur. Importation will be considered only from sites that (i) a Canadian Local Fish Health Officer has approved after a site inspection; (ii) can demonstrate a thorough record of disease history to the satisfaction of a Canadian Local Fish Health Officer; (iii) can document and demonstrate disease-free water supply system; and (iv) can document and demonstrate the capability of the physical plant to isolate stocks and prevent disease transfer between stocks.

...2

7. Importation of Atlantic salmon eggs will be for the purpose of developing aquaculture brood stocks in British Columbia. Importers must propose a number or percent of fish to be held to maturity for reproduction and collection of sex products and demonstrate progress and intent to establish brood stocks.
8. Consideration for import will be given particularly to stocks that are demonstrably adapted for commercial aquaculture pen rearing, assuming that all other conditions are met.
9. After March 31, 1989, no further shipments of Atlantic salmon will be permitted.
10. All Atlantic salmon must be held under strict quarantine (as outlined below).

All Live Salmonids:

11. Notwithstanding sections 2,3,5,6 and 8, exceptions may be permitted for limited numbers of eggs or small volumes of milt for such activities as research or brood stock development and improvement when work is to be conducted under strict supervision of government fisheries agencies. Approval for exceptions must be obtained from the Director General, Pacific Region, Department of Fisheries and Oceans and the Director, Fisheries Branch, British Columbia Ministry of Environment and Parks.

Atlantic Salmon Quarantine Conditions:

12. Prior to the arrival of any eggs, a quarantine facility must be inspected and approved by designated government personnel according to the following conditions as judged by the designated Fish Health Officer. The quarantine facility must:
    a) be an adequately enclosed area, physically separated from any other hatchery operation;
    b) have restricted access;
    c) have approved facilities for disinfection of effluent.
13. All eggs and resultant fish must be held in quarantine for a minimum of 12 months after arrival.
14. All stocks in the initial year and thereafter all stock kept for brood stock must be inspected and sampled according to the CFHPR Manual of Compliance. Fish must be sampled 3 times in their quarantine year and once just after transfer to salt water. Brood stock must be sampled at maturity.
15. Diseased stocks:
    a) shall be destroyed if VHS, IPN, or whirling disease is detected, and
    b) may be ordered destroyed or treated if any disease listed in Schedule II of the CFHPR is detected.

    Also, detection of any other disease designated by Federal and Provincial fisheries management agencies may lead to the same requirement for stock destruction or to further quarantine of the stock.

...3

16. Failure to comply with importation or quarantine conditions will result in suspension of the Commercial Fish Farm Licence of the facility.

Marine Rearing of Atlantic Salmon:

17. All movements of Atlantic salmon from hatchery to salt water will be by Federal-Provincial Transplant Committee approval only.

The precautions taken in 1 to 17 above are designed to minimize the risk of introducing exotic fish diseases and to maximize the chances for detection of any exotic fish diseases that may be carried by introduced stock.

Procedures:

18. All requests for permission to import live salmonids are to be addressed to the Canada-British Columbia Transplant Committee, c/o Local Fish Health Officer, Pacific Biological Station, Hammond Bay Road, Nanaimo, British Columbia, V9R 5K6.
19. In recognition of the importance of managing fish disease upon the orderly development of aquaculture in British Columbia, and recognizing the lead role of the Ministry of Agriculture and Fisheries in aquaculture; the Department of Fisheries and Oceans and the Ministry of Environment and Parks will confer with the Ministry of Agriculture and Fisheries:
    a) prior to any decision being made by the parties regarding item 11 requests;
    b) prior to any amendments to the policy under item 20;
    c) at least semi-annually regarding the nature and status of requests to the Canada-British Columbia Transplant Committee to import live salmonids to British Columbia.

Amendment:

20. This policy may be amended by mutual consent of the signatories.

APPROVED:

Peter Meyboom, Deputy Minister Department of Fisheries & Oceans	B. E. Marr, Deputy Minister B.C. Ministry of Environment and Parks
Date	Date

November 17, 1986

APR 0 2 1987

VILLAGE PARTICIPATION CONFERENCE RESOLUTION # 87 - 4

ENTITLED: IN SUPPORT OF SENATE BILL 106.

WHEREAS, mariculture presents important economic opportunities to many rural communities; and

WHEREAS, rural communities need to become more self sufficient; and

WHEREAS, this method of economic development suits many rural communities.

Now, therefore, be it

RESOLVED: that the 1987 Village Participation Conference hereby supports pending legislation regarding mariculture (Senate Bill 106).

ADOPTED this 27th day of February, 1987 at the Village Participation Conference in Juneau, Alaska.

Chester Ballot

Chester Ballot, Chairperson
1987 Village Participation Conference

APR 0 2 1987

Telecopy Cover Sheet

To: JMM LID Phone

From: Donna-Volden LID Phone 835-7041

Instructions: For- Rep. Herrmann H. Resources

Number of Pages: 1 (Not counting this Cover Sheet)

Re: HB 108: Mariculture

May name is Paul Mc Collum. I've been raising salmon at State, Federal and private hatcheries in Alaska for 13 years.

The opposition to HB 108 seems to fall into (4) categories:

1. Competition
2. Effective Control of proposed industrial development
3. Environmental Impact
4. Feasibility

The feasibility of a private business is in my view the burden of the business community and not the government. Any mariculture project involving net pen rearing will require a lot of vested capital and most people are not going to proceed on these projects without apretty fair indication that they have a reasonable chance of making a profit.

Environmental impacts of these projects in my opion would be insignficant when compared to most industries that Alaska bends over backwards trying to develope. This issue should be dealt with through policy and not legislation. Disease issues could be dealt with as specified in HB108 through the ADF&G FRED division pathology which already is in a position to handle this.

Effective control of this industry's development is a very important issue. I feel that this bill provided enough control for the initial process and that, if passed, would allow for follow-up policy to be put in place, which is critical to avoid foreign or outside control of this industry.

Competition is, in my mind, the only real issue here that has enough merit to question this bill's ability to pass. I think that pen rearing in Alaska will be more difficult than a lot of people believe. It is also possible that due to our temperature and climate many facilities would be better off producing pan-sized fish, which seems to be more effective, and has no wild market counterpart.

I think this is a serious issue. But, if this bill passes, it would be appropriate to have a meeting between ADF&G, AK Mariculture Assn., regional associations, and ASMI to sit down and fine tune policies and marketing strategies to hopefully allow for a peaceful coexistance between these important industries.

We're talking about a viable business here, and it's farming pure and simple. I don't think Alaska has the legal grounds nor the justifications to pass up this opportunity. The rest of the world will continue to crank out more and more of these fish regardless of the success or failure of this bill. Whatever competition there is will be there anyway. I support passage of this bill.

Paul McCollum
Box 1676
Valdez, AK 99686

TELECOPY COVER SHEET

KETCHIKAN LIO(225-9675)

TO: Rep. Hermann/Hammond PHONE 465-1442

FROM: Mike Judson PHONE 225-2532

INSTRUCTIONS: Please deliver

RECEIVED: DATE 4-6-87 TIME 10:00 am

SENT: DATE 4-6-87 TIME 10:02 am

DISPOSAL OF ORIGINAL: THROW AWAY X HOLD FOR PICK UP ____

NUMBER OF PAGES: 4 (NOT COUNTING COVER SHEET)

SENT BY: LIO/KETCHIKAN (June)

APR 06 '87 09:06 LEG. AFFAIRS - KETCHIKAN

GOOD MORNING, MY NAME IS MIKE JUDSON, I WAS BORN AND RAISED IN SOUTHEAST ALASKA, MY FAMILY HAS BEEN INVOLVED IN FISHERIES FOR MANY YEARS,

I SUPPORT HB 108, ~~TODAY~~ I WOULD LIKE TO SPEAK ON SALMON FARMING. ONLY

FOR THE PAST 12 YEARS I HAVE BEEN A RETAILER OF MEAT AND SEAFOOD AT A SUPERMARKET IN KETCHIKAN, IN THAT TIME WE HAVE HAD CONSISTANT PROBLEMS AQUIRING FRESH QUALITY SALMON, EXEPT DURING THE SUMMAR SALMON SEASON.

THE REASONS A FARMED SALMON IS DESIRRABLE IN THE RETAIL AND RESTURANT MARKETS IS CONSISTANT AVAILABILITY, SIZE, PRODUCT QUALITY, & FRESHNESS (WHICH WOULD GIVE THE END SELLER LONGER TO SELL A QUALITY PRODUCT)

SEAFOOD CONSUMPTION CONTINUES TO INCREASE, ~~IN THE LAST 4 YEARS CONSUMPTION HAS INCREASED BY 21.5%~~, BY THE TURN OF THE CENTURY CONSUMPTION SHOULD INCREASE BY 33 BILLION POUNDS.

MANY FIRMS NOW PURCHASE PEN REARED ATLANTIC SALMON REGARDLESS OF WHETHER OR NOT WILD PACIFIC SALMON ARE AVAILABLE.

THIS MEANS THOSE FIRMS NOW PREFER THE CONSISTANT QUALITY OF PEN REARED SALMON OVER THE INCONSISTANT QUALITY OF THE WILD PRODUCT.

DEC 08 '97 09:08 LEG. AFFAIRS - KETCHIKAN

I SPOKE WITH A SEAFOOD BROKER IN SEATTLE WHO IS CURRENTLY IMPORTING FARMED SALMON FROM, NORWAY, CHILI, NEW ZEALAND AND CANADA HE STATED " A FARMED ALASKAN SALMON WOULD CARRY MORE WEIGHT ON THE SEATTLE AREA AND WORLD MARKETS THAN THE NON ALASKAN FARMED FISH" THIS WOULD HELP ESTABLISH A YEAR ROUND MARKET FOR ALASKAN PRODUCTS. BOTH WILD AND FARMED."

THANK YOU FOR THIS OPPORTUNITY TO EXPRESS MY OPINION

APR 08 '97 09:08 LEG. AFFAIRS - KETCHIKAN

A STIR IN THE SALMON MARKET

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.

How new supplies are changing the picture.

BY PEGGY PARKER

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.

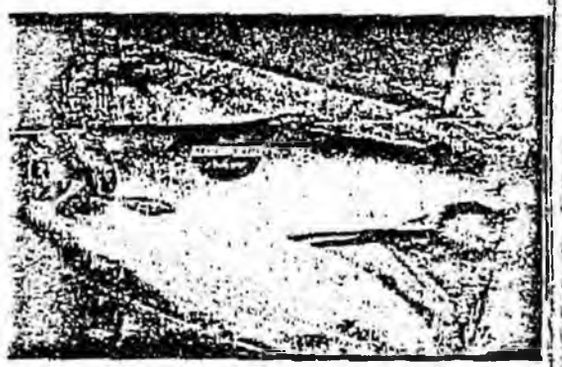
Salmon producers are taking two approaches to the market. One is to join the competition. Interest and investment in farming operations are high on the coasts of both Canada and the U.S. Another is to promote high-quality frozen salmon as a product that meets the aesthetic standards of fresh, yet is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

APR 08 '87 09:05 LEG. AFFAIRS - KETCHIKAN

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.

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

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: *Oncorhynchus* (on ko' rin kus) and *Salmo*. Members of the *Oncorhynchus* 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 *Oncorhynchus* spawn once and die; *Salmo* spawn several times.

APR 0 6 1987

ASCC

ALASKA STATE CHAMBER OF COMMERCE
310 Second Street
Juneau, Alaska 99801
(907) 586-2323

April 3, 1987

The Honorable Adelheid Herrmann
Alaska House of Representatives
Post Office Box V
Juneau, AK 99811

Dear Adelheid:

I wish to state the Alaska State Chamber's wholehearted endorsement of HB 108.

The development of a viable mariculture industry for Alaska is critically important to all Alaska. New industry means private sector jobs and jobs mean payroll. Alaska's economy can be placed on a continued strong footing, but only through State generated support.

Passage of HB 108 would send a real signal that the Alaska Legislature supports a strong Alaska economy.

Cordially,

George Krusz
President

GK:cbr

APR 10 1987

Peratrovich, Nottingham & Drage, Inc.
Engineering Consultants
Telex 090 26436
Telefax (907) 563-4220
1506 West 36th Avenue • Suite 101 • Anchorage, Alaska 99501 • 907-561-1011

April 7, 1987

EN&D 87000r

Representative Adelheid Herrmann
Alaska State Legislature
P.O. Box V (MS 3100)
Juneau, Alaska 99811

Dear Representative Herrmann:

With regard to HB No. 108 relating to mariculture, I would like to express my support for this concept. The U.S. seafood industry is making large strides in market development and research, but still does not have the competitive edge. There is no question that Alaska has very little to say about markets and prices.

Market stabilization, support of hatcheries and use of now wasted products would all be directly related to a sound mariculture program. Instead of competing directly with present Alaska fishing methods, mariculture could instead complement the industry.

I was told that recent testimony indicated that Alaskan's do not contribute to mariculture. Attached is a photo of a "Norwegian Limit" fish rearing pen designed by Alaskans which is capable of handling rough water. This method is, to my knowledge, in advance of the present Norwegian technology. This pen is presently used in Valdez to start feed about 50 million pinks and chums each spring before release and later in the year to imprint king salmon at Anderson Bay.

As a matter of interest, Alaska Fish and Game has developed better fish ladders and fish incubators than were available outside.

Alaska DOT/PF has done significant arctic research and development with roads and foundations for both land and marine installations. They built the first cable stayed bridge in the United States (see attachment). Alaskans were responsible for many of the unique designs and new technology used on the Trans Alaska Pipeline. Aluminum anodes for protection of steel marine structures from corrosion are now being considered as an industry by Alaskans simply by recycling aluminum cans.

In short, given the chance, Alaskans can develop technology as well as anyone and mariculture is no exception.

Please consider the mariculture bill for its long term economic benefits to Alaska.

Thank you.

Sincerely,

PERATROVICH, NOTTINGHAM & DRAGE, INC.

Dennis Nottingham, P.E.
President

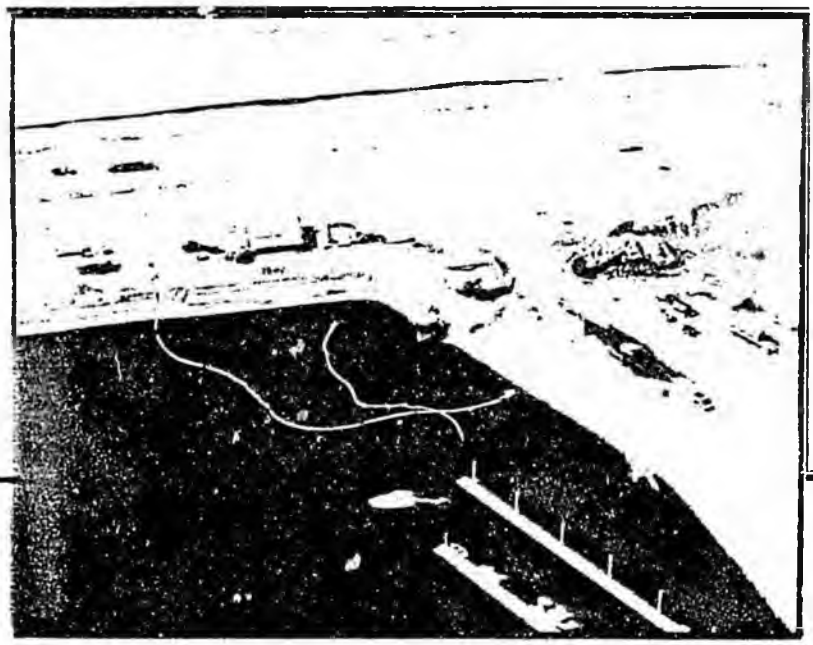
DN/jk/L8

cc: Representatives Sam Cotten
Lyman Hoffman
Cliff Davidson
Mike Nevarre
Dick Shultz
John Sund
Henry Springer
Drue Pearce

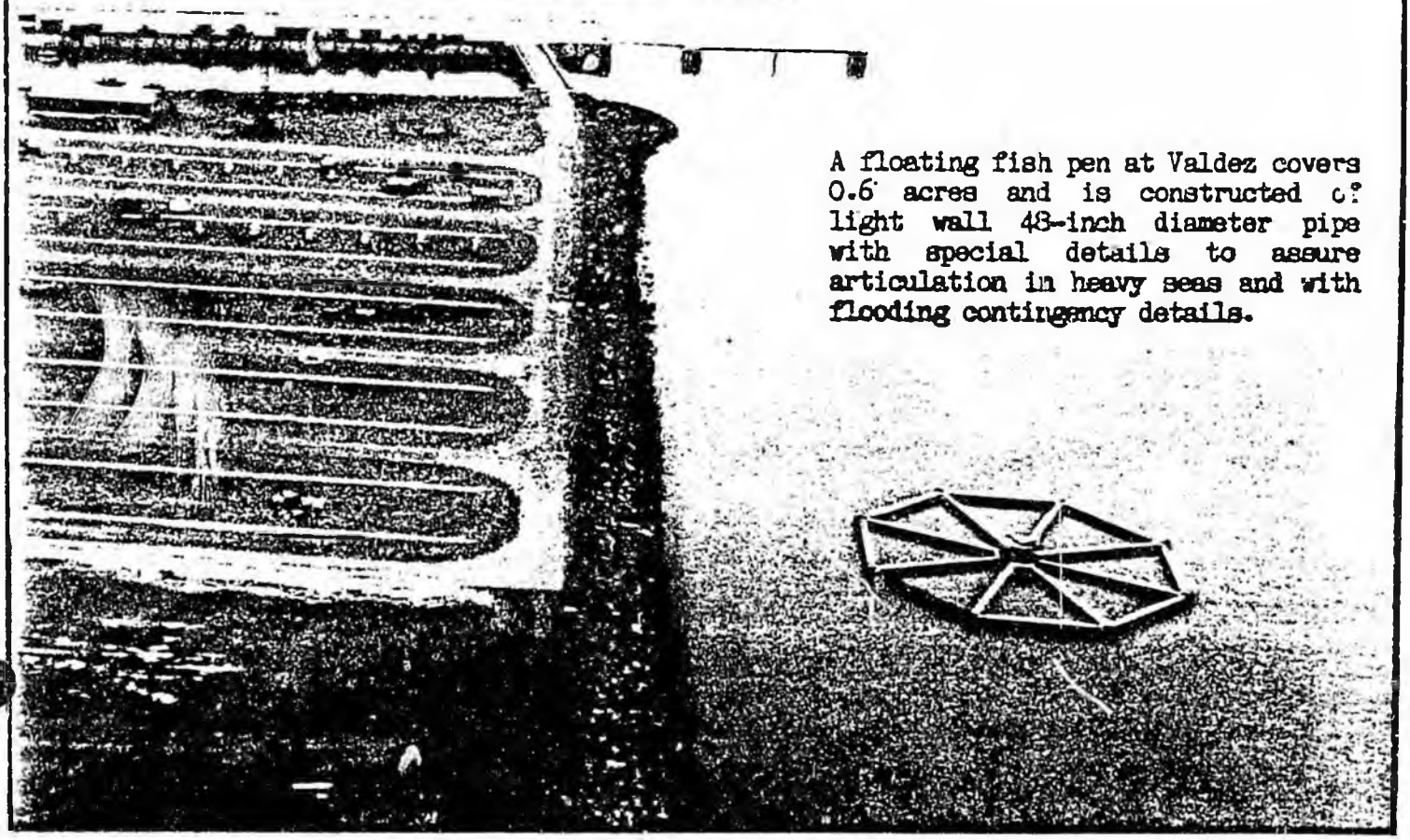
Peratrovich, Nottingham & Drage, Inc.
Engineering Consultants 1506 W. 36th Anchorage, AK 99503
ENGINEERING REPORT
ISSUE NO. 22, DECEMBER 1986

MARINE CONCEPTS: • SILTATION CONTROL • FISH EXCLUSION • FISH CONTAINMENT

Peratrovich, Nottingham & Drage, Inc. has been involved with development of marine components and structures serving to isolate silty water from fish habitat or to isolate fish. These developments to date have been in the form of floating fish rearing pens and filter fabric silt curtains with combinations possible.



The potential to perform in rough water, light ice environments, and limited currents are features that have application to many situations.



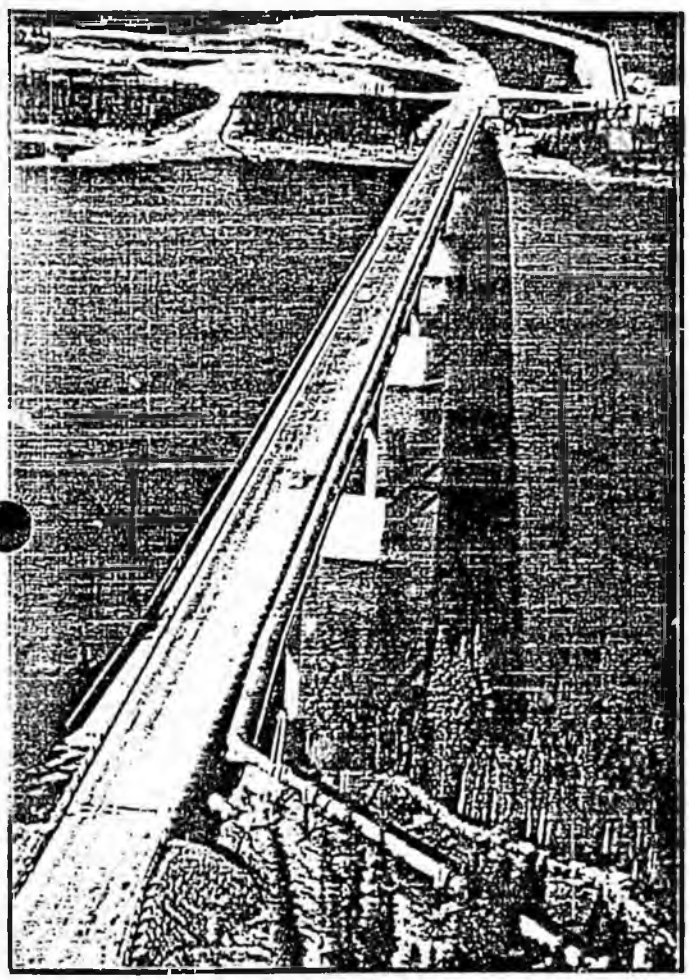
A floating fish pen at Valdez covers 0.6 acres and is constructed of light wall 48-inch diameter pipe with special details to assure articulation in heavy seas and with flooding contingency details.

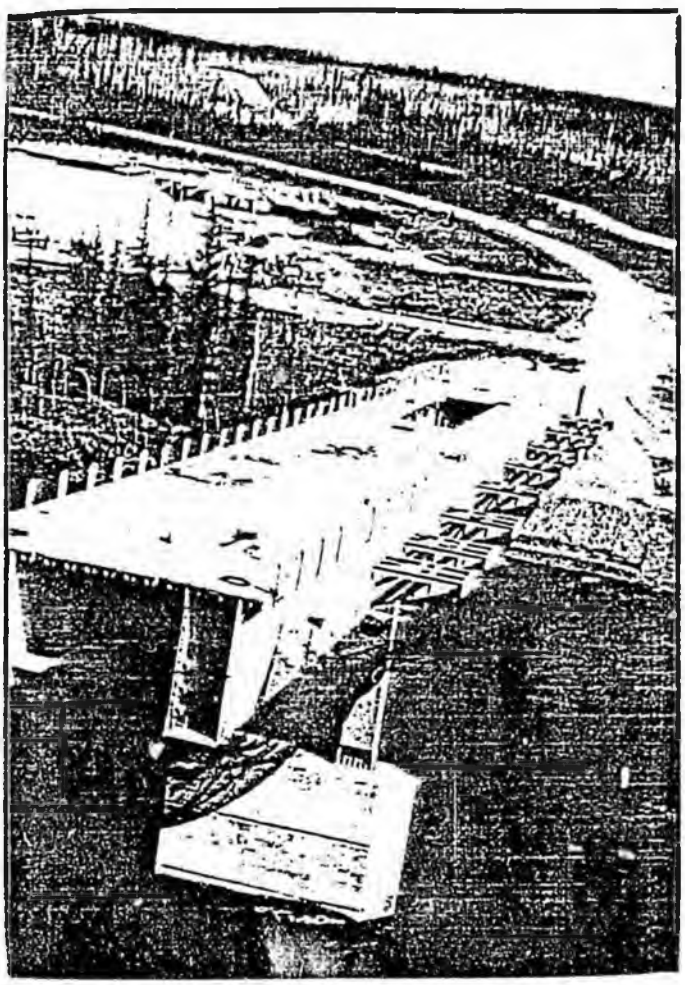
Peratrovich, Nottingham & Drage, Inc.
Engineering Consultants

ENGINEERING REPORT
ISSUE NO. 23 MARCH 5, 1987

BOX GIRDER BRIDGES

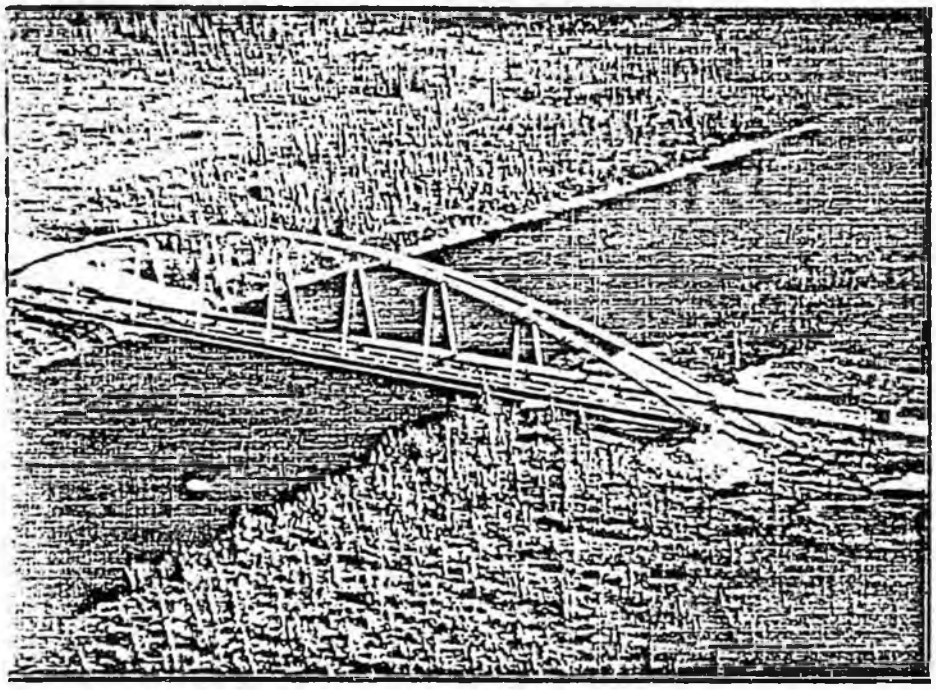
Modern welding procedures allow the creation of bridges with remarkable stability and redundancy features by utilizing steel box girders. These bridges can take many forms as are shown on the accompanying photos. PN&D has extensive Alaskan experience with box girder bridges and continues to develop this technology.





YUKON RIVER BRIDGE (NEAR FAIRBANKS)

This award winning design spanning the Yukon River is a steel orthotropic structure that carries both the Trans-Alaska Pipeline and vehicular traffic. One of the first of its kind in the United States, it was also the most difficult link in this great Alaskan project.

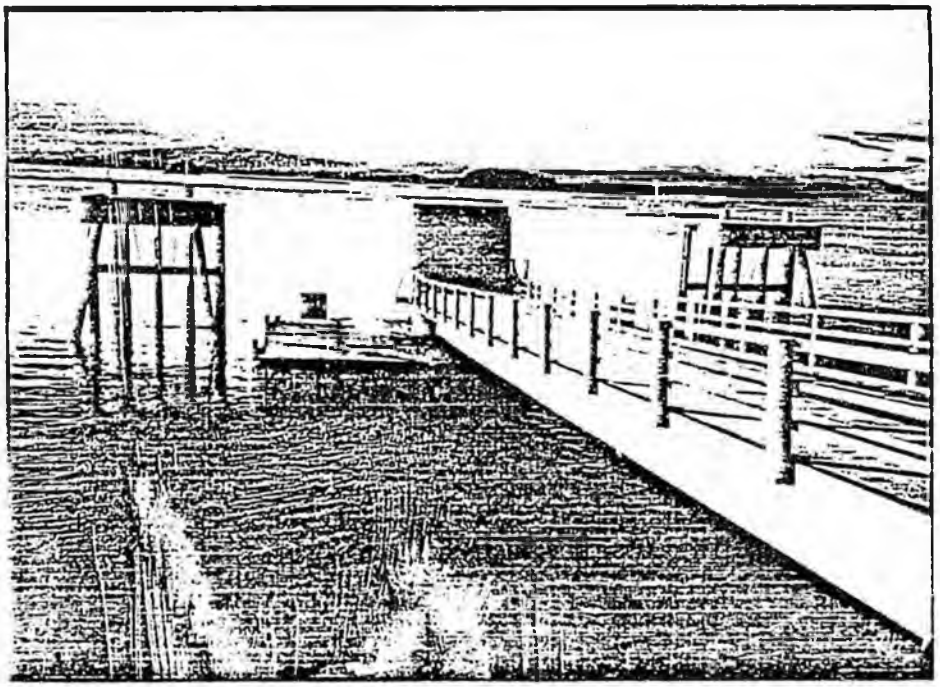


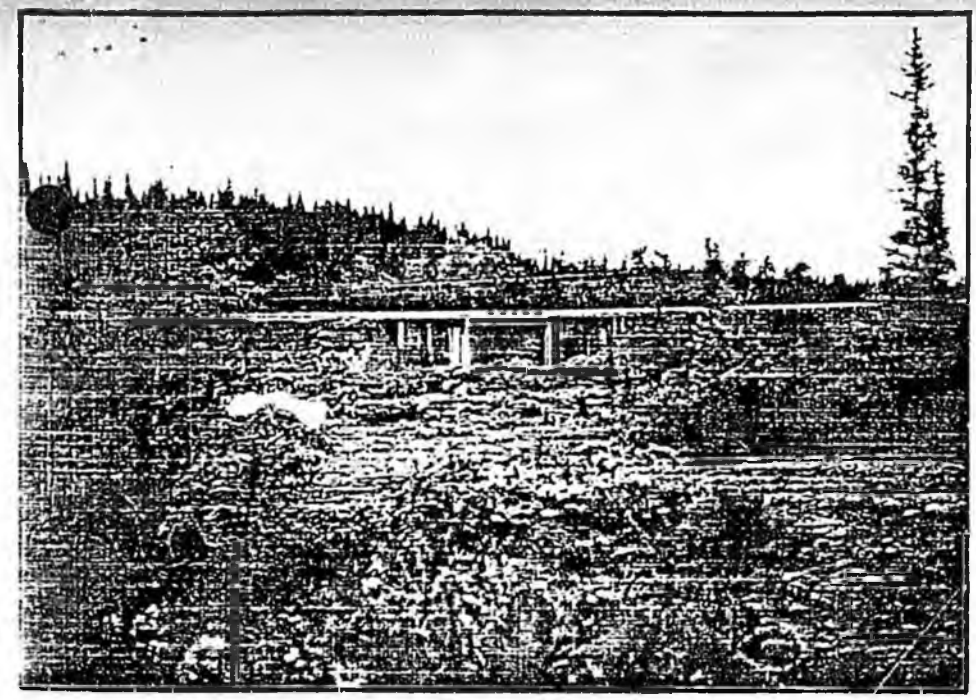
GULKANA BRIDGE

This "strong iron" bridge was designed and constructed within a 9-month period using available materials. Founded on permafrost, this award winning tied-arch structure carries the Trans-Alaska Pipeline across the Gulkana River near Sourdough. The arch is composed of steel box sections.

KAKE FLOATING FERRY TRANSFER STRUCTURE

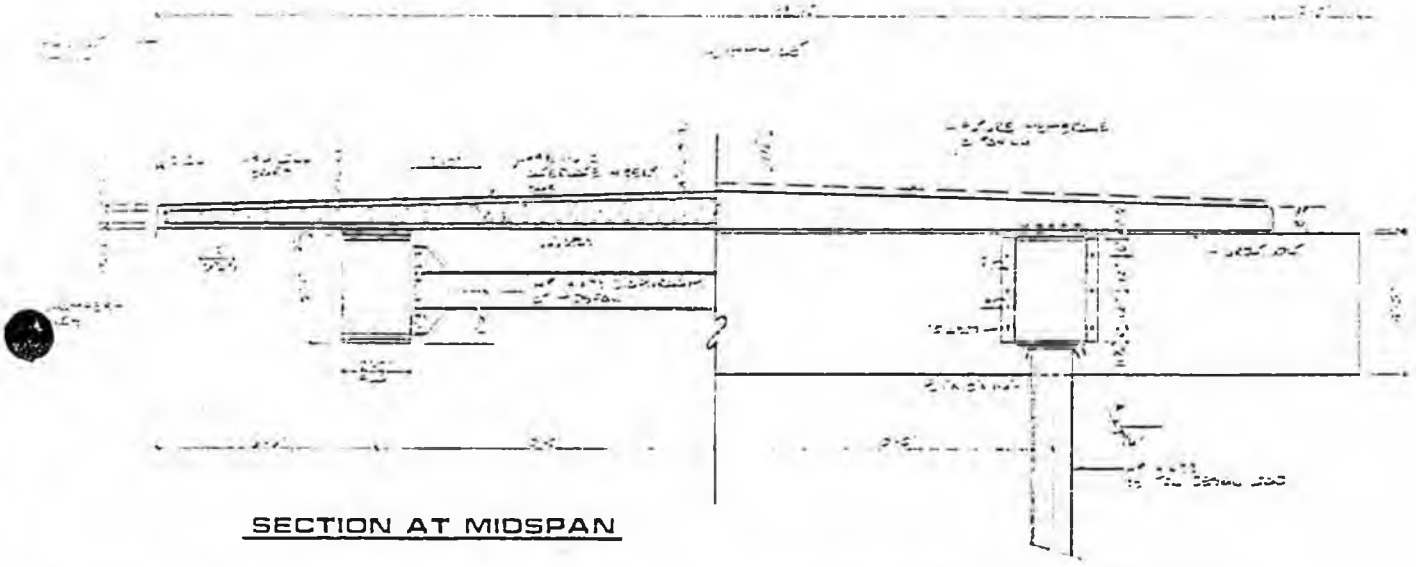
Budget limitations for small communities do not allow use of more expensive "Cordova-type", pile supported, ferry transfer structures. This led to the development of lower first-cost floating systems, such as this one at Kake. The all-steel system utilizes a double orthotropic box girder system.





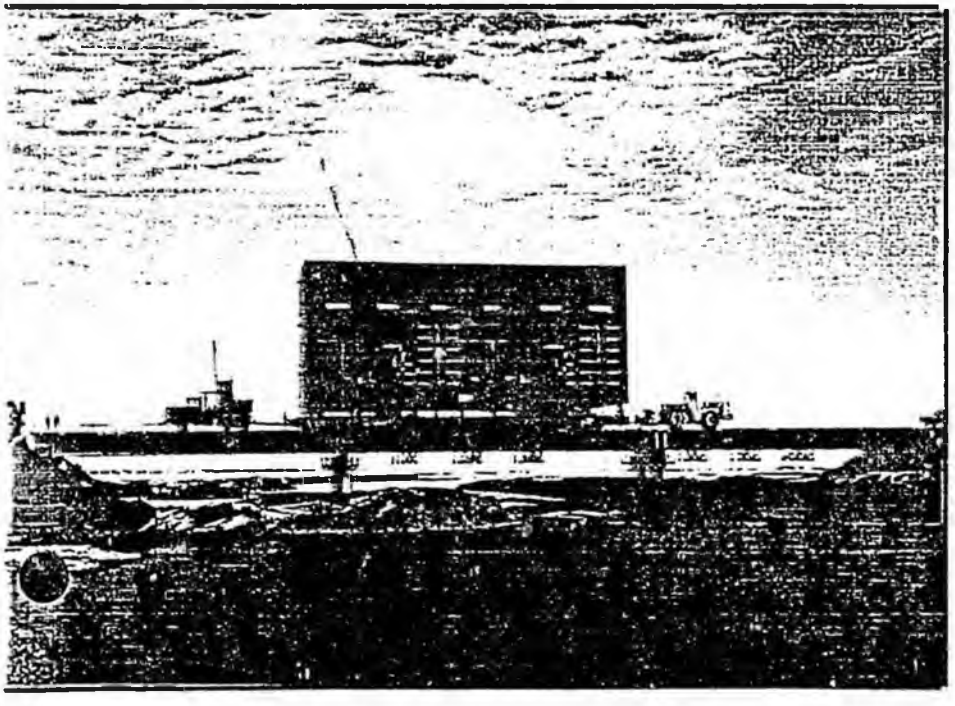
NORTH FORK ANCHOR RIVER BRIDGE

North Fork Anchor River Bridge is of composite concrete and double steel box girder construction for highway loading.



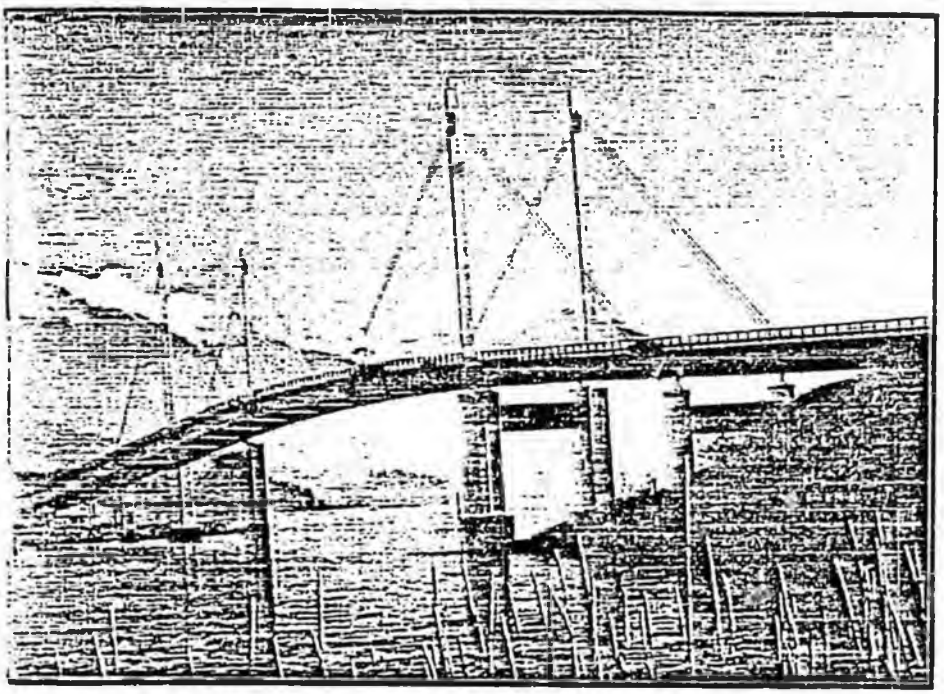
SECTION AT MIDSPAN

SECTION AT ABUTMENT



KUPARUK RIVER BRIDGE (IN THE ARCTIC)

1981 First Place in Heavy Construction Project of the Year, Alaska Construction & Oil magazine, and Third Place in the James F. Lincoln Arc Welding Foundation National Awards. One of the strongest bridges known, accommodating 2,600-ton vehicles, this structure is utilized in oil production development on Alaska's North Slope. Four steel box girders bridge spans of 100 feet.

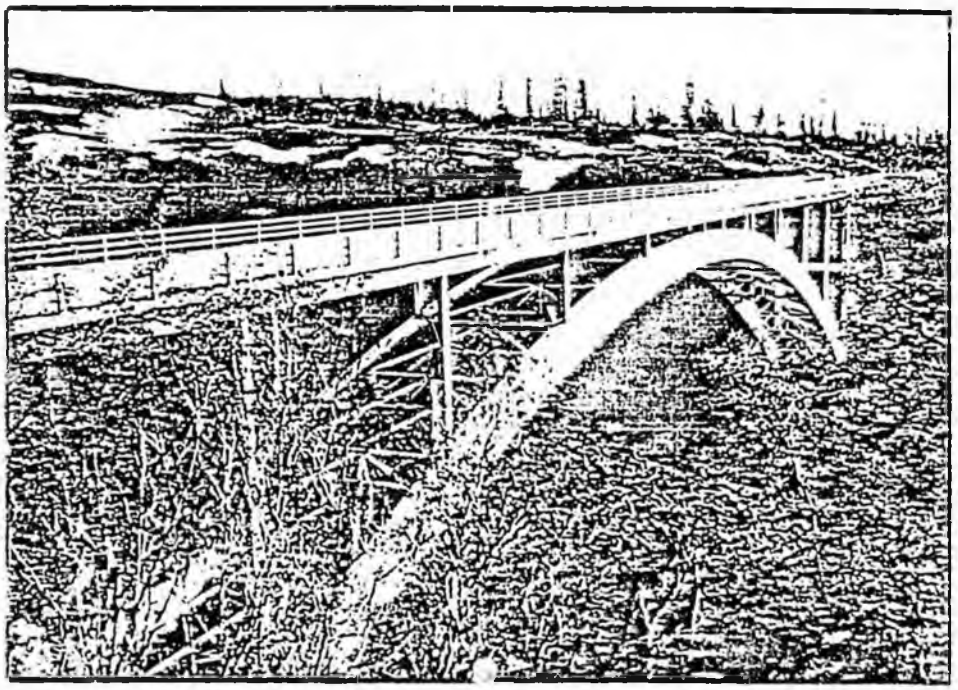


SITKA HARBOR BRIDGE

The Sitka Harbor Bridge has the distinction of being the first cable stayed highway bridge in the United States. Since construction, other states have adopted the live load deflection philosophy utilized here and are now producing these economical structures with ever increasing spans. Double steel box girders supported by cables support the structure.

HURRICANE GULCH BRIDGE

One of the largest two-hinged arches in the United States, this bridge at Hurricane Gulch on the Parks Highway is supported by steel box ribs.



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Brent T. Drage, P.E., Secretary/Treasurer

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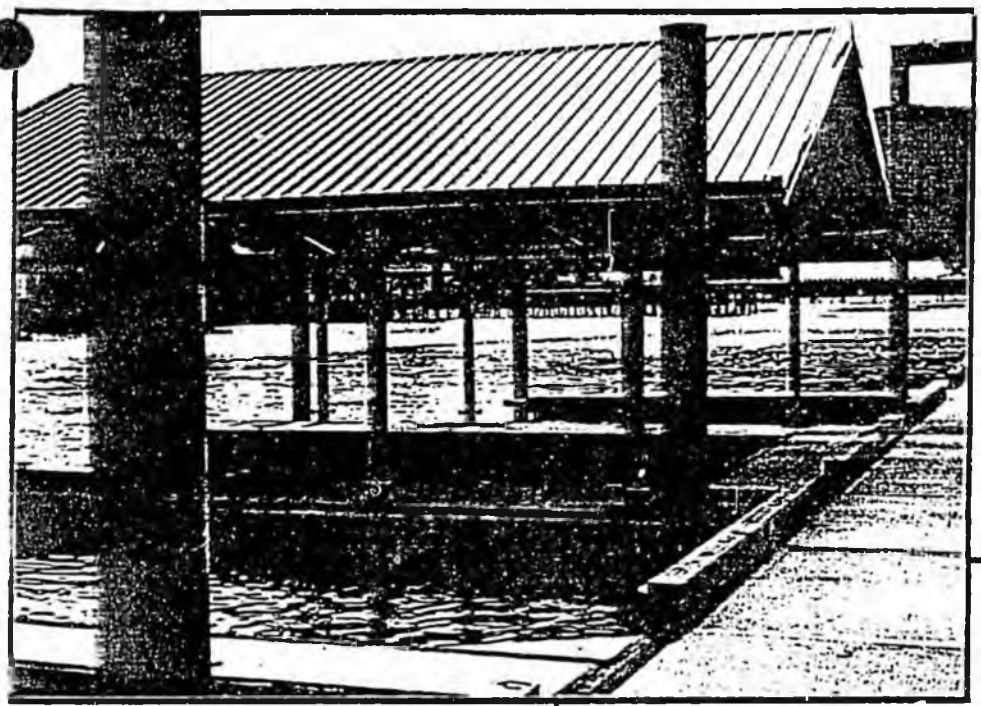
Civil Engineering • Marine Facilities • Coastal Engineering • Bridges/Structures • Foundations
Hydrology/Hydraulics • Permafrost and Ice Planning • Construction Management

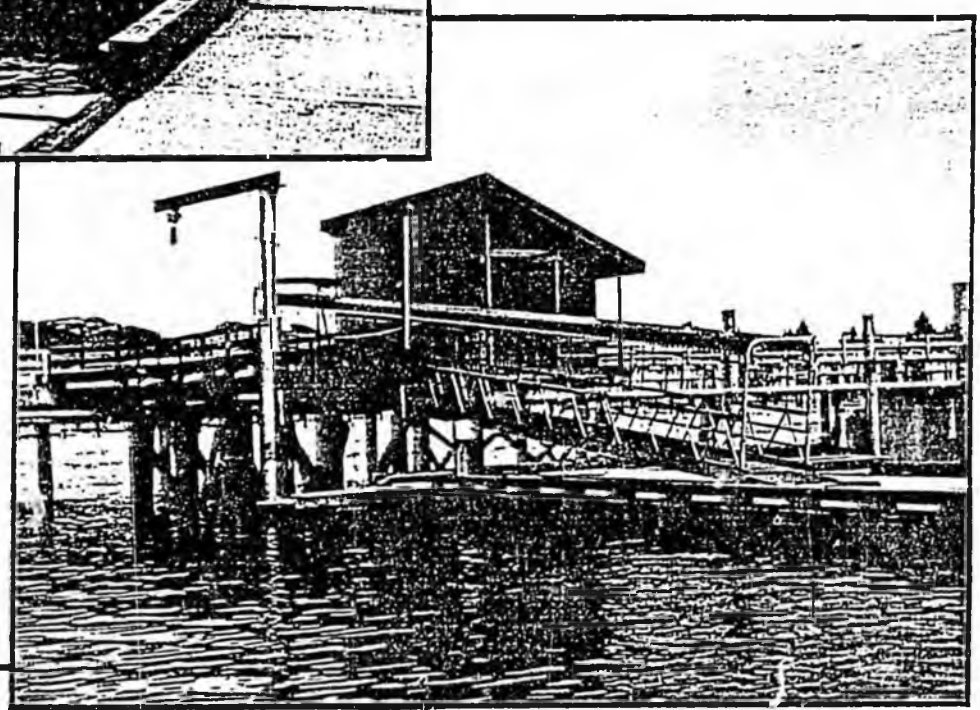
Peratrovich, Nottingham & Drage, Inc.
Engineering Consultants

ENGINEERING REPORT
ISSUE NO. 13, SEPT. 1985

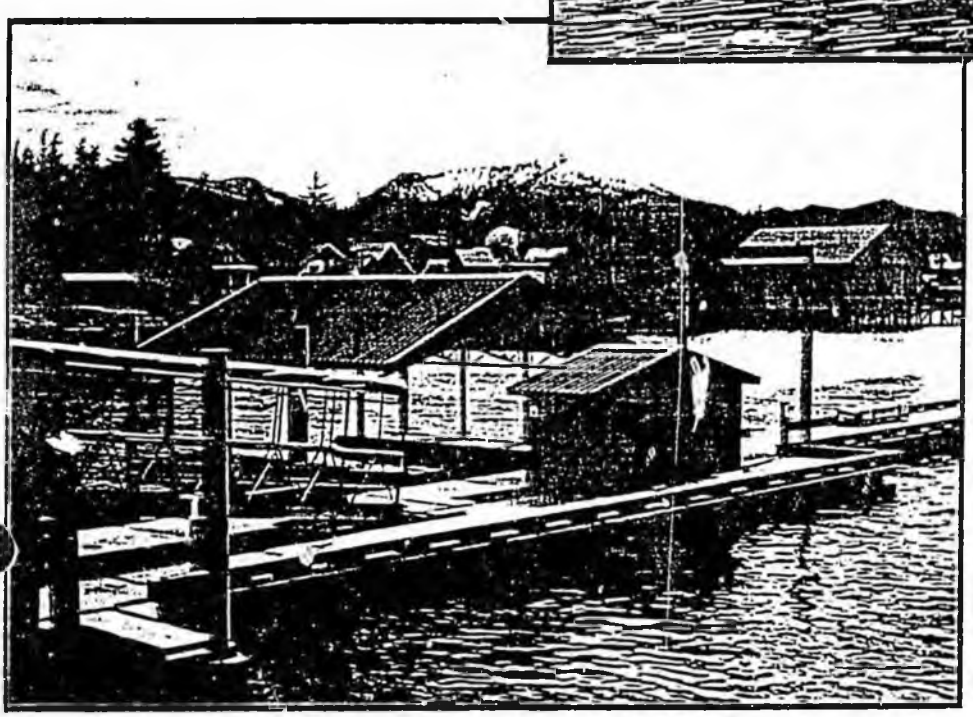
USFS PETERSBURG MARINE FACILITY



PN&D designed this steel-framed, concrete float, supported covered boat shelter as part of a marine facility for the U.S. Forest Service in Petersburg, Alaska. This design provides improved function and aesthetics over past designs.



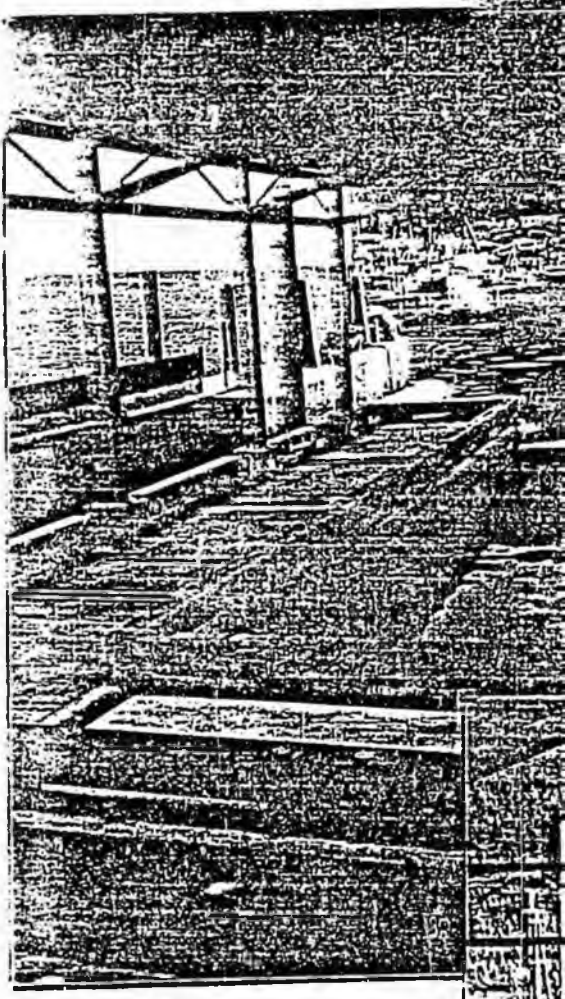
Facility access dock, crane and covered ramp are shown. Galvanized steel, pressure treated wood and concrete floats insure a low maintenance marine facility.



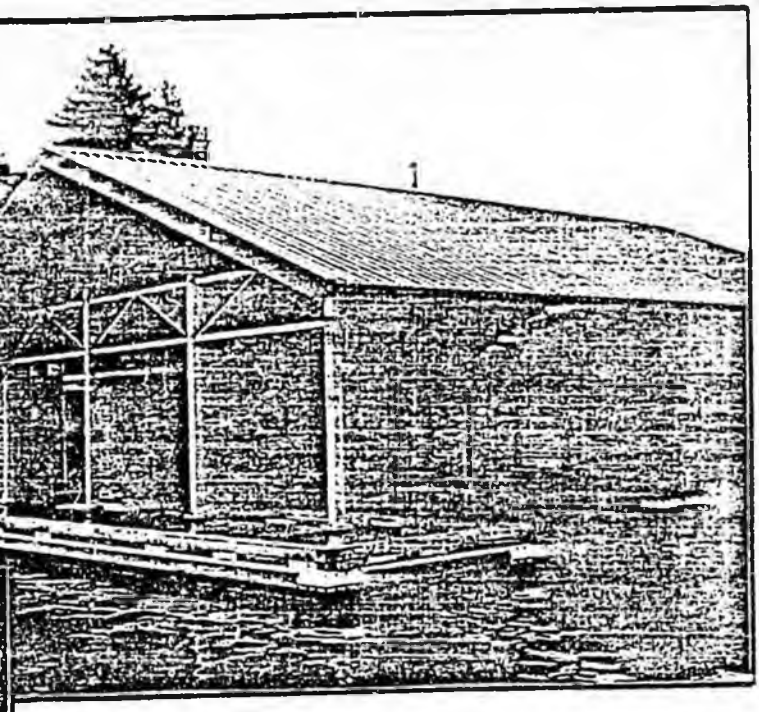
View of the covered access ramp, covered boat shelter, storage building and concrete floats.

USFS WRANGELL MARINE FACILITY

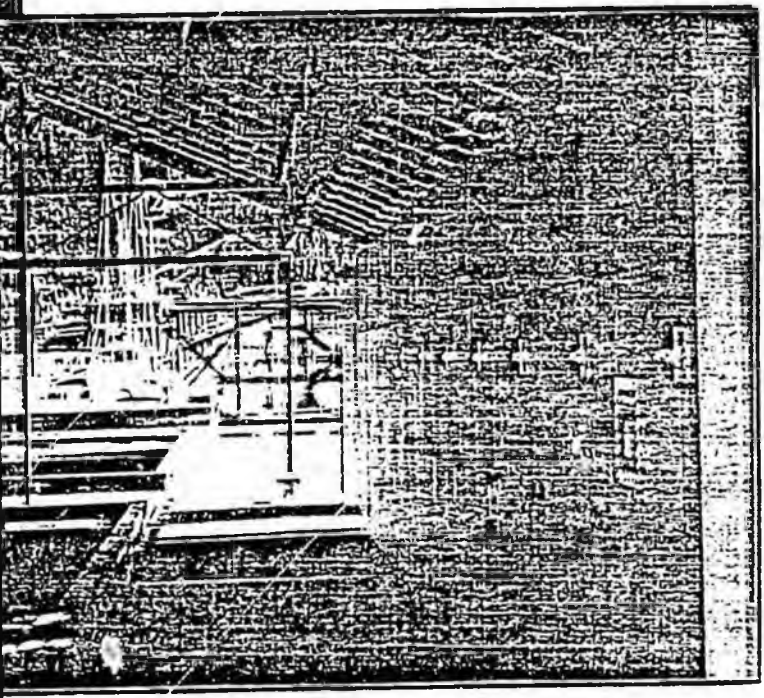
This marine facility is composed of a floating warehouse, two covered boat moorage areas and an open float moorage for larger vessels.



Lockers are provided to store a wide variety of marine supplies and equipment.



This view from beneath a covered moorage area shows galvanized rigid steel frames, concrete floats and treated timber rails and rub strips.

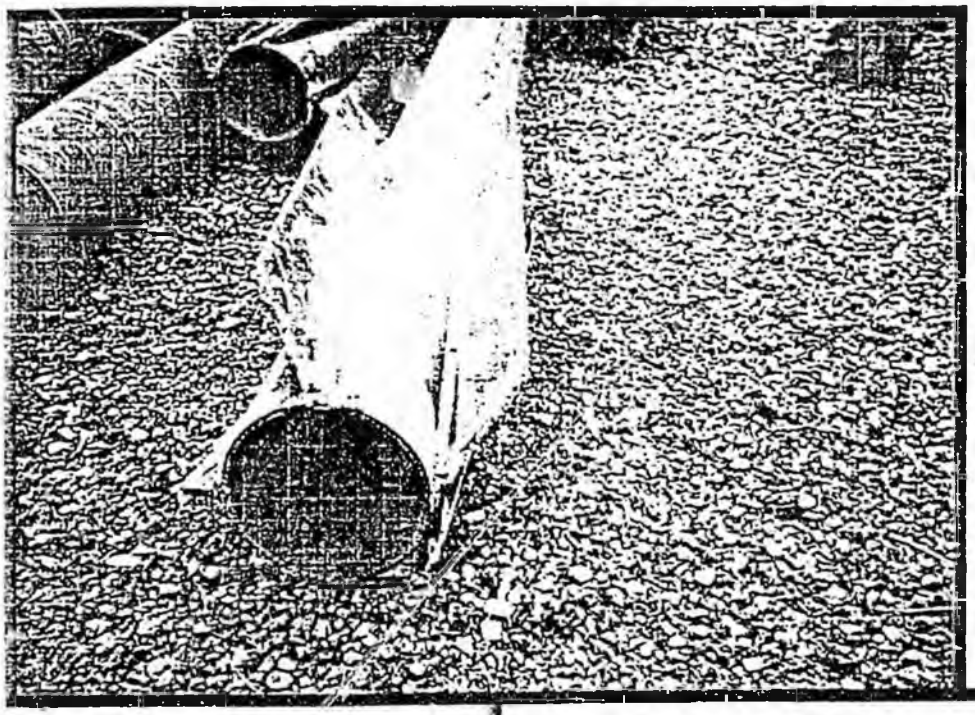


Peratrovich, Nottingham & Drage, Inc.
Engineering Consultants

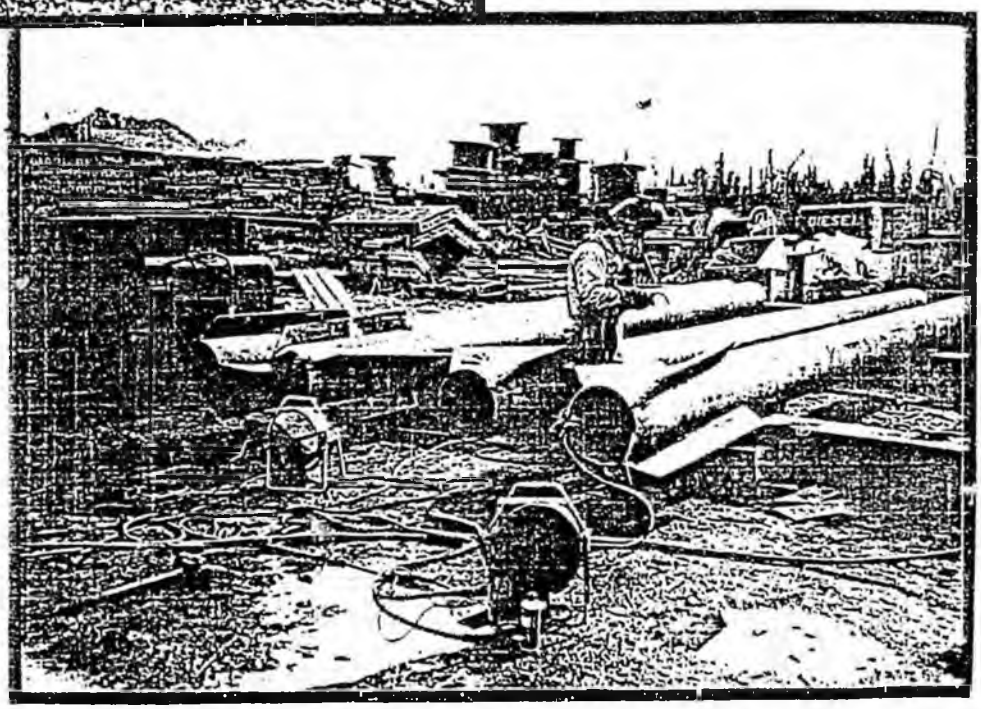
ENGINEERING REPORT
ISSUE NO. 18, JUNE 1986

SPIN-FIN PILES

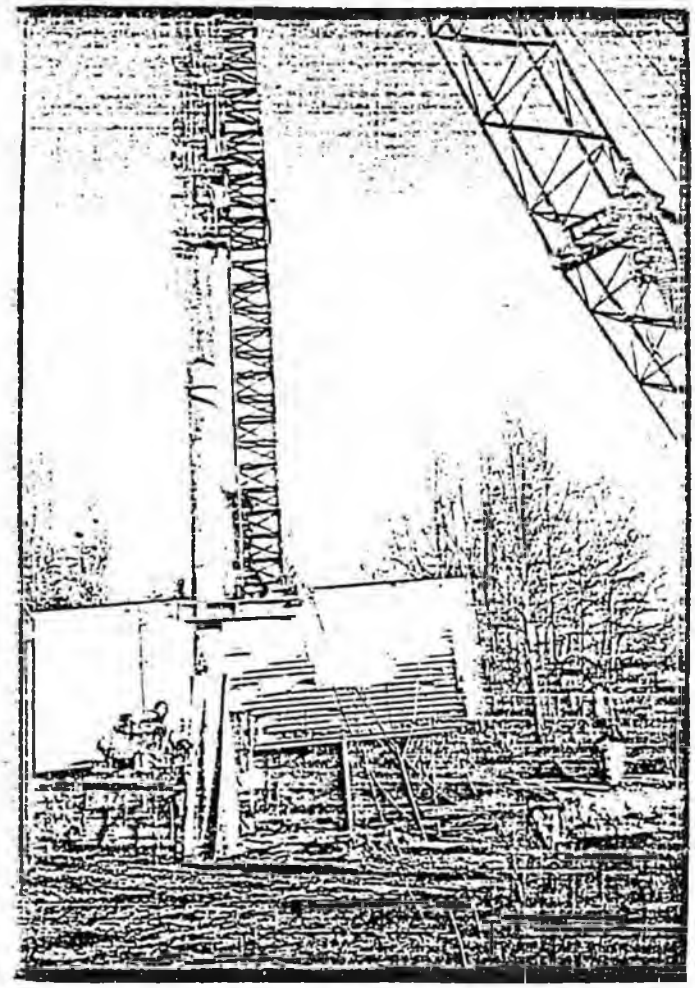
Highly loaded tension piles are being used more frequently and in more diverse applications. Conventional piles must therefore be longer to resist these tension loads. Peratrovich, Nottingham & Drage, Inc. (PN&D), has developed an innovative pile, dubbed the "spin-fin," with tension characteristics that are superior to those of a normal pipe pile, that does not require increasing the pile length or making major pile modifications. Spin-fin piles can be used in mooring dolphins, docks, retaining wall tiebacks, ice resistance piers, earthquake anchors, wind footings, or any other pile foundation where anticipated uplift or impact loads may cause pile failure. Because of their unique load deformation characteristics, these piles allow substantial pile deformation without catastrophic failure--even after repetitive loading.



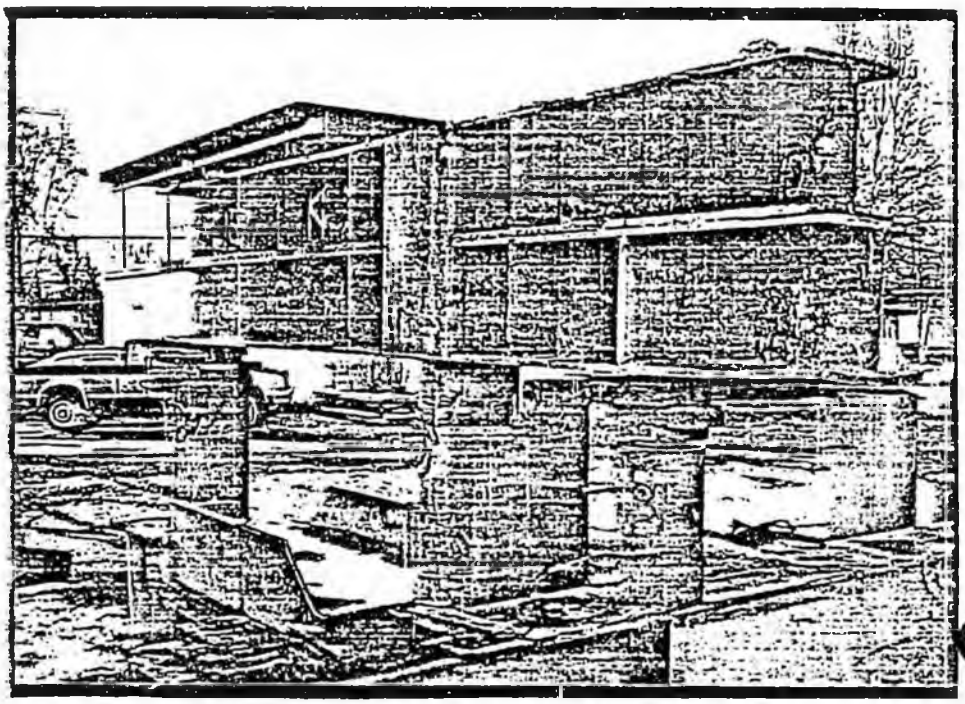
A spin fin pile is a pipe with steel fins welded at a batter, to give the pile a screw-like appearance and characteristics. The concept was developed by PN&D to improve torsion and uplift resistance in driven piles.



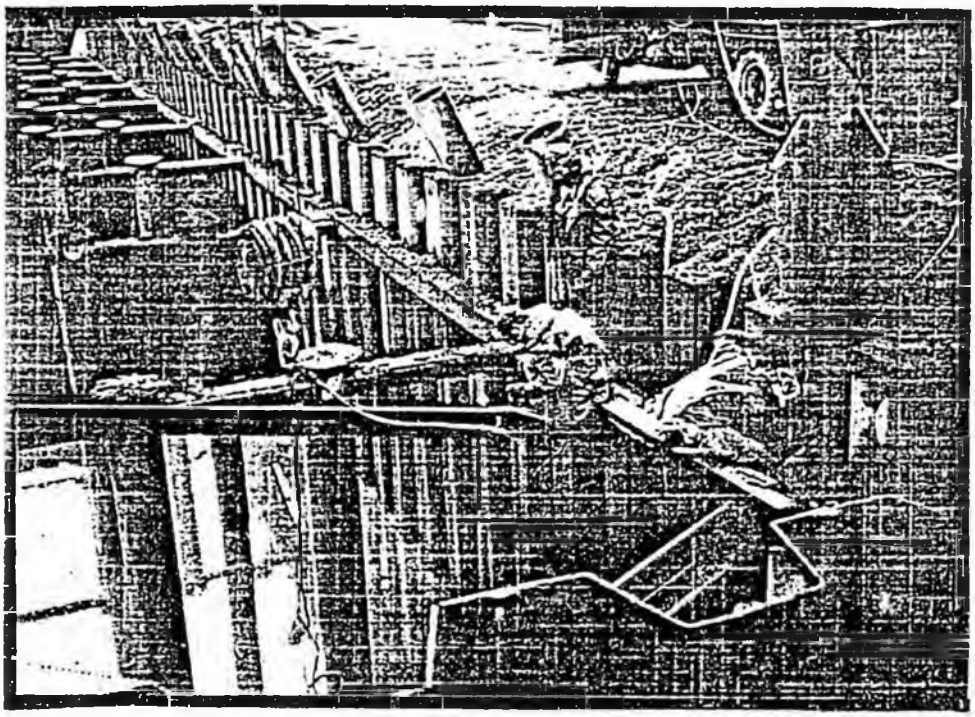
Spin-fin piles being fabricated by welding steel plates to a pipe pile.



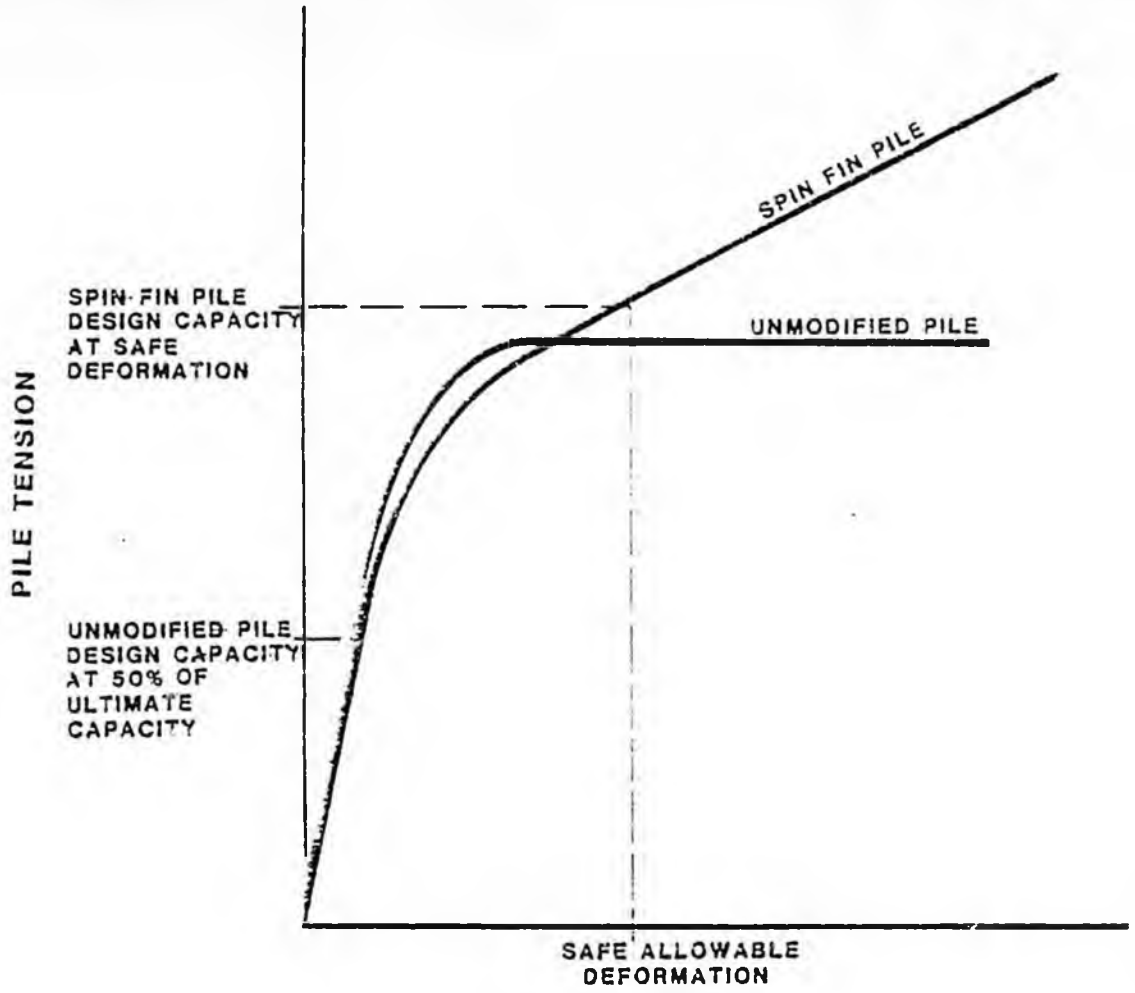
Spin-fin piles are driven like unmodified pipe piles, except that the piles twist as they penetrate the ground. The diesel hammer shown here was used to drive a 16" diameter test pile.



A hydraulic jack and load beam were used by PN&D to conduct tests on 8" and 16" diameter spin-fin piles. An ultimate tension load of over 200 tons was achieved on a 16" pile with 20' embedment.



The first field use of spin-fin piles was at the Seward Coal Transfer Facility. Spin-fin piles were used as anchor foundations for conveyor belt tensioning devices, and also as sheetpile wall tiebacks in the coal receiving pit shown above. The coal car dump facility won a Bronze Award in the national design contest conducted by the James F. Lincoln Arc Welding Foundation in 1985.



SPIN FIN PILE CAPACITY

Design Philosophy

The tension load-deformation characteristics of spin-fin piles shows why designers must modify the generally accepted concepts of factor-of-safety and pile failure, if the spin-fin pile is to be properly utilized. The method of dividing the ultimate capacity of a pile by a suitable factor-of-safety, as in the case of unmodified piles, does not work for spin-fin piles because their load capacity increases with deformation. Thus, the capacity of a spin-fin pile should be determined by selecting a safe load from its load-deformation curve for an allowable deformation that the structure can sustain without damage. Spin-fin capacity should be determined by allowable deformation. Thus, the factor-of-safety for spin-fin piles may be rationally selected by analysis.

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Gerry Merrigan
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MAR 1 ? 1987

Pouch V
Juneau, Alaska

March 11, 1987

Dear REPRESENTATIVE SUND

I would like to take this opportunity t· comment on House Bill 108, the mariculture bill, with particular emphasis in regards to the pen-rearing of salmon. The basic assumption of the bill is that aquatic farming would create more jobs and stabilize the economy with no threat to commercial fishermen or our natural resources. This simplistic view could not be further from the truth. Salmon pen-rearing directly competes with Alaskan fishermen as well as posing critical environmental and genetic hazards for our present resources. However, the bill does not fully address these problems. Instead, it paves the way for swift and far too accelerated licensing of these highly capital-intensive farms, which would be quite out of reach of most Alaskans. Who would benefit from this bill? Clearly not Alaskan fishermen or the average Alaskan resident and especially not the natural resources from which we derive our livelihood.

Salmon pen-rearing is portrayed as a long term economically viable industry... The jury is still out. It can only grow as much as the market will bear. It appears that the gourmet salmon market in which trollers compete alongside with salmon farms, has not increased or kept in step with the mushrooming growth of salmon farms. Norway,which heavily subsidizes its salmon industry, (spending over $100 million dollars on marketing alone),has curtailed its number of farms and is now exporting the technology. Pen rearing has been primarily introduced into countries which have no natural wild stocks and no corresponding fishery to compete with. Therein lies the greatest difference... Alaska already ha· healthy wild stocks with a viable commercial fishery and market. Salmon pen-rea· .g would not introduce new jobs, it would merely displace historic ones.

In addition, pen-rearing poses genetic and environmental threats to our existing healthy stocks and habitats. In this bill,these possible hazards are lightly glossed over with little apparent thought to long term damage, and it also omits guidelines or penalties. Instead, the bill leaves it up to the Department of Fish and Game to manage aquatic farming without direction or funding. I would like to focus your attention on these hazards.

Salmon farms suffer the same problems as any other ranch... the production of waste, and the ease of disease becoming epidemic due to high population densities. Diseases can be treated with antibiotics which in turn leads to a more virulent strain, and a vicious cycle develops. The obvious hazard here is escape into the native stocks which did not have the initial benefit of immunization. Genetic interbreeding would follow in the long run,and who is to say what would happen? Traditionally, the native stock loses out. Given Norway's own estimate f one per cent, plus the likelihood of storm-damaged pens, and accidental releases, we are indeed gambling with our wild stocks. The bill charges

Fish and Game with the responsibility to oversee this problem, and inspect these remote farm sites, but with current funding and staffing in pathology, this is hardly feasible. There is little incentive for private for profit fish farms to voluntarily destroy infected stock so as not to infect wild stocks.

The siting criteria for the farms is also omitted from the bill. Due to the high amount of concentrated waste generated in a salmon farm from fecal matter and unconsumed feed, siting is of critical importance. This self-inflicted water pollution would blanket the bottom substrate, creating an anaerobic environment, ending the bay's potential for juvenile fish and shellfish nursery areas, as well as its ability to support other life forms. This is of particular interest to Dungeness crab fishermen.

To summarize, there would be considerable economic and biological displacement from the introduction of salmon farming in Alaska. It is the duty of our legislators to thoroughly examine the impacts before setting the course into motion. House Bill 108 does not address these impacts adequately not does it establish the necessary regulations, guidelines and penalties for setting up an industry of this scale. What the bill does do clearly is to expressly put the Board of Fish(and therefore the fishermen) outside of the process, while at the same time taking eggs and smolt we paid for through aquaculture taxes.

We do not need to blindly rush ahead with licensing simply to keep up with the Joneses or British Columbia. They are currently experiencing market glut forecasts and problems with algae blooms. We should take this opportunity to learn from their experiences rather than risking our already exis.ing wild stocks and commercial fisheries. House Bill 108 is a premature, superficial approach to maricultural development in Alaska. Thank you.

Jerry Mersy

P.S. THANKS FOR YOUR RECEPTIVENESS DURING THE TELECONFERENCE OF 3/11 I HOPE YOUR INTENTION TO KILL THE MARICULTURE BILL WILL BE REALIZED. I FEEL THIS BILL IS TOO "UNMANAGE" DUE TO ITS VAGUENESS - AMENDMENTS DO NOT SEEM APPROPRIATE AT THIS TIME - ADVOCATES OF MARICULTURE SHOULD DO THEIR HOME WORK AND COME UP WITH SPECIFIC GUIDELINES FOR SITING, ETC. THIS BILL IS AHEAD OF ITS TIME IN TERMS OF RELEVANT DATA.

David G. Bedford
Box 1211
Petersburg, AK 99833

Dear, Representative Sund

I am concerned with House Bill 108 permitting various forms of aquaculture in Alaska. I believe that some forms of aquaculture may be beneficial to Alaska, but at the present time and for the forseeable future, salmon pen rearing is not one of these.

The Norwegians have stopped issuing permits for new salmon farms. If there is an existing or potential market for more penned salmon then why aren't they gearing up to fill it?

The Norwegians are researching the conversion of present salmon pen facilities to the production of Atlantic cod or Atlantic halibut. If penreared salmon is such a bonanza then why are the occupant of the ground floor making plans to get out?

All sources agree that pen reared salmon production will increase dramatically over the next few years. The numbers vary from source to source. Curt Kerns in Marine Advisory Bulletin # 26 holds the low ground estimating 130,000 MT of production by 1990. At a Danish conference a figure of 220,000 MT by 1990 was given. So expert sources put production at 300 % to 500 % above 1985 levels in three years.

To put this in perspective, the entire catch of all salmon species statewide in Alaska averaged 275,000 tons over the period 1979-1984. Thus pen reared salmon bound for the exclusive fresh fish markets is projected to equal between 50 and 80% of the Alaskan harvest by 1990.

So it is clear that the production of pen reared salmon will increase dramatically in the next three years. But what does that mean? It means that a world-wide market presently absorbing about 50,000 tons world-wide of fresh wild and pen reared salmon must expand in a period of three years to accommodate between three and five times that much: that is

an annual growth rate of 80 to 150%.

But what are the realistic potentials for growth in fresh salmon consumption? The Alaska Seafood Marketing Institute would like to see American consumption of all types of seafood increase from the present level of 14#/year per person to 20# by 1990. This is the high end that ASMI is hoping for and this optimistic projection would yield an increase of less than 50%. In this same period the existing pen rearing industry must increase its markets at least 250%. The actual rate of growth in seafood consumption is lagging behind even ASMI's relatively modest hopes. The present rate of growth will yield about 1#/per person per year or growth rate of 25% by 1990.

To avoid the kind of major market shakedown that oil producers have seen in the last two years the pen rearing industry has to experience a growth rate 10-20 times greater than what can be expected for seafood consumption as a whole. Unfortunately, most of the increase in U.S. seafood consumption is reflected not in expensive fresh salmon, but in shellfish and in pre-packaged white fish, convenience foods like surimi.

There simply are not the potential markets to accept the glut of pen reared salmon that is already feeding in the pens of Norway, the United Kingdom and Canada. Farmed salmon is an industry headed straight for trouble. The Norwegians see it. They have a moratorium on new development in the industry. They're putting research money into learning how to convert existing facilities over to other species. They are digging in and if it gets too tough, they're preparing to bail out and leave someone else holding the bag.

It is my fear that passing House Bill 108 and its Senate counterpart is going to put that bag in Alaskan hands. If Alaska enters the pen rearing industry at this time our farms will begin to produce when world competition is at a fever pitch. The first cycles of Alaskan fish will be relatively expensive (as we learn the pitfalls and make the mistakes

of a new industry in untried country lacking the necessary body of research and experience to guarantee stable production). But even when we hit stride Sea Alaska expects a cost of $2.90/# to get Alaskan pen reared fish to Seattle while the Norwegians, even with higher transport costs can do it today for $2.30/# or less. In the market glut of the 1990's our competition will be realizing a 25% profit at prices that will be driving Alaskans broke.

So the prognosis for pen rearing salmon in Alaska is bleak. So what? If people want to put their money into a dubious venture why not let them? All things being equal that's a reasonable point of view. But all things aren't equal. We have existing fisheries that will be impacted by these bad investments. We have bountiful stocks of wild salmon that will be threatened by this risky business. We have a badly strained state bureaucracy that will have to strain even further to try and manage this doubtful industry. In short we have a great deal to lose and very little hope of any gain in the for-see-able future.

Sincerely

Donald G Bradford
Box 1211
Petersburg Ak 99833

Julie Hursey
Box 213
Petersburg, Alaska
99833

Representative SUND
Pouch V
Juneau, Alaska

March 11, 1987

Dear Representative SUND,

I am a commercial fisherman in Southeast Alaska, and I am very concerned about the potential impacts that House Bill 108, relating to aquatic farming, will have on my livelihood. I think this bill has the potential for having an extremely adverse effect on our fishing industry and on the marine environment.

My specific concern is about the pen-rearing of salmon. I am a troller, and pen-reared fish will compete directly with my fish on the market. This is already a reality with pen-reared fish from other countries, but I don't think Alaska needs to contribute to the problem. Pen-reared fish are predicted to flood the market, and produce a glut as soon as 1990, and if this happens, the price of all salmon will decline, so all gear groups will be affected. Even if Alaska allowed pen-rearing of salmon, by the time these farms were producing, they would face a glut in the market, and declining prices.

I am also concerned that this bill does not adequately address the careful controls that are needed for salmon farming, to prevent biological impacts. Without strict regulation over site selection for farms, biological degradation of habitat will occur. When a salmon farm is not properly sited, the accumulation of fish wastes and excess feed cause a pollution problem. Disease control is also a very serious concern. This bill does not adequately outline how these issues will be resolved. Problems with water quality and disease control must be closely monitored. Where will the money come from to pay for a monitoring program, during this time of declining revenues?

The bill indicates that the State will be responsible for the permitting procedure, as well as paying for health inspections for disease control, and that this will be handled by the Department fo Fish and Game. How can this be possible without diverting funds from existing management programs for salmon fisheries?

The proponents of salmon farming say that pen-rearing of salmon offers business opprtunities to Alaskans. This is a very expensive industry, however, and with the high costs of this capital-intensive industry, it is unlikely that individual Alaskans will be able to participate as owner/operators. In Norway, these small farms were subsidized by the government. That will not be the case here. This means that salmon farms will likely be run by large corporations and/or foreign investors. This would create a minimal number of jobs for Alaskans, meanwhile displacing people currently employed with commercial fishing, processing, and related service industries.

There are too many potential problems which are not specifically addressed in this bill. The potential for environmental degradation and spread of disease are too serious to be ignored. Without more careful planning and control, these hazards are very real.

I am strongly opposed to House Bill 108 for the reasons outlined above. Please give this issue your careful consideration. With adequate planning and controls, aquaculture has a place in Alaska. However, this should not occur haphazardly and at the expense of the marine environment or the existing fishing industry.

Sincerely ~~Yours~~,

Julie Hursey

CORDOVA DISTRICT FISHERMEN UNITED

P.O. Box 939

Cordova, Alaska 99574

(907) 424-3447

February 23, 1987

Rep. Adelheid Herrmann, Chairman
Resources Committee
P.O. Box V
Juneau, AK 99811

Dear Rep. Herrmann:

Cordova District Fishermen United (CDFU) supports the orderly controlled development of shellfish and plant mariculture. Before mariculture is introduced into Alaska, however, a socio-economic study should be done. The study was requested by the United Fishermen of Alaska (UFA), CDFU, Prince William Sound Aquaculture Corporation (PWSAC) and recommended by the fisheries mini cabinet.

The development of salmon farming without the state studies, coastal community input and the recent land grab for fish farm sites in Canada have raised many eyebrows in Alaska. The people of Alaska have entrusted millions of dollars to enhance wild stocks. In 1975, the fishermen of Prince William Sound formed PWSAC and started the most successful hatchery and enhancement program in North America. Enhancement of wild stocks and ocean ranching is the best investment the State of Alaska has ever made. This tremendous investment is now paying for the state and the fishermen. As wild stocks are on the decline, hatchery production is kicking into gear.

PWSAC is one of seven private non-profit regional associations in Alaska and was created by the fishermen and the legislature to enhance salmon production. Prince William Sound fishermen passed a 2% salmon enhancement tax to financially support the salmon enhancement program of PWSAC. The 2% salmon enhancement tax received by PWSAC will amount to $750,000 annually and will, in turn, partially support the program that will provide $25 million annually to the commercial fisheries by the year 1995, at which time PWSAC will be providing over half of the commercial fishery revenues in Prince William Sound.

It makes no sense to the CDFU Board of Directors to cut funding for state hatcheries, management of the commercial fishery and the enforcement division to start a new industry which will require millions of dollars to get started.

We are harvesting 130 million salmon per year and continuing to build our future salmon runs to obtain greater harvests. We are the fish farmers of Alaska and have made a big commitment to the State of Alaska by building new hatcheries, paying assessments, upgrading fishing vessels and putting out a better quality of salmon all the time. CDFU is concerned that the coastline, wild stocks, traditional fishing grounds and enhancement programs are protected before a fish farming bill is passed.

Ocean ranching is the biggest investment in the State of Alaska and the State should keep funding the enhancement programs. Commercial fishing has and always will be a major employer in Alaska, where fish farming will only employ a few.

Foreign companies in some cases are prevented from expanding in their own countries because of legislation protecting local communities. We have made our choice to protect the wild stocks and enhance the salmon runs in the State of Alaska. In five years, the State of Alaska could have five new hatcheries operating and generating revenues before the first pen-raised salmon ever hit the market. We need to keep investing our money to compete on the world market by freezing, labeling and storing our fish products in the State to be distributed all year round.

We urge you to take no action on legislation and development of fish farming mariculture until all concerned groups and communities have had a chance to respond to the impacts of fish farming.

Sincerely,

CORDOVA DISTRICT FISHERMEN UNITED

Gerald McCune

Gerald McCune
Vice President

GM/mbl

cc: Members of House Resources Committee

CORDOVA DISTRICT FISHERMEN UNITED
RECOMMENDATIONS

1. Strict controls to prevent foreign corporations and banks from taking over fish farming in Alaska. This industry should be kept in the hands of U.S. corporations and citizens if Alaska wants the full benefits of fish farming to stay in Alaska.

2. A complete study of the environmental effects of salmon farming on wild stocks and coastline communities.

3. No use of fish farming as a trade off for wild stock fishery habitat lost.

4. Control development of fish farming sites.

5. Alaska keeps control of any aquaculture development.

6. Clearcutting at sites have quality control standards.

7. Limits on proximity of fish farms to other sites and density controls of fish in farms.

8. Regulations covering location of fish farms.

9. Studies of tidal flush out at fish farms.

10. Environmental impacts with respect to wild fish stocks.

11. Concerns of commercial fishing, sport fishing, recreation groups and coastal communities should be addressed.

12. Studies of Norway and Scotland controlled development of fish farming.

13. Continued state funding of PNP and FRED hatcheries to enhance the wild stocks and enhance salmon production by ocean ranching. This means leave the funding in Commerce for the state and PNP to advance our enhancement programs.

14. No importation of Atlantic salmon eggs into Alaska.

15. Research, health inspection and testing of facilities be set up to address concerns of the use of hormones and antibiotics, impacts of toxicants, disposal of dead fish and human waste, predator control and efficient feed practices. Studies have been done implicating the toxicant Tributylin (TBT) as a human health risk and has recently been found in imported farm salmon. A ban of TBT in the State of Alaska should be made into law.

CDFU CONCERNS

1. Reallocation of State funds and services to fish farming.

2. A rush on salmon farm sites in Alaska without proper guidelines. Loss of traditional fishing grounds.

3. Predator control for fish farms be reviewed and identification of appropriate predator control methods.

4. Impact on water quality and marine environment.

5. Excess feed falling through netpens.

6. Good tidal flush-out sites.

7. Separation of fish farms and shellfish farms.

8. Navigational obstruction of fish farms and safe anchorages lost to the commercial vessels.

9. Conflicts with fish farmers and commercial fishing vessels.

Alaska troll sector fights farmed salmon impact

Fearful that farmed salmon will destroy prices and markets for Pacific troll-caught salmon, Alaska fishermen and processors are launching a campaign to promote the virtues of wild fish.

But the man heading up the campaign admits his efforts are largely a defensive effort designed to retain the market share that still exists for troll salmon.

"We've seen our market share for troll fish from Alaska and B.C. get smaller and smaller over the last five years," says Barry Lester, of the Alaska Troll Salmon Processors Association. "We've seen it reflected in prices.

"From our own point of view as processors our goal is to maintain the markets we have and not see any decline. If we succeed, we should try to expand."

Lester's organization was formed during the spring in response to growing concern in the American troll industry about the impact of farmed fish.

Lester said in an interview Aug. 7 that farmed salmon has invaded traditional troll salmon markets in the European and New York smoked salmon industries. Second grade farmed salmon not suitable for restaurant sale is going into the smoker market as volumes of production rise.

Lester said the processors decided to take a positive approach: "We don't want to say it swims in its own waste and is filled with chemicals against disease. We're trying to talk about the virtues of wild salmon."

The program involves promotions with buyers in European and New York markets as well as improved grading and quality standards on the grounds and in the plants.

Earl Krygier, spokesman for the Alaska Trollers Association, said his organization is pledged to support the campaign. "We've seen prices soften quite a bit, especially because our troll coho go to European markets. The Norwegians are definitely making inroads."

Krygier said Alaskan fishermen are solidly behind the moratorium imposed on salmon farming in Alaska and are reaping the benefits of their non-profit hatchery system. "It would be a real mistake to bring farms in here."

So far the processors have financed the campaign internally, but Lester hopes support will come from other quarters.

Continued erosion of the troll fishery could have "a devastating effect on the economy of Alaska," he said. "We're talking about a way of life. This goes beyond the economic situation to the very existence of fishermen."

B.C. production adds to farmed salmon glut

As trollers see coho and chinook prices tumble under the assault of farmed salmon, experts in Norway are predicting Atlantic salmon production there could soar to 150,000 metric tonnes by 1990.

Even B.C.'s farmed salmon production is shooting up, with harvests this year likely to hit 2,000 tonnes up from only 250 tonnes in 1985.

The forecast Norwegian production is a staggering leap from about 30,000 tonnes last year and double recent forecasts of 80,000 metric tonnes. The 1986 harvest should be between 63,000 and 68,000 tonnes.

Canadian federal and provincial fisheries departments have just begun to assess the impact of the farmed production on existing salmon sales from B.C.

Jim Fralic, aquaculture co-ordinator for the provincial agriculture department says B.C. farmed salmon production should jump to 2,000 tons this year, up from 250 in 1985.

He said declining prices may have an impact on the viability of B.C. salmon farms, which normally forecast their economic position based on the strong prices of the past two years. "We've always been of the opinion that prices for farmed fish would come down," he said.

"We hoped to reduce the cost of production at the same time by reducing the rate of natural mortality. There are indications this is happening as people get more experienced."

Troll prices dive to $2.25

Trollers found fairly good fishing as the season opened June 20 but needed the volume to partly compensate for a major price cut.

Opening prices posted by B.C. Packers for spring salmon were $2.20 for large, $1.65 for medium and $1.30 for small.

That was a 17 percent cut from last year's July 1 opening prices of $2.65, $2.10 and $1.50. By June 23 this year the prices had moved up to $2.25, $1.70 and $1.35, still far below the July 8, 1985, range of $2.75, $2.25 and $1.70.

Without the protection of a minimum price agreement, troll fishermen are at the mercy of price-cutting processors, who are blaming Norwegian farmed salmon in European markets for the depressed prices.

By July 10, B.C. Packers had raised its prices to $2.35, $1.80 and $1.40.

Coho prices were more stable, opening at $1.30, $1.20 and 85 cents this year, compared with 85 cents, $1.25 and $1.40 in 1985.

Initial troll spring landings on the west coast of Vancouver Island were good, apparently more because of abundance than increased effort.

Spring returns to the Skeena were double the 10-year average for the first week in July, according to fisheries northern director Paul Sprout. That was in stark contrast to the sharp decline in sockeye returns.

By July 10, the fisheries department could report total chinook catches of 35,537 in the northern area up to July 5 and warned that catch controls could be necessary if "current catch rates continue."

Northern coho catches totalled 336,537, including 126,036 taken in the week of July 5 alone.

Chinook catches on the west coast of Vancouver Island also were running ahead of forecast. On July 7 the department closed the Big Bank to slow the harvest rate. By the end of the week ending July 5 the troll catch had hit 145,300, a figure that fisheries salmon coordinator Eric Kremer said could reflect both increased effort and increased abundance.

Coho catches to the same date were 614,800, also close to the 696,000 mark at which conservation measures could be imposed. Kremer said the department was very close to curbing the coho fishery.

Troll chum catches to July 5 were 64,100 and the Gulf troll catch had hit 36,250.

Sockeye non-retention regulations remain in effect.

Warnings of new difficulties in chinook markets were issued June 13 in *Friday*, the publication of the Pacific Coast Federation of Fishermen's Associations. Even before the season opened, some purchasers refused to sign market contracts.

According the the PCFFA, the California, Oregon and Washington fleet had to return to port in the second week of the season to negotiate a lower price. The prices were slashed from U.S.$2.65, $2.35 and $2.05 to $2.30, $2 and $1.75.

Sales were good until the first week of June when rumors of Norwegian farmed salmon being dumped on the market slowed sales. The story was false but the PCFFA quoted reliable reports indicating that Norwegian sellers dropped prices 50 to 75 cents a pound to retain a market share after the fresh salmon season began.

Toxic chemical detected in farm salmon

A spokesman for B.C.'s ministry of the environment confirmed Nov. 7 that there are no controls in this province on the use of a toxic anti-fouling agent that has been detected in farmed salmon.

The substance is called tributyltin, or TBT, and is one of the most toxic substances known to man. Popular as an anti-fouling paint for boat bottoms, it has been banned in a number of European countries because of the damage it inflicts on the environment.

Now TBT has been detected in pen-reared salmon sold in U.S. seafood markets. According to *Friday*, the publication of the Pacific Coast Federation of Fishermen's Associations, aquaculture products from Puget Sound and Norway purchased in public markets contained concentrations of .28 to .9 micrograms per gram of TBT.

TBT, sometimes used to treat netting used in salmon pens, can be toxic in levels as low as five parts per trillion. Two scientists working for the National Marine Fisheries Service found the substance in baby coho sold in public markets.

"We have no controls on the use of anti-fouling agents," B.C. environment ministry spokesman Michael Coon told *The Fisherman* Nov. 7. "We're in the process of collecting samples. We're trying to assess the problem. It's something we don't know very much about."

Evidently the pen-sized fish are not exposed to the TBT for long enough to die from its effects. The chemical concentrates over time in certain parts of the body.

Coon said the toxic effects of anti-fouling agents are a concern. "It's in everyone's interest to make sure fish aren't contaminated."

UFAWU secretary-treasurer Bill Procopation said the threat of TBTs is another example of the chaos surrounding the B.C. fish-farming issue. "We'll need more than a 30-day review to establish regulations to prevent this kind of damage," he said.

The two American researchers also studied the effect of low concentrations of TBT on juvenile salmon, concluding that exposure to low doses may increase susceptibility to disease.

Norway's salmon farms face tight regulation

National aquaculture policy aims to protect wild fish

Farm fish to hit wild salmon market

Ireland freezes foreign fish farms

Ireland has slapped a ban on foreign ownership of salmon farm leases to head off what officials feared could be a take-over of the country's industry.

"We could fill every bay on the Irish coast with salmon cages within two years if we allow the Norwegians in without restriction," a local official told *Fish Farming International*. He later corrected himself and said "non-nationals" rather than Norwegians.

The Irish Fisheries Department has announced that no further licences will be issued for salmon-farming projects in which nationals of countries outside the European Economic Community have a major stake.

A policy review is under way.

By contrast, there is absolutely no curb on foreign investment or control in B.C.'s salmon farming industry, which has a large Norwegian element. Norwegian investors are attracted to B.C. by much looser regulation than they face at home.

Opponents of outside investment in the Irish industry claim that Norwegians control 60 percent of the fishing farming industry in Scotland and have starved locally-owned farms of smolts from Norwegian-controlled hatcheries.

Angry fishermen are reported to have rammed salmon cages in Scotland in frustration.

Fishermen in Ireland are concerned about the implications of a Scandinavian proposal to raise farmed salmon in converted oil tankers. Even other farmers are fearful of its impact on the environment and markets.

Smolts for the scheme would come for Iceland, posing the threat of importing kidney disease to Ireland.

DFO aquaculture subsidy hits $3 million in '85

Fisheries department expenditures in support of the aquaculture industry totalled $3 million nationwide in 1984-1985, says fisheries minister Tom Siddon.

In reply to a query from Skeena NDP MP Jim Fulton, Siddon said June 2 that DFO "has been the lead federal department in fostering the development of aquaculture in Canada, focussing particularly on research and experimental development, the protection of fish from communicable diseases and the transfer and application of research results to industry."

In the year ending March 1985, the department spent $2.5 million on aquaculture research, a period when salmonid enhancement spending was frozen. A further $300.00 was spent to assist aquaculturists to use the latest methods in rearing and harvesting.

The amount spent on research has increased to $2.5 million up to March 1985 from $2.3 million during the previous year.

Siddon told Fulton that fish farmers are eligible for interest-free loans under the Canada B.C. Subsidiary Agreement on Small Business Incentives. More than $9 million of $50 million loaned under the program went to fish farmers.

Siddon could not provide a breakdown on how much of the research money was spent on the Pacific coast.

fish farming
INTERNATIONAL

MONTHLY £1.50 DECEMBER 1986, V

SURPLUS SALMON WARNING

Production may exceed demand by 23,000 tons

A NEW estimate of farmed Atlantic salmon production and demand comes from the Irish Sea Fisheries Board (BIM).

In a research study of international production and market trends, it finds that the market is expected to grow to 153,000 metric tons by 1990 — with Norway providing 100,000 tons, Scotland 25,000 tons and Ireland 10,000 tons.

For Ireland alone, this could mean farm earnings of IR£32 million, exports of IR£44 million and 1200 jobs.

According to the report of this study, Europe's technical maximum of farmed salmon production is around 250,000 to 300,000 tons. Norway, says the report, can produce 200,000 tons a year, Scotland up to 30,000 tons and Ireland up to 15,000.

Atlantic salmon farming has also been greatly assisted by recent major developments in feed compounding; and stock improvement programmes have been underway for some time.

But, with the prospect of rapidly increasing supplies, there will be a need for increasing emphasis on marketing with effective performance making the difference between success and failure.

With the growth in production, falling real price trends for fish and frozen salmon are already evident in most European and North American countries. If continued they should induce greater consumption. And growing awareness of salmon's health value will

demand by 1990 could cause reductions in prices and margins greater than farmers and traders presently envisage.

Lower margins will force the least efficient producers out of the industry and will deter potential small-scale new entrants.

The emphasis on greater efficiency will stimulate high standards of technology and training, and a larger minimum-volume production unit.

Salmon farms based on integrated smolt and sea cage production are unlikely to be less than 500 tons a year capacity, notes the BIM report.

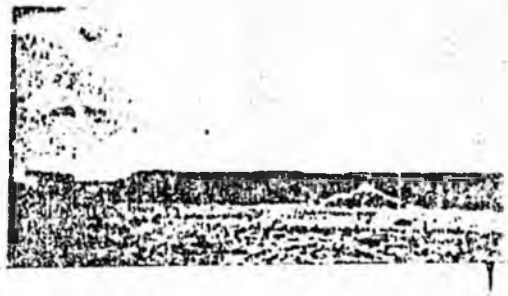
Investment needed for

duties) would reduce this return to zero. ..

● We shall be looking at this BIM report and its conclusions in more detail in our January 1987 issue.

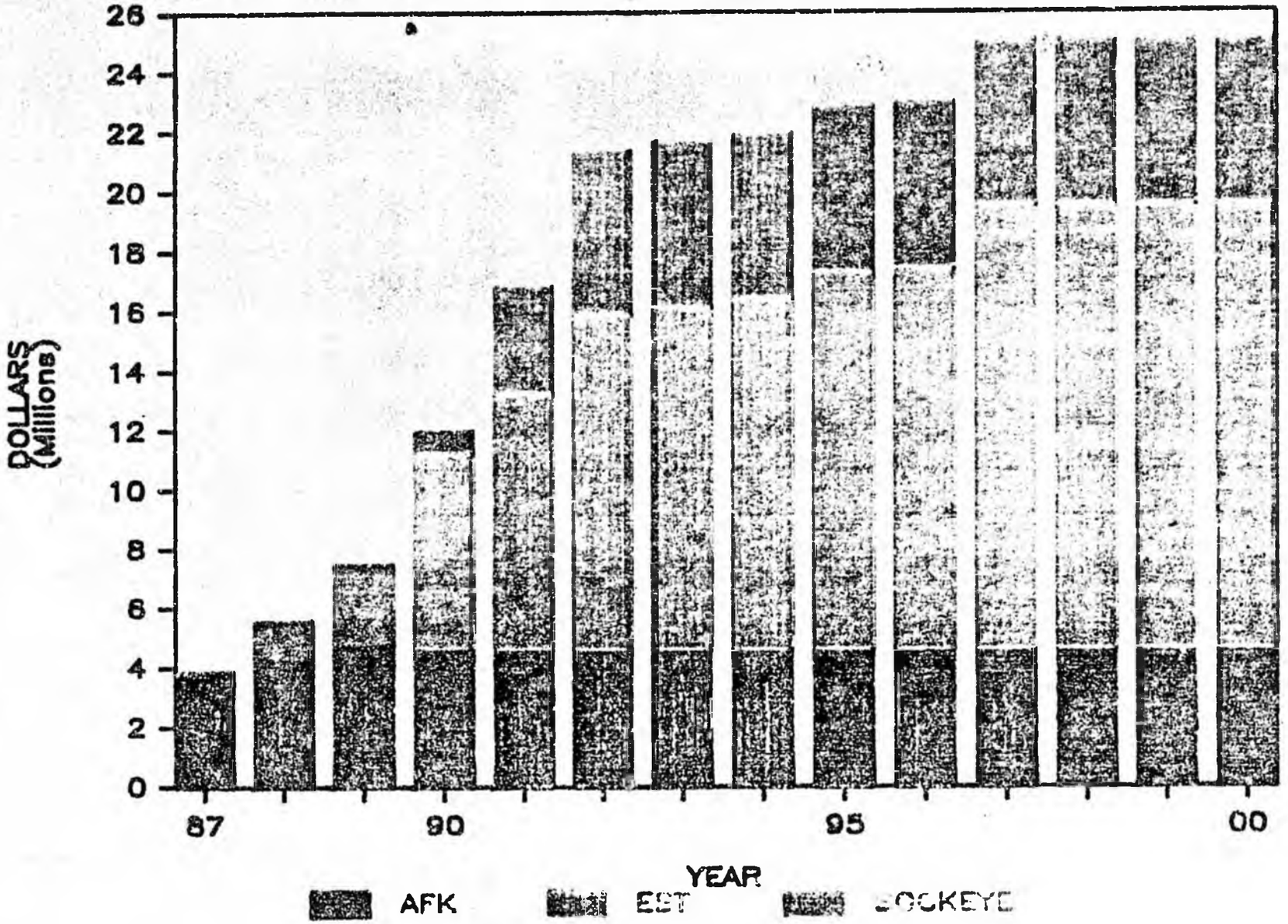
A NEW colour brochure to Engl... says that the salmon's natural hab... location for developing Irish sal... by the Irish Sea Fisheries Boar... notes that the first crop of farm... harvested in 1977. Production is ... tons in 1990.

Bridgestone "Hi-Seas" Fis



TOTAL COMMERCIAL FISHING REVENUE

PRINCE WILLIAM SOUND AQUACULTURE CORP.



PRINCE WILLIAM SOUND SALMON HATCHERY PRODUCTION

HATCHERIES	1986 BROOD YEAR EGG NUMBER (millions)					FINAL EGG CAPACITY (millions)				
	Pink	Chum	Coho	Chinook	Sockeye	Pink	Chum	Coho	Chinook	Sockeye
Armin F. Koernig	126	--	--	--	--	137	--	--	--	--
Esther Island	78	40	1.0	0.12	0.9	211	111	1	4.0	30.0
Solomon Gulch	64	4	1.3	--	--	136	18	1	.3	--
Main Bay	3	85	--	--	--	25	190	--	--	--
Cannery Creek	39	--	--	--	--	111	--	--	--	--
Gulkana Springs	--	--	--	--	30.0	--	--	-	--	30.0
TOTAL	310	129	2.3	0.12	30.9	620	319	2	4.3	60.0

ARMIN F. KOERNIG HATCHERY
PRINCE WILLIAM SOUND, ALASKA
PINK SALMON PRODUCTION DATA

BROOD YEAR	FRY RELEASE	FISHERY HARVEST	HARVEST RATE	BROOD STOCK	HATCHERY HARVEST	TOTAL [illegible]	TOTAL MARINE SURVIVAL
1975	1,000,000	4,000	10%	15,155	24,845	[illegible]	[illegible]
1976	11,010,577	--	--	40,432	111,189	[illegible]	[illegible]
1977	16,950,784	275,000	50%	54,207	224,748	[illegible]	[illegible]
1978	22,774,739	1,038,700	70%	108,061	346,723	[illegible]	6.6%
1979	21,500,000	1,353,907	60%	198,901	707,037	[illegible]	[illegible]
1980	69,787,000	3,613,086	70%	164,545	1,354,732	[illegible]	[illegible]
1981	70,118,000	2,950,225	80%	124,278	607,[illegible]	[illegible]	[illegible]
1982	87,384,533	2,226,[illegible]	80%	186,131	387,14[illegible]	[illegible]	[illegible]
1983	76,746,000	3,772,962	75%	271,513	[illegible]	[illegible]	[illegible]
1984	103,531,000	3,[illegible]72,332	78%	277,705	[illegible]	[illegible]	[illegible]
1985	112,527,516	---	---	---	---	---	---

UNITED FISHERMEN OF ALASKA

Jack Cadigan
Executive Director
907-586-2820
1-800-478-FISH

Mr. Chairman and Members of the Committee:

My name is Bob Blake and I am here to express some of the concerns the United Fishermen of Alaska and the Cordova District Fishermen United have with the CS for House Bill #108.

Our basic concerns are outlined in the United Fishermen of Alaska's Resolution 87-3, passed unanimously by the Board of Directors at their annual meeting the first week in February, which is:

Keeping in mind that Alaska has 90% of the U.S. salmon production and 43% of the world salmon production, excluding pen-reared salmon, you can understand our anxiety.

We raise the following issues:

1. (a) Disease related problems have the potential of affecting existing stocks of wild salmon which are fully utilized by sport, commercial and subsistance users, or are needed for PNP brood stock or spawning escapement.
(b) Potential of polluting the quality environment needed for continued production of wild stocks of salmon, sea run trout and other aquatic plants and animals by use of antibiotics in treating pen-reared disease problems, surplus fish food damaging the bottom dwellers around net pens, restriction of water current movement because of net pen placement, human waste and garbage contamination, etc.
(c) Genetic alterations are a potential concern; after several cycles of altering and domesticating, pen-reared salmon, upon escaping, could in turn effect the gene pool of wild stock.
(d) What are the impacts of hormones, toxicants (ie. TBT) antibiotics, etc., ont he natural environment, animals and the human food chain?

2. Where do the smolt or eggs come from to start up a Mariculture industry?
(a) Certainly not from imported stocks - the history of importing smolts is laden with disease problems.
(b) Wild chinook in Southeast is still in the build-up stage to help fulfill the U.S./Canada Treaty obligations.

Southeast hatcheries are not up to maximum capacities to meet that obligation either, and even if they are close, what about the ever increasing needs of the sportfish, commercial and subsistence common property users? Chinook and coho stocks in Southeast are fully utilized under the existing fisheries and industry. The same goes for Cook Inlet and Prince William Sound, any surplus spawning escapement is currently utilized by FRED and PNP hatcheries for supplementing existing user group fisheries. All the chinook and coho stocks West of Cook Inlet are also fully utilized by existing fisheries or escapement.

3. Funding problems that need to be addressed:

.F.R.E.D. Division of the Alaska Department of Fish & Game would be required to bear inspection costs. They would have to develop a disease control and management program and provide all types of associated services. Where's the funding for these additional costs going to come from? The F.R.E.D. Division is forced by the proposed FY88 budget to close down four State hatcheries and reduce its other programs, all of which are valuable to existing users.

.D.E.C. will have to be involved with all the environmental research and monitoring. While that agency's budget isn't proposed to be cut this year, they simply don't have enough funding to monitor existing problems (even the Alyeska Pipeline Terminal).

.D.N.R. is way behind on existing work loads of permitting, land use planning, etc. That agency's budget is being cut even further.

.D.C.E.D. is set up in this legislation to be a lead-type agency. They are taking a 26% budget cut, I believe, for FY88.

None of the agencies involved are able to carry out their current legislative mandates and program needs for their existing respective user groups. Shouldn't their budgets be brought up to levels to meet the current needs of existing industries and user groups before the Legislature imposes more changes on them? I can appreciate the Legislature's desire to enhance the State's economy, but not at the expense of reducing the economic potential of existing industries.

4. Physical displacement of traditional users: Commercial fishermen fear disruption from traditional fishing grounds and anchorages, as well as the hazard to navigation salmon farms will pose. We have to assume that sport fishermen, recreational boaters and tourists will feel the same way. Waterfront property values could also diminish, depending on the siting of such farms. Tourism is a blooming industry in this State. People come to Alaska to find esthetic values, to photograph pristine environment, and to have the ultimate experience sportfishing and hunting, not to see salmon farms scattered all up and down the coast in all the favorite fishing spots and anchorages.

5. The PNP and State hatchery program has been stated as the best renewable resource investment the State has made with oil dollars. It's a shame that the State did not make more money available for this venture during times of plenty, because the program collectively has not come close to acheiving its potential throughout the State. Our hatchery system supplements the wild stock resource for the common property fishery. Every person in this State has access to the hatchery-produced fish if they so desire, via commercial, sport of subsistence fishing. This venture in hatchery production has created many more jobs for State residents and helped maintain the economic viability of the commercial and sport fishing fleets in much of the State. In Prince William Sound, for instance, the commercial fishermen opted to increase the salmon resource rather than eliminate many of the fishing permits. We have done this through ocean ranching and it works. Our Prince William Sound hatcheries are also producing chinook and coho for sport fishermen and tourists. If the State is ever again going to invest in the salmon industry, it should invest in the proven commodity, and not in potential disaster. The existing industry provides many, many thousands of jobs.

6. Funding: As stated earlier, the State is not willing or able to fund the four agencies that will have to be involved with this Mariculture legislation to a level that will allow them to adequately manage their present obligations. This needs to be rectified first. Both the Enhancement and Commercial Fishing Loan programs have been mislabeled "revolving". The principle and the interest from both programs go directly into the General Fund upon repayment. Both loan funds are literally out of money unless the Legislature makes an appropriation to them. Some of the loans from these programs have been transferred to AIDA to help finance things like the Red Dog Mine. These loan repayments go directly to AIDA, not to the General Fund. It might be a consideration of this Committee to look into this "non-revolving" situation before there is no money left for reinvestment in the State's largest non-oil industry.

7. What are we trying to accomplish with pen-reared salmon? Are we trying to create a "cottage" industry, a "mom and pop" show up and down the coast, or are we trying to develop an environment for multi-national investors to exploit to the fullest by providing a few jobs and taking home the profits (if there are any) at the expense of several existing industries? If the State is desirous of maximum potential benefit to the State itself, or its residents, it will have to make a tremendous financial investment in order to pull it off. Norway had to do it because its rural coastal communities were drying up from lack of fisheries resources to sustain their economy. Norway also had very little natural "salmon" resource to worry about or consider effecting. Alaska's present economic situation and flourishing salmon stocks do not mandate such a move. Besides, it does not appear that the limited size structure restricted by Norway to accomplish their goal will be economically viable in Alaska. Without the money to do it in-State, the only logical option would be to allow outside investors to come in, bring their experts and equipment with them, and control an industry that will provide just a few local resident jobs while competing for General Fund dollars and services at our expense. In my "logical" scenario, it would be prudent for the State to carefully analize the actual value gained for potential cost incurred. As commercial fishermen, we realize the market impact of pen-reared salmon on Alaska wild salmon. While we don't feel that pen-reared will ever really displace our markets, we do already feel an impact and will continue to feel that impact with or without Alaska being involved. If this Committee is intent on pursuing HB108 in its present form, then it should consider including in the legislation a time frame during which pen-reared salmon could be sold in order to not directly compete for market space during the wild salmon seasons.

As the U.F.A. and the C.D.F.U. support the careful and controlled development of shellfish and plant mariculture, and we are not desirous of slowing down the process by which the exsisting shellfish farmers can continue, or new farmers becoming involved, we suggest that this Committee split the two issues into two separate bills, thus allowing shellfish legislation to proceed with little or no resistance.

We appreciate the opportunity to speak on this issue during its past hearing and will be providing more information and comments in the future. Thank you.

UNITED FISHERMEN OF ALASKA

Jack Cadigan
Executive Director
907-586-2820
1-800-478-FISH

UNITED FISHERMEN OF ALASKA

RESOLUTION 87-3

WHEREAS in 1985 the United Fishermen of Alaska requested the State of Alaska to perform a thorough study of the biological, economic and sociological problems and potentials of salmon pen rearing in Alaska, but this study has not yet been undertaken; and

WHEREAS the UFA supports the careful and controlled development of shellfish and plant mariculture; and

WHEREAS the development of the salmon farming concept of mariculture will adversely affect the fishermen and the most successful hatchery and enhancement program in North America by: (1) reallocating State funds and services; (2) competing with markets for wild salmon; (3) preventing water and land use of traditional fishing, hatchery, enhancement, and smolt rearing and release sites; (4) increasing the potential disease contamination of the wild stock; and

WHEREAS no realistic fiscal note has been produced to identify the cost to the state incurred by the management of the proposed activities;

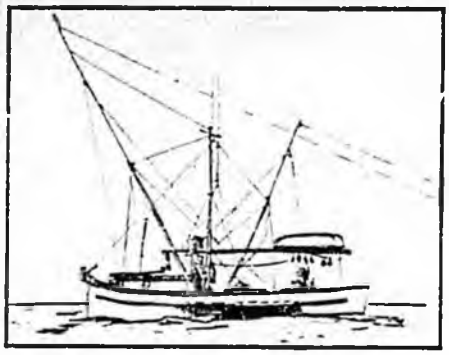
NOW THEREFORE BE IT RESOLVED that the Board of Directors of the United Fishermen of Alaska urges the State of Alaska to take no action on legislation and development of salmon farming mariculture until such time as the aforementioned issues of concern are addressed through private and public forums.

Robert H. Blake — 2/6/87

Robert M. Blake
President

Date

MAR 03 1987



Alaska
Trollers
Association

REPRESENTING ALASKA POWER TROLLERS

130 Seward St., No. 213
Juneau, Alaska 99801
(907) 586-9400

TESTIMONY OF THE ALASKA TROLLERS ASSOCIATION

~~RE HB-108 AND SB-106;~~

"An Act relating to aquatic farming; and providing for an effective date."

2/16/87

Earl E. Krygier

Executive Director

EXECUTIVE SUMMARY

The Alaska Trollers Association believes that passage of HB-108 and SB-106, "Act(s) relating to aquatic farming...", in their present form would be detrimental to the Alaska salmon industry and not in the best interest of the State. ATA generally supports of aquaculture, and believes there are many opportunities for Alaskans in various aquaculture developments. However, we specifically oppose those aspects of these companion measures aimed at permitting the pen rearing of salmon in Alaska.

Alaska produces some 43 percent of the world harvest of salmon. The pen rearing industry, spearheaded and dominated by foreign interests and backed by their governments' subsidy programs, is in direct competition with our salmon industry. This applies not just to king and coho salmon, but to all fresh and fresh-frozen product forms. Encouraging those interests to invest in and control pen rearing in Alaska is clearly not in the interest of our industry, and will jeopardize the enormous private and public investments already made in our wild and hatchery stocks. We cannot control the actions of other nations, but we need not actively contribute to the market competition facing our own industry.

We are also extremely concerned about possible biological impacts on our wild stocks. While the spread of an extremely virulent infection from penned to wild stocks may be of a low order of probability, the potential for major damage to wild stocks does exist. With so much at stake, is pen rearing worth the risk? Pen rearing will produce chronic habitat problems local to the rearing sites, will compete for release sites with our existing enhancement programs, and may physically displace existing fishery activity, as has been the case with log dumps.

Proponents assertions not withstanding, pen rearing will divert increasingly scarce State government resources from existing fishery management programs. Fiscal impacts have not been addressed. ADF&G, DEC, DNR, DCED, and Revenue programs will be effected.

We contend that proponents are exaggerating the potential economic benefits of salmon farming in Alaska. Without the strict controls, which are not contemplated by these Bills, pen rearing operations will not be small, Alaska owned businesses. They will be large corporate operations, utilizing foreign technology, and funded and controlled by foreign interests. The few Alaskan jobs they will provide will be at the lower end of the technical and pay scales of these operations. To the extent that Alaskans are involved, either as investors in foreign dominated ventures or as independents, their position will be precarious. This industry is headed for a major "shake out" worldwide, and small, late entrants will be the most vulnerable.

In sum, salmon pen rearing threatens our existing industry and will not be the bonanza that proponents claim. Alaska's support for aquaculture should be in those areas where we can become the technological and market leaders. Let's not get on a bandwagon which is about to run out of gas!

INTRODUCTION

Proponents of aquaculture say it offers one of the single greatest new opportunities to develop and diversify State and local economies and create new jobs. To hear them talk, you'd think that salmon pen rearing in particular is "the greatest thing since sliced bread." Frankly, your fishermen constituents disagree. They think pen rearing of salmon could well be a disaster for them and a very bad deal for the State of Alaska generally.

It is important to look beyond the enthusiastic statements of proponents about the "great opportunity" represented by aquaculture. We must also look at its' effects on the entire spectrum of the existing seafood and support industries. The past administration's Ad Hoc Committee on Mariculture, including the representatives of the fishing industry, found that aquaculture in general does offer new opportunities - though not without costs. Indeed they found that some forms of aquaculture - pen rearing of salmon to be specific - could, in fact, have detrimental effects on the fishing industry, particularly in Southeast fishing communities.

We, the fishing community, suggest that pen-rearing of salmon - the "fish farming" which is really the key element driving this Bill - poses three principal threats to Alaska fisherman:

- saturation in the price and quality leading sectors of our markets which will eventually impact the price of all Alaska salmon, not just our "top of the line" fish;

- negative biological impacts on our vital wild stocks and rearing habitat; and

- diversion of increasingly scarce State government fiscal and managerial resources toward management of a new industrial sector dominated by foreign capital and operators, to the detriment of our Alaskan industry.

Additionally, we contend that the developmental and employment benefits of salmon pen rearing to rural communities and to the economy of the State in general are being heavily, even irresponsibly oversold by pen rearing advocates.

MARKET CONSIDERATIONS

The advocates of aquaculture claim that consumption is rising and that there will be no competition between the farmed and the commercial forms of seafood. The reality is, that the bulk of the highly touted "world increase" in seafood consumption will occur in shellfish, and cod and catfish type fish rather than in the more expensive salmon species. This projected increased in world consumption has two main components.

(1.) Fish as a Cheap Source of Protein: Aquaculture in Third World countries has increased exponentially during the past few years - mostly in the form of warm water pond culture of tilapia and carp. Such culture in Third World nations is often run in conjunction with annual irrigation of rice fields, or in areas where the yield of protein per acre is grossly in favor of pond culture (fish such as Grass Carp or other herbivorous species for local consumption, or shellfish for export) where lands have a low plant productivity due to bad soil conditions. In the industrialized countries cheap protein is also important, but here consumption increases are largely in the form of "fast-food" fillets for fish sandwiches and deep fried catfish. Indeed, the largest aquaculture sector in the U.S. is Mississippi Valley catfish farming, and the single largest fish processor in the U.S. is a catfish processing plant.

(2.) The Health Benefits of Seafood: In North America and Western Europe, the increased recognition of the health benefits of seafood mostly spawned by the educational efforts of such institutions as the Heart Association and the National Marine Fishery Service, has led to a greater consumption of fish and shellfish. Consumers who increased their consumption for health reasons, are normally more interested in the expensive product forms, such as fresh or frozen salmon.

Unfortunately for Alaskan fisherman, the increased awareness and consumption occurred coincidentally with the advent of the Norwegian pen reared salmon industry - though not because of it, as some would claim. Through aggressive marketing and government subsidized production and shipping (including heavily underwritten air freight rates on the government owned airline SAS) the Norwegians made heavy inroads in this product niche of the seafood industry. Our Alaskan commercial fisherman, unprotected from this heavily subsidized, government organized marketing blitz into their traditional markets, have not enjoyed the benefits of increased demand through higher prices or expansion of market opportunities for our other salmon species, such as frozen reds and ocean bright pinks. So, Norwegian salmon has not just hurt trollers, it has limited diversification opportunities for gillnet and seine caught fish as well.

There is really only one market for quality salmon. This market is worldwide and must absorb all inventory, both fresh and fresh-frozen. As fresh-farmed salmon output increases, it cuts into the commercial high quality fresh-frozen market where Alaskan fish has been traditionally been dominant. Present worldwide production of wild salmon is 600,000 to 700,000 metric tons, the vast majority of which is pink, chum and sockeye salmon. Only 70,000 to 80,000 metric tons are high quality coho and king salmon, and it is these fish which are facing competition from pen-reared salmon. This competition is increasing yearly. The production of pen-reared salmon worldwide is expected to approach

150,000 metric tons by 1990. Such an increase will nearly triple the present volume of high quality salmon. In the world market, Western Europe, Canada, and the United States represent "the marketplace" for high-quality salmon. The troll industry's fresh and fresh-frozen product has already felt the impact of market competition from pen reared fish. Our king salmon price to fisherman has dropped from $2.50/ lb in 1985 to $1.80/lb in 1986. Cohos dropped .50 cents /lb this past winter when a large inventory of Norwegian fish was dumped on the French market.

Demand for this high quality fish just can't expand as fast as the supply is growing. Studies indicate that every man, woman and child in the United States would need to exchange a meat dinner for a salmon dinner to increase consumption by 25,000 metric tons per year. If pen-reared salmon production does reach 150,000 metric tons by 1990, then a population the size of the United States would have to eat six salmon dinners per year that they are not presently consuming. This is a product which retails for $6.00 to $8.00 a lb. Any economist will tell you that it is unreasonable to expect such a demand increase to occur in such a short time. It also means that the enormous amount of high quality salmon on the market will have to sell at reduced prices to compete within its own market niche, with other seafood, and with a more competitive red meat and poultry industry.

This problem was headlined in the December 1986 edition of FISH FARMING INTERNATIONAL which read, "SURPLUS SALMON WARNING - PRODUCTION MAY EXCEED DEMAND BY 23,000 TONS". The article stated that an imbalance of projected supply and demand by 1990 (three years from now) could cause sharp price reductions and upset profit margins. It stated that lower margins would force the least efficient producers out of the industry and preclude small-scale new entrants. It went on to say that farms which produce less than 500 tons per year (this latter type of large facility has a cost of US$3 million +) would not have the product volume capacity to reach profit margins. They state that such large investment would be very risky, since a stock loss every five years through disease or the effects of unseasonable weather would yield zero net returns. Such losses are not without precedent. Salmon farmers in Norway, on the Sunshine coast of B.C., and at the National Marine Fisheries Service experimental farm at Little Port Walter in Southeast Alaska, have experienced such losses from algal blooms, stress induced by harassment from marine mammals, and from disease.

Commercial fisherman, as users of a wild, common property resource have been striving for years to stabilize natural fluctuations through hatchery enhancement and resource allocation. Pacific coast fisherman, in trying to solve those problems via the U.S./Canada Treaty, will face not only an increase in production from salmon farms, but the need to market the expected great increases in wild and ocean released hatchery

stocks resulting from the U.S./Canada Treaty. Canada and the Pacific States plan to release 2.6 billion enhancement salmon by 1990 - an increase of 245 percent! Add to this the increases from natural stocks rebuilding to maximum sustainable yield. This represents a tremendous investment in management and enhancement dollars, and tremendous sacrifices by our fishermen to achieve wild stock rebuilding. Pen reared salmon compete with these fish and dilute the value of our already massive investment.

It is also frequently asserted that penned salmon won't compete with Alaskan wild stock salmon since most of our production occurs during the summer, whereas penned salmon are sold in the winter. In fact, 10% of all pen reared salmon is sold in the summer. As long as penned salmon production was low, its summer market impact was not too severe. The total Alaska troll king and coho salmon production was about 9,700 MT in 1985. If full projected pen reared salmon production of 150,000 MT is reached by 1990, then a 10% summer market competition will be 15,000 MT in the summer of 1990. That is, they will dump more fresh fish in the summer market alone than the entire Alaskan troll production. As we have said, Alaskans in general will lose from this competition since the development of new product forms of pink/chum/and sockeye, ie. fresh frozen ocean bright quality, will be out-competed by the fresh farmed fish industry which has already developed its market strategy. But, the hardest hit will be the troll fleet. Our product, both fresh and fresh-frozen, competes head to head with pen reared salmon.

Since the volume of pen reared salmon projected by 1990 will triple the product volume available from the current harvest of all king and coho salmon (the two species which compete most directly with pen reared salmon), the issue of product saturation is both real and imminent. Whether or not Alaska becomes involved in the pen rearing of salmon will not change the fact that our wild stock fishing industry will see an increased market competition with pen reared fish, but we don't have to contribute to the problem.

I've spoken about world market impacts and their effects on Alaska fishermen, but if we allowed pen rearing in Alaska we would also have to deal with direct competition in our local markets. Most pen raised fish would be marketed in the winter when local fishermen are supplying local winter markets and getting their best price. When there is such high winter unemployment, winter fishing is both good for mental health and for the pocketbooks. Local pen-reared fish would severely hurt our local winter markets since buyers would not need to wait - as they're presently accustomed to doing - for a winter storm to pass so that local boats can "sneak back out" for a bit of winter fishing.

BIOLOGICAL CONCERNS

Additionally, salmon farming poses threats to our native stocks and our rearing habitat in Southeast. The rapidly growing aquaculture industry faces two big environmental problems; self-inflicted water pollution around the fish farms, and disease epidemics in the pens.

The problem of pollution from feces and unconsumed feed poses a real habitat problem. Most of the choice sites for aquaculture are important as nursery areas for other juvenile fish and shellfish. The problem of bottom habitat degradation is exemplified by the history of log storage facilities. The scientific literature is full of descriptions of the harmful effects to critical environments from hydrogen sulfide pollution - the same pollutant by-product associated with salmon farms.

As for disease, in 1983 epidemics cost the farmed salmon industry approximately $110 million. Much of this occurred when a bacterial disease in Norway forced 29 out of 40 farms to slaughter their entire stock. Fish farmers, and feed lot farmers in general, respond to diseases with antibiotics which can lead to new virulent forms of disease. Virulency can take the shape of drug resistant disease strains or as new forms of disease to which natural stocks have little or no immunity. The major countries producing farmed salmon have either destroyed their

natural runs or never had them, so they have no natural stocks at risk. However, Alaska produces 90% of all U.S. landings, which equates to 43% of the world landings, from wild, natural runs of salmon. Can we really afford to risk a major disease induced crash of our wild stocks? We think not! Proponents of pen rearing would like to "wish away" the disease problem, but its not a simple thing to deal with and the risks are potentially catastrophic.

MANAGEMENT AND FISCAL CONCERNS

Pen rearing advocates are fond of stating that they aren't seeking State loans and hence won't have a fiscal impact on State government. This is a ruse. Loans aren't the only way of impacting the budget. With revenues getting tighter and tighter State resource managers are faced with doing more and more with less and less. Introducing pen rearing will have an impact on departments charged with regulating the seafood industry and managing the State's tideland resources. DNR, DEC, Revenue and ADF&G will all have to gear up to deal with permitting, regulating and otherwise managing this new industry. You tell me what it will cost! The only certain thing is that it won't be cheap, and that it will negatively impact already shrinking management efforts applied to our existing fisheries.

I think it would be very wise to have a detailed examination of the fiscal impacts of this legislation before proceeding further.

We have previously mentioned the U.S./Canada Treaty. Two additional programs were sold by the State of Alaska to the fishing fleet which promised a long term future and stability, Limited Entry and Salmon Enhancement. Though these programs hold promise, they have put the troll fleet in a precarious make-it or break-it balance. The farming of salmon can upset this balance. It is important to remember that Limited Entry was instituted to control excess effort and give assurances to fisherman that a reasonable livelihood could be obtained. The State also invested heavily in this process by making State loans available and by instituting additional programs which would benefit limited Entry participants and the seafood industry. Such basic assurances encouraged many Alaskans to invest their lives and wealth in this newly stabilized industry. If the State now decides to allow pen rearing of salmon, which competes directly with Limited Entry fisherman, it will have broken its trust with the existing industry. Additionally, salmon enhancement was conceived and developed in Alaska through a legislative process, the main intent of which was to exclude "private-for-profit" salmon farming or ranching. The Alaska Legislature understood at that time the social and economic implications of private salmon culture on a healthy commercial fishing industry. Those legislators understood that salmon culture was capital intensive and would likely be dominated by out-of-State extractive investment unless regulated to ensure that control and benefits remained in Alaska.

OVERSELLING THE ECONOMIC BENEFITS OF SALMON PEN REARING

Proponents of pen rearing salmon like to claim that they will be able to produce 1,900 jobs. Just how many of these will be held by Alaskans? A recent T.V. documentary promoting the salmon farming industry made a sad, unintended joke of this claim, stating that on the large fish farms on the Sunshine Coast in British Columbia you need to speak Norwegian to get by. We strongly contend that this new industry will not create 1,900 new jobs. On the contrary, it may well displace that many and more existing jobs in the seafood industry and its' supporting industries (shipwrights, fuel and food suppliers, etc.).

The Southeast troll fishery has the highest residency rate of any fishery in the state. Fully 85 percent of our fishermen live here in Alaska. Last year this represented nearly 3,500 fisherman and crew members. Using a standard 2.2 employment multiplier for Southeast indicates that the troll fishery alone may generate a total employment of 7,700 fishing, processing and support industry jobs, all of which are in some degree of jeopardy from pen rearing. Many trollers are barely making it now. Further, price slumps will place even more fishermen in the marginal category, forcing many to seek scarce winter employment on shore, and others to quit entirely. To the extent that Alaska based pen rearing hurts Alaskan fishermen, and it will, we are talking about displacing existing investment with new investment and new

people. As residents of Alaska, we want to see more jobs and more economic stability in our communities for the people that live here now. The following analogy exemplifies our dilemma. The Chamber of Commerce is always a strong local proponent of development. That is, until a Fred Meyers, Safeway, or McDonalds' wants to come to town. We all know that this is because the Chamber is made up of locally-owned small restaurant, grocery and shop owners who want some development, but not "that kind" of development. They know from painful experience that such new development often simply displaces existing industry owned and run by local people. That is the threat our fishermen - your neighbors - see and feel.

Pen-rearing is the latest economic "buzz word". Its logical conclusion is market saturation and an economic shake-out. Alaska's late leap onto the bandwagon - which will run out of gas about the time our production reaches market size - means more economic instability in communities which have suffered enough from the boom/bust economy which has characterized Alaska. The hype over salmon farms reminds me of a similar, though not so global, "new opportunity" in the early 1970's. Remember "worm farms"? Sportsfishermen surely wanted worms and the worm casts made a wonderful plant mix. The only problem was market saturation. Toward the end of that little boom, the only real money in worms was in selling the technology and equipment to "new farmers"! Isn't it interesting that Norway has curtailed developing new salmon farms, but is very hot on exporting its

technology, fry and pens to "new farmers" worldwide? They see the shake-out coming. We'd best have our eyes open too! This isn't just my opinion and advice, as I'm repeating sentiments which are increasingly being expressed in the international aquaculture industry press, most notably FISH FARMING INTERNATIONAL.

Salmon farming is capital intensive rather than labor intensive. Multi-national companies and foreign banks will put up the bulk of the start up dollars, and they will expect the earnings to flow back to them, as do out-of-State companies such as Fred Meyers or Safeway. Those profits won't be retained in the local community. Multi-national corporations are known to come in for the quick initial profits and sell out or just quit business for tax losses which offset other corporate gains. This is not just hype.

Certainly, wise foreign investment in Alaska is needed. We need the inflow of capital. However, such investment should be in the form of joint ventures with Alaskans, not just a license to steal from our resource base. Unfortunately, this bill does not address the issue of controlling the form and rate of growth of this proposed new industry to ensure that Alaskans are the primary beneficiaries (nor has the Alaska Mariculture Association put forth any proposals in this regard). Because of the start-up and operating costs involved, "Ma & Pa" type Alaskan operations will have a difficult time even "getting their foot in the door", and it is even more doubtful that any who did get started could stay

afloat if hit with a disease outbreak or a down turn in the market which all experts project within the next 3-5 years. Advocates of pen rearing like to sell the idyllic view of rural coastal Alaska sprinkled with hundreds of small scale, family run salmon farming operations. We see pictures of the old world charm of Norway with a neat, trim little salmon farm in the foreground. What you, as Legislators, aren't being told is that the Norwegians were only able to accomplish that through strict controls on the size of farms, establishment of quasi-public marketing agencies to ensure sales stability and fair treatment of individual small producers, absolute limits on the total number of entrants, etc. - in sum, strong central control over the magnitude, location and conduct of development. Nobody is even talking about those kinds of controls here. So, what will our development really look like?. Odds are it will take the form of large corporate farms with minimal labor inputs. Wherever possible these will be located outside existing cities or villages to avoid local taxes. Managerial personnel will be largely non-Alaskan. This is hardly a view to gladden the hearts of those who see salmon farming as a means to alleviate rural poverty in Alaska, but it is accurate. Just look at what has happened in B.C.

It would be interesting to know if Sealaska, one of the main promoters of this new industry, plans to invest it's own capital, or is it looking for foreign investment capital?

It's true that many of the aforementioned impacts will occur whether or not Alaska allows the farming of salmon. We can do little more than prepare for the glut of high priced fish by assuring our quality standards and strongly promoting the market virtues of "Wild Alaskan Fresh And Fresh-Frozen Salmon."

The only real justification for permitting the pen rearing of salmon in Alaska is to produce benefits for residents of the State. We need to know in what manner and under what conditions pen rearing of salmon can produce benefits to Alaskans which outweigh the social and economic costs of introducing the new industry. The only answer which make sense to us, is one which compliments the existing industry rather than bringing in new people to compete with the existing seafood industry. Unfortunately, the advocates of pen rearing have not provided us with such a solution, and failing that, we don't see any good reason why the State of Alaska should actively contribute to aggravating difficulties for its own industry by permitting and promoting pen rearing of salmon here.

If entrepreneurs want to develop new aquaculture opportunities which do not negatively impact our existing industrial base, that's great. Indeed, we think there are many opportunities for Alaska to get ahead of the competition in new aquaculture technologies. There is already interesting work going on with scallops and oysters, and there is available technology for

lobster culture which might well be adaptable to high value Alaska crab species. These, and a host of other opportunities are what you should be encouraging. However, we ask you to say no to pen rearing of salmon, and urge you to beware of placing the State in a position of having to cope with the economic instability of a new industry which is nearing a major shake-out worldwide.

I would like to close my testimony with these thoughts from an article in the January, 1987 issue (pg. 5) of SEAFOOD INTERNATIONAL headlined "Salmon Prices Fall As Supply Forecasts Rise":

> "Salmon prices are falling, and the Irish Sea Fisheries Board (BIM) is predicting they will continue to do so over the next five years. BIM commissioned a study to examine the potential supply and demand situation for farmed Atlantic salmon in the next decade, and the effects of increased production levels on prices. Using information based on the Norwegian, Scottish and Irish salmon farming industries, BIM concludes that adherence to strict quality standards and efficiency in production, marketing and distribution will become of crucial importance; but prices will still fall. (S)ome experts were forecasting...salmon prices...on a par with cod. The last two months of 1986 certainly saw a drop in price levels (in Europe).In the USA plentiful supplies also pushed prices down, and this is expected to continue. Meanwhile,

in all countries, production forecasts are up for this year. Future emphasis is likely to be on frozen fillets, portions, blocks and prepared items, with merchandising aimed at convincing the consumer that each country's salmon is the best."

SOUTHERN SOUTHEAST REGIONAL
AQUACULTURE ASSOCIATION, INC.

1621 Tongass Ave., #103 Ketchikan, Alaska 99901

(907) 225-9605

Representative Adelheid Herrmann
Alaska State Legislature
P.O. Box V
Juneau, AK 99801

March 4, 1987

Dear Representative Herrmann:

I am writing to encourage you to oppose those portions of House Bill 108, "an act relating to aquatic farming", that address the private pen rearing of salmon. The Board of Directors of the Southern Southeast Regional Aquaculture Association (SSRAA) urges you to exempt salmon from this act. The reasons for opposing this act are:

(1) The state of Alaska is already actively and successfully practicing salmon mariculture and, therefore, the proposed legislation for salmon is not needed.

(2) The act will create limited economic and user benefits for Alaskans.

(3) The act will create negative competition with private nonprofit aquaculture corporations and commercial user groups.

(4) The act will place the current nonprofit aquaculture program at risk.

(5) The net effect of the act would have a negative impact on state employment opportunities.

The Alaska legislature passed an act in 1974 that authorized the private ownership of salmon hatcheries by qualified nonprofit corporations. Following legislation in 1976 that authorized the formation of Regional Aquaculture Associations, SSRAA as well as other Regional Aquaculture Associations, incorporated and initiated projects to contribute, by artificial means, to the rehabilitation of the state's depleted and depressed salmon fishery. A common practice in operating salmon enhancement

projects is to short-term rear the salmon in marine net pens before releasing them to migrate to the sea. The major difference in pen farmed salmon and those produced by private nonprofit corporations (PNP) is that salmon produced by PNP corporations are grown in the open ocean and harvested by the common property fishery; whereas, those produced by pen farming are never released and are grown to harvest size in the net pens.

Those salmon produced by PNP corporations are harvested by the common property fishery providing economic benefit to all user groups, including recreational fishermen, commercial fishermen, processors, subsistence fishermen, the visitors, and all segments of the community. This program is just ten years old and is still developing. The benefits are now being realized and there is still much growth potential. Pen culture of salmon, however, will benefit just a few individuals and mostly large corporations. Experience from Oregon and Washington has shown that most small operations will fail.

If netpen culture of salmon becomes part of the mariculture bill, it will create competition with the PNP corporations for sites. The availability of suitable sites for further expansion of the PNP corporations will be reduced because they will be occupied by the netpen farmers.

Salmon farming would also compete for the available broodstock. Chinook salmon have been determined to be the most desirable. Currently, these broodstocks are being used to supply the expanding enhancement programs of the state and PNP corporations as well as for the rebuilding of the Alaskan wild stocks. Further demand for chinook eggs or other salmon eggs by salmon pen farmers would reduce the current production levels or come from the reduction in harvest in our wild stocks. This would result in fewer salmon being released or harvested to provide the broodstock for salmon farmers. This is undesirable in view of the U.S./Canada treaty and the quota imposed on Alaskan fishermen. This current situation exists in Canada in which the rush for salmon farms has created demand for 38 million chinook eggs from a surplus supply of only 1.3 million.

At present, the PNP programs are providing the broadest economic benefit to all Alaskans and the potential exists for further expansion. The state has already made a financial commitment of over $40 million in the enhancement loan fund to help assure the success of the PNP corporations, and now that the PNP corporations are becoming established they are investing large amounts of their own funds for further growth. Why should the state risk the success of the current PNP program for a questionable unproven salmon farm program? Where is the most benefit to Alaskan residents?

It has been proposed that salmon farming will provide year-round employment. The current PNP corporations are already doing this and are capable of expanding. Just how many new jobs will salmon farming create and how many will be lost from the current user groups? Where is the net benefit?

It has been proposed that farmed salmon are superior to commercially harvested salmon because farmed salmon can be provided all year long. It has also been argued that Alaska should enter this market because it is already happening around the world. Technology has vastly improved the frozen products, and the commercial fishermen and processors have made considerable improvements in handling salmon to keep them fresh. Continued improvements will diminish the argument about freshness; furthermore, Alaska has a developing winter king salmon fishery which will continue to provide year-round fresh salmon. The solution for Alaskans is to maintain a high volume of salmon to remain competitive, not more farm raised salmon which will directly compete in the market place with our commercial salmon. The PNP corporations are in the best position to provide a continued high harvest level which contributes to the economic benefit to the most Alaskans. Alaska is not going to lose its productivity for salmon as other countries have.

If it is desirable to pen rear salmon, why must it be by profit corporations? Alaska determined ten years ago that salmon production should be nonprofit. What has changed in the last ten years? If absolutely necessary, the PNP corporations are already capable of salmon farming. Salmon farming by PNP corporations could be used to help offset cost recovery needs and help repay the state loans. There is no need to have profit salmon farming.

The enclosed tables show the production record of SSRAA since 1984 and forecast the harvest through 1992, assuming the current production capabilities. SSRAA started operations in 1978 and released the first production in 1980. In this short period, the harvest has had a significant impact on the commercial fishery and the recreational benefits near Ketchikan have improved dramatically. The future promises even more benefits and this is the record of only <u>one</u> PNP corporation.

In conclusion, I again emphasize that House Bill 108 is not needed for salmon farming and salmon should be excluded from the bill. The potential for salmon farming already exists in the PNP corporations and, in fact, private salmon farming could negatively impact the future success of the existing PNP program which has a broad economic benefit to Alaskans. Your help to exempt private salmon farming from House Bill 108 would be greatly appreciated.

Sincerely,

Donald F. Amend
General Manager

Enclosures

cc: Alaska Trollers Association
Southeast Alaska Seine Boat Owners and Operators
United Southeast Alaska Gillnetters Association

1986 ADULT RETURNS 16-Feb-87

Species	Location	Brood	SSRAA Harvest	SHA Harvest	Sport Harvest	Commercial Harvest	Total
Chinook	Neets Bay	2,500	1,282	590	1,500	5,700	11,572
	Whitman Lake	559	0	0	100	100	759
	Subtotal	3,059	1,282	590	1,600	5,800	12,331
summer chum	Nakat	10,100	540	0	0	81,103	91,743
	Neets Bay	16,000	15	430	0	21,503	37,948
	Subtotal	26,100	555	430	0	102,606	129,691
fall chum	Neets Bay	47,885	94,218	49,677	0	40,550	232,330
coho	Whitman Lake	6,227	28,823	0	2,556	107,700	145,306
	Neets Bay	22,530	41,568	4,613	4,047	158,000	230,758
	Subtotal	28,757	70,391	4,613	6,603	265,700	376,064
TOTAL		105,801	166,446	55,310	8,203	414,656	750,416
PERCENT		14.1	22.2	7.4	1.1	55.3	

	TERMINAL	COMMON PROPERTY
Number	272,247	478,169
Percent	36.3	63.7

[illegible] FRY/SMOLT RELEASE

	1982	1981	1980	1979	1978	1977	1976	1967 TOTAL
COHO								
W.L.	191,000	224,326	219,422	206,000	326,500	859,600	234,200	150,000
N.E.	282,000	560,000	340,000	960,000	959,000	2,153,000	2,356,000	2,300,000	
E.W.C.	0	0	0	94,600	0	0	100,320	320,000
NAHAT	0	0	0	0	0	0	99,000	92,000
SUBTOTAL	473,000	784,326	559,422	1,260,600	1,285,500	3,009,600	2,789,500	2,740,000
CHINOOK								
W.L.	0	0	145,500	0	0	87,000	113,000	93,000
N.E.	0	0	0	135,000	144,000	831,400	932,000	750,000
C.I.	0	0	0	0	0	0	51,000	600,000
E.W.C.							97,500	300,000
SUBTOTAL	0	0	145,500	135,000	144,000	253,500	1,197,500	1,943,000
STEELY								
NAHAT	1,340,000	3,145,000	5,078,000	6,240,000	0	4,845,000	4,100,000	4,000,000
N.E.	0	0	0	1,140,100	2,844,000	8,300,000	9,500,000	9,000,000
E.W.C.	0	0	0	0	0	0	1,813,000	1,500,000
SUBTOTAL	1,340,000	3,145,000	5,078,000	7,380,100	2,844,000	13,146,000	14,813,000	14,500,000
FALL CHUM								
NAHAT	0	0	0	0	0	12,842,000	2,350,000	3,500,000
N.E.	1,340,000	15,437,000	8,078,000	14,600,000	84,560,000	21,900,000	17,215,000	33,000,000
SUBTOTAL	1,340,000	15,437,000	8,078,000	14,600,000	84,560,000	41,942,000	19,375,000	36,500,000
EXCHANGE	0	0	0	0	0	0	100,000	100,000
GRAND TOTAL	3,153,000	19,366,326	14,055,922	23,423,900	28,834,500	58,359,100	38,100,000	63,781,000
LEASE								
COHO								
W.L.	0	0	0	0	153,000	0	0	0
N.E.	0	0	0	0	754,000		0	0
TOTAL	0	0	0	0	907,000	0	0	0
CHINOOK								
W.L.	0	0	0	0	0	12,000	0	0
N.E.	0	0	0	0	325,500	407,000	2,000,000	1,500,000
C.I.	0	0	0	0	0	0	250,000	250,000
TOTAL	0	0	0	0	325,500	419,000	2,250,000	1,750,000

NUMBER OF FISH - ALL SPECIES

	ACTUAL					05-Mar-87			
GEAR GROUP	1984	1985	1986	1987	1988	1989	1990	1991	1992
TROLL	45,294	73,600	196,603	137,650	155,018	180,234	202,273	210,092	210,092
SEINE	372,451	185,412	136,042	209,969	296,242	287,651	468,934	660,016	675,841
GILLNET	90,300	128,200	116,505	131,891	227,748	278,563	455,842	651,965	692,891
SHA-NEETS BAY	465,142 *	145,826 *	138,060 *	494,165	647,377	573,857	857,271	1,006,649	984,009
TOTAL	973,187	533,038	587,210	973,675	1,326,385	1,320,305	1,984,320	2,528,722	2,562,833

*SSRAA ONLY

SHA OTHER SITES	5,000	3,000	35,050	23,378	99,585	92,871	195,302	240,606	257,818
GRAND TOTAL	978,187	536,038	622,260	997,053	1,425,970	1,413,176	2,179,622	2,769,328	2,820,651

VALUE OF ALL GEAR GROUPS

	ACTUAL					05-Mar-87			
GEAR GROUP	1984	1985	1986	1987	1988	1989	1990	1991	1992
TROLL	$706,400	$788,100	$2,057,882	$1,584,202	$1,944,104	$2,865,645	$3,801,123	$4,148,740	$4,200,000
SEINE	$1,361,000	$794,700	$796,397	$1,153,555	$1,596,739	$1,630,651	$2,616,512	$3,659,142	$3,749,561
GILLNET	$464,900	$647,800	$691,067	$752,034	$1,393,784	$1,457,485	$2,123,129	$3,176,287	$3,455,539
TOTAL	$2,532,300	$2,230,600	$3,545,346	$3,489,791	$4,934,627	$5,953,781	$8,540,764	$10,984,169	$11,405,100

SSRAA PRODUCTION ALL S.E. ALASKA

TROLL-%	28%	35%	58%	45%	39%	48%	45%	38%	37%
SEINE-%	54%	36%	22%	33%	32%	27%	31%	33%	33%
GILLNET-%	18%	29%	19%	22%	28%	24%	25%	29%	30%

SALMON FARMING POSITION PAPER

EXECUTIVE BOARD OF DIRECTORS
PRINCE WILLIAM SOUND AQUACULTURE CORPORATION
P. O. BOX 1110, CORDOVA, ALASKA 99574

Over the past twelve months the Executive Board of Directors of the Prince William Sound Aquaculture Corporation (PWSAC) had debated and discussed the pros and cons of establishing a salmon farming industry in Alaska. These discussions were prompted by the previous administration's apparent desire to explore the feasibility of developing the regulatory, administrative and legislative framework to implement a large scale salmon farming industry in Alaska. Considering the fact that legislation has been introduced to both the House and the Senate specifically for the purpose of legalizing the operation of salmon farms in Alaska, we feel that the time is appropriate to express our opinions and concerns to those individuals and agencies that will ultimately be responsible to formulate statewide policy on this issue. There are two major issues that we feel must be addressed and dealt with before the state takes any further steps towards legalizing the development of a salmon farming industry within state waters.

I. Long Term Social and Economic Impacts - Ocean Ranching vs. Salmon Farming

First of all, it is imperative that a long hard look be given to the relative benefit of ocean ranching vs. salmon farming in years to come. This should be done keeping in mind that success of an industry or undertaking be measured by the sum total of its contribution to the people, communities and industries of Alaska, both in terms of social and economic wealth.

The legislation that created both the private non profit hatchery program and the F.R.E.D. Division of AD&FG charged these programs with the responsibility of enhancing salmon runs statewide so that harvest levels in the common property fisheries would support and industry, meet the desires of sport fishermen, and satisfy the needs of subsistence fishermen. At first glance many people interpreted these programs as a "fish welfare subsidy" by which the state pays the bill and commercial, sport and subsistence fishermen thrive. In fact, after ten years of growing and developing, these programs are on the verge of becoming self-sustaining, cost efficient entities that will represent the backbone of Alaska's second largest industry.

The fishing industry is our largest employer and generates more dollars in ex-vessel value and final product marketing than any other industry in the state besides oil.

The ocean ranching programs in Alaska have undeniably stabilized salmon production in areas where unpredictable fluctuations in wild stock returns has kept the Alaska salmon industry from diversifying and growing due to the lack of a constant, ensured supply of product - a necessity in any resource related industry. Product diversification and progressive marketing strategies for pink and chum salmon have just begun to be explored. These avenues of development, aided by the consistant supply of wild and enhanced salmon we have realized in the early 1980's, have provided the salmon industry with its first long term, optimistic outlook in many years.

To try to express the value of Alaska's ocean ranching programs in terms of a cost benefit ratio is virtually impossible. The production of ocean ranched salmon provides fish to be harvested, jobs in the processing industry, product to be marketed and a consistant supply of product year to year. This assures lending institutions that investment in the industry is well-founded. As well as these direct benefits, there are the infinite number of multipliers of income generated to communities and support services throughout the state as the revenues associated with handling large volumes of salmon filter down.

This past year in Prince William Sound (PWS) the ADF&G estimated that 55% of the entire pink salmon harvest can be attributed to ocean-ranched production. The failure of wild stock returns to PWS was not predicted. Without the private non profit and F.R.E.D. Division enhancement programs, millions of dollars invested by fishermen and processors preparing for the coming season would have been lost. Raw fish tax revenues that supplement the city's operational and capital funding needs would have been greatly reduced. Ultimately the state would have had to deal with these losses in the form of subsidies or at least supplemental funding requests from the city. By 1992 PWSAC alone will generate better than $20 million dollars in direct revenue to commercial fishermen. State investment and support of these programs to this point has been indispensable and demonstrates a great deal of foresight. To sell these programs short now would be a tragic mistake.

Specifically, it is the long term social and economic benefits that ocean ranching has provided that we feel are lacking within the proposed salmon farming industry. It is an undisputable fact that all ocean ranching production by the regional association and private non profit facilities is carried out on a zero budget level by the corporation involved. Incorporated under non-profit status as required by the enabling legislation and subsidized by commercial fishermen through a mandatory enhancement tax, the sole

purpose of this program is to produce fish for harvest in the common property fisheries. The only money retained by these corporations are used for operational funding and retirement of long term debt to the state's revolving hatchery loan fund.

In contrast, the salmon farming industry would operate as a strictly for-profit venture. According to the House Research Agency report "Aquaculture In Alaska" (H.R.A.-A.I.A.), most likely the major investment base in this industry would come from Scandinavian banks, similar to salmon farming development in British Columbia. Alaska has just begun to turn the tide of foreign investment in its fishing industry. If any one word stands out as a calling card to Alaska's fishing industry in the past five years, it is Americanization and what the implementation of the Magnuson Act has done toward that end. If the investment base in the salmon farming industry is for the most part other than domestic, it is safe to assume that the profits will be realized by other than domestic entities. If this is the case and it seems to be a worldwide trend in the salmon farming industry, why should Alaska invest it's resources (water and land) and it's money (resource agency monitoring and regulatory development) in salmon farming when it already has a program (ocean ranching) that it has funded that directly benefits its people and a thriving established industry.

Salmon farming is not a labor intensive undertaking. According to the House Research Agency Report Aquaculture In Alaska; Norway, the country that pioneered salmon farming directly employed only 2,000 individuals in 1984. This hardly represents an industry that could make a significant contribution to the job market in coastal Alaska. There are that many people employed directly by the salmon industry in the small town of Cordova in any given year.

The December 1986 issue of Fish Farming International reports in an article by the Irish Sea Fisheries Board (BIM):

> "BIM's conclusion from this is that the imbalance of projected supply and demand by 1990 could cause reductions in prices and margins greater than farmers and traders presently envisage.
>
> Lower margins will force the least efficient producers out of the industry and will deter potential small-scale new entrants.

> The emphasis on greater efficiency will stimulate high standards of technology and training and a larger minimum-volume production unit.
>
> Salmon farms based on integrated smolt and sea cage production are unlikely to be less than 500 tons a year capacity, notes the BIM report.
>
> Investment needed for such a project would be around UK 22 million pounds and would be capable of earning 18 per cent internal rate of return.
>
> But the investment is risky. A drop of ten per cent in real revenues through low prices would halve the rate of return. A stock loss say every five years (through disease or unusual weather conditions) would reduce this return to zero."

If this prediction by experts within the salmon farming industry proves true, it is clear that a developing industry in Alaska has little chance to establish a significant market share for a product that already shows signs of saturating the market for which it produces.

Further, the investment capital and the level of technology necessary to operate at the scale suggested in order to be competitive predicates an industry that holds very little hope for any vertical integration. This scenario is more likely to create high volume production salmon farms financed by large, multinational corporations that do nothing more than create a few local jobs and pass profits on to parent corporations.

Taking these facts into consideration is is hard to visualize this state government, confronted with extremely limited funding for existing programs, creating an industry (salmon farming) that will require extensive agency monitoring and regulatory development, while offering negligible long term social or economic benefits to the State of Alaska.

II. Salmon Farming: Funding and Operational Considerations

The House Research Agency report Aquaculture In Alaska suggests in its section on options for financing of salmon farms that repayment of capital construction loans from the private non profit aquaculture corporations to the revolving hatchery laon fund could be used to fund the development of salmon farming. On page 21 of the report the author states "The cornerstone of Alaska's aquaculture industry is the State's system of public (F.R.E.D. Division) and private non

profit (PNP) salmon hatcheries which are designed to augment the state's natural runs. As enumerated in Chapter One, by almost any economic measure (i.e,. employment, income, total economic activity), aquaculture is probably the best renewable resource investment the state has made with it's oil wealth."

In the preceding paragraph the author speaks of the tremendous, wise investment the state has made in its ocean ranching program. Yet in the next chapter he suggests taking away the only available funding mechanism the PNP hatchery program has to continue investing in its own and the state's future.

This rationale remains a mystery to us. Perhaps the authors need to be reminded that large portions of those loan repayments are made with funds generated by commercial fishermen paying a mandatory enhancement tax. We suggest that if the House Research Agency had held public hearings as recommended by the Fisheries Mini Cabinet Aquaculture Advisory Committee, they would have been informed by the public that fishermen much prefer their enhancement tax funds be used to further the combined effort of the PNP program and the F.R.E.D. Division in tranditional enhancement and ocean ranching endeavors rather than financing a fledgling salmon farming industry.

The Regional Planning Team concept, a combined effort of regional aquaculture corporations and the sport, commercial, subsistence and F.R.E.D. Divisions of ADF&G have produced Regional Salmon Plans throughout the state that define the enhancement needs of each individual region. These plans develop a list of priority projects that will help achieve the enhancement needs of their respective regions. The only mechanism for funding available to the private sector to achieve these goals is the revolving hatchery loan fund and it is imperative that it remains in tact.

In the House Resource Agency report Aquaculture In Alaska the authors explain that if salmon farming were to become a reality both the genetics and disease control staff and lab facilities would need to be expanded. This represents only two of the many state programs in which both capital and operational funding would have to be expanded to support the salmon farming industry. From our point of view as a regional aquaculture association charged with responsible and beneficial enhancement development in PWS, this is where we find the greatest conflict between salmon farming and ocean ranching in Alaska.

Consider this fact: in 1987 the F.R.E.D. Division claims it will not operate its Cannery Creek hatchery in PWS. This facility cost the state $4 million dollars in 1979. The hatchery can rear 111 million pink salmon eggs when filled to capacity. Because of a lack of $180,000 in operational funding, the Cannery Creek facility will forego producing a return in 1989 of as many as 3.5 million adult pink salmon. It is very unlikely that there is any other situation in which the state could invest $180,000 and produce direct revenues of $3.5 million dollars, not to mention associated revenue to local communities through raw fish tax funds, local work force in the processing and shipping industry and support services region-wide that generate their income as large volumes of salmon are harvested in the region.

We are in a time that the state isn't even able to fund ongoing projects that for a relatively small investment can potentially produce significant economic gain. It seems irrational for the state to even consider the development of a new venture (salmon farming) that will not only require considerable state support but further, is most likely not even comparable to existing established programs in terms of its potential long term benefits.

In conclusion, we thank you for taking the time to consider our point of view on these issues. Most importantly, we hope you have gained a better understanding of how crucial the continued funding and development of our aquaculture programs are to Alaska's future.

Matthew Luck, on behalf of the
Executive Board of Directors
Prince William Sound
Aquaculture Corporation
February 24, 1987

CONSTANTINE - ALASKA IVORY TRADERS

GARRI R. CONSTANTINE
BOX 207
DOUGLAS, ALASKA
99824

CAPITOL 108
DEAR REP. HERRMANN

CONCERNING HB 108 ADDRESSED BY YOUR BODY RELATING TO SEA FARMING, I,AND MY FELLOW FISHERMEN WHO ARE DISCOURAGED BY A STATE GOVERNMENT THEY FEEL IS PUTTING THEM OUT OF BUSINESS, STRONGLY URGE YOU LOOK VERY CLOSELY AT ANY LEGISLATION DESIGNED TO ENCOURAGE THE PRIVATE FARMING OF FISH, ESPECIALLY SALMON, ANYWHERE IN ALASKA.

IT IS NOT ALARMIST AT ALL FOR MYSELF,AS A POWER TROLL FISHERMAN, TO BE CONCERNED BY AN INDUSTRY WHICH UNDERSELLS MY MARKETS WITH A CHEAPER, IF EVEN IN SOME OPINIONS, SUPERIOR PRODUCT, FLOODING AN ALREADY SEASONALLLY SATURATED MARKET IN FRESH FISH. I DO NOT PROPOSE WE IGNORE THE SEA FARMING INDUSTRY ALTOGETHER, BUT THAT IT WOULD BE EXTREMELY UNWISE FOR THE STATE TO SANCTION A PRIVATE FOR PROFIT SALMON FARMING INDUSTRY WHICH WOULD UNDERCUT THE ALREADY DISTRESSED INCOMES OF A LARGE NUMBER OF ALASKA'S SALMON FISHERMEN.

TO CLOSE, I SUPPORT ALL PRIVATE NON-PROFIT HATCHERIES, AND ANY EFFORTS TO FARM SALMON FOR BROOD STOCK OR EGGS FOR THEM. I CANNOT SUPPORT ANY LEGISLATION DESIGNED TO COMPETE WITH ALASKA'S FISHERMEN OF FRESH, WILD FISH, AND HOPE IN YOUR DELIBERATIONS YOU WILL CONCUR. THANK YOU FOR YOUR CONSIDERATION OF THIS OPINION.

PUBLIC OPINION MESSAGE

DEAR: REPRESENTATIVE DAVIDSON

NAME: LONNIE WHITE, PRESIDING OFFICER
TITLE: KIB ASSEMBLY
ADDRESS: 710 MILL BAY RD.
CITY: KODIAK ZIP: 99615
PHONE: 486-5736
BILL NO: HB 108
SUBJECT: MARICULTURE BILLS
MESSAGE: THE ASSEMBLY'S POSITION IS SUPPORTIVE OF DEVELOPING A MARICULTURE BILL WHICH WILL ALLOW SHELLFISH MARICULTURE TO DEVELOP. PRESENT SYSTEM IS TOO STIFLING AND DISCOURAGING TO DEVELOPMENT. THE ASSEMBLY FURTHER BELIEVES THAT SALMON MARICULUTE SHOULD BE ADDRESSED UNDER A SEPERATE BILL.

POMID: 09161227
DATE: 02/27/87
TIME: 16:12:27
LIONAME: KODIAK LIO

COPIES: SENATOR

ZHAROFF

Irene Miller
P.O. Box 995
Petersburg, Alaska 99833

March 20, 1987
Fifteenth Alaska State Legislature
First Session, 1987
P.O. Box V,
Juneau, AK 99811

I am concerned about House Bill 108, particularly the pen rearing of salmon. I make my living by trolling for salmon in S.E. Alaska and if Alaska lets these salmon farms in the state (which are dominated by foriegn investors) it will direcly affect my livelynood and investments.

The jobs created by salmon farms will not justify the number of commercial salmon fishermen you will be eliminating. Why destroy an already productive industry that is in Alaska and for Alaska?

Where is the money going to come from to manage these 'farms' in an already scarce state government budget?

State loans to commercial fishermen may be in jeopardy and present loans may be forced into non payment if we can't sell our product. There are already more than enough salmon farms to supply our countrys fish needs and by 1990 we will see a flooding of the market, driving down prices which already is happening.

We have a viable source of wild salmon which is renewable. Norway's salmon farms are subsidised by their government. Current information on salmon farming shows environmental impacts which have not been considered in this bill. More research is needed before we can allow pen reared salmon in Alaska.

Pen rearing of salmon does not belong in bill 108. We need to address these problems and others before we let this bill through.

Irene Miller

MAR 23 1987

Re: House Bill 108: Relating to aquatic farming, specifically the pen-rearing of salmon.

From: Jean Shannon
Box 1211
Petersburg, Ak., 99833

20 March, 1987

Dear

My name is Jean Shannon, I live in Petersburg and am a permanent, seasonal Fisheries Technician for the Department of Fish and Game. I am very concerned with House Bill 108 which addresses the issue of aquaculture and, more specifically, the pen-rearing of salmon in Alaskan waters.

In it's present form, were it to pass, the bill leaves too many questions unanswered and doesn't adequately provide for the safety of the Alaskan environment or its wild stocks of fish. Where I am not opposed to various other forms of aquaculture, for example, oyster or scallop farming, which would mean the development of a heretofore unexploited resource, I fail to see why anyone would find it necessary to pen-rear salmon when Alaska already contributes 43% of the world harvest of salmon.

As a state employee, I am acutely aware of the pressure that has been brought to bear on the department as a result of our failing oil revenues. Fewer employees generally means a more conservative management policy which in turn leads to a smaller harvest and less return to enhancement programs and the state in the form of the fish and aquaculture taxes.

It will be interesting to see this year how well the Bristol Bay fishery is managed without the benefit of their counting towers, a system that provided vital daily escapement statistics and played a key role in determining what areas to open and close. Fish and Game already has a tough time keeping a handle on their management responsibilities and increasing these duties

without allocating additonal funds only promises a more conservative management policy, hence reduced harvests, less money in local communities and less revenue to the state.

House Bill 108 does not sufficiently provide for careful management of an aquaculture program. Fish and Game offices are struggling to maintain the programs they already have in place, I don't see how they will be able to perform such tasks as site selection and inspection, issuing of permits, and the implementation of a disease control center, not to mention the additional personnel they would be required to hire. Any bozo could obtain a permit to pen-rear salmon (there are no educational qualifications or restrictions included in this bill), but it would fall on the shoulders of the Fish and Game to make sure the operation were properly carried out.

With the Norwegians experiencing a 1-2% escape rate from their facilities and virtually no wild stocks of their own to threaten, how could we take such a chance when our natural stocks are still so strong and diverse? Let's protect and cultivate what we're lucky enough to still have. Why play genetic roullette when the stakes are so high?

This bill makes no provisions or requirements for the protection of the environment or its wild stocks of fish. From House Bill 108, page 3, section c, "The commissioner of Fish and Game... may attach conditions to an aquisition permit..." and, further down the page, section e, "The commissioner of Fish and Game may deny or restrict a permit...if...the proposed harvest will...impair sustained yield of the species". The burden of proof rests solely with the department and requires them to give facts explaining their action. The benefit of the doubt seems to rest exclusively with the permit holder.

In addition, the bill states that Fish and Game will provide brood stock for these facilities. Does this mean that fishmen will be shut down in order to attain those goals?

Finally, one of my greatest concerns has to do with the displacement of fishermen and their family's as these farms get going. I do not believe they are compatible with commercial fishing nor do I believe that most Alaskans would benefit from their influx. It is my impression that is foreign investors, like Mor-

way, who are ready and eager to move in and set up pen-rearing in Alaska. Is this because they are quickly using up available sites in their own country? They have already had to destroy 22 facilities due to disease and are in the process of converting others for rearing cod and halibut.

Fishing, especially here in Southeast, represents a traditional way of life and is inextricably interwoven in our communities. I see how budget cutting strained our local Fish and Game offices last year and these next few years won't be much better. The Stikine River project was forced to shut down after 6 weeks instead of running for its original 4 months. I don't know if I'll have a job this summer. It would be foolish to thrust even more responsibility in the departments lap.

House Bill 103 (and Senate Bill 106) is full of holes and I urge you to not only vote against it but to lobby actively in committee for its defeat.

Sincerely,

Jean Shannon

Dear John,

MAR 19 1987
MAR 23 1987

I hope this letter will give you a few topics that need to be discussed & facts that must be brought forward before we can consider approving fish farms in Alaska. This is the time of year for us to get out and make some money as fishermen and I hope you will point this out to the other Resources committee members when the teleconference comes around the 1st of April. Many of us will be out working and may not be able to vocalized our misgivings About H.B. 109

I hope more of the House

members will start giving some serious thought to this bill, thank you very much for your support & work on this issue.

Chris Shapstar

Julie Hursey
Box 213
Petersburg, Alaska

Dear Representative Sand,

I am a commercial fisherman from Southeast Alaska, and I am very concerned about the passage of House Bill 108 and its counterpart Senate Bill 106. Before outlining my arguments against the passage of these bills, I would like to say that I am not opposed to aquaculture ever being developed in Alaska. In fact, shellfish aquaculture could be an economically viable industry here, and co-exist well with the existing fisheries. However, the development of any kind of aquaculture must follow a careful management plan, so that our existing fisheries resources are not adversely effected. My main argument with these bills is that they do not outline a careful or specific plan for development of aquaculture, and they leave too many crucial issues unresolved.

I have worked at several hatcheries around the country, and also helped establish a shellfish hatchery and management program back in Massachussetts. I have seen what thoughtful planning and development of aquaculture can be. In order for it to be successful, a management plan must be in place prior to development, to oversee site selection and to monitor water quality. This program must also be responsible for conducting inspections of the sites to maintain health standards and to ensure the protection of the environment, as well as control any problems with disease.

My particular concern is the effects that uncontrolled development of salmon farming could have on our wild stocks. It is a fact that if salmon farms are not carefully sited, fish wastes and excess feed can cause a pollution problem. Also, if the site is not carefully located, salmon populations become stressed and subject to disease. The effects of the disease problem on our wild stocks is not known. There were very few natural stocks in Norway to worry about. Eventually they developed "green zones" though, which were aquaculture-free, to protect what few stocks they had.No "green zones" are mentioned in these bills. Canada is already experiencing problems with the improper siting of salmon farms, and they now have a moratorium on new permits.

Neither of these bills mention a specific management plan for the development of aquaculture. Much of the responsibility for health inspections and the permitting procedure will be given to the Department of Fish and Game, but there is no indication as to where this money will come from. With the state's declining revenues, there is no extra money in the budget to fund this essential management program. It would be expensive to run such a program too. It would require quite a staff to oversee permitting, and also run a pathology lab, not to mention the costs of transportation to remote sites for inspections. This could not be funded at this time without diverting funds from our existing fisheries management programs. This is not an option.

Another issue that is not addressed in these bills is how disputes over an area will be resolved between conflicting user groups. Salmon farms could be located in areas that have been traditionally used as anchorages, fishing grounds, recreational areas, or even as marine transportation corridors. Canada is already having problems with these kinds of conflicts now, and it has reached serious proportions, according to Vince Goboyan, a Canadian delegate from the Canadian Standing Senate Committee on Fisheries. According to these bills, there would be no opportunity for fishermen to have any input into the decision-making process of site selection, since the Board of Fish is specifically precluded from participating. This hardly seems fair.

Julie Hursey
Box 213
Petersburg, Alaska

There has not been adequate research done on the resources available to develop a successful aquaculture industry. I have seen no mention of studies that show an inventory of the areas that are available to support aquaculture projects. This is not sufficient preparation for developing a viable new industry, and more research must be done on the feasibility of aquaculture before money is earmarked for its development. Research is necessary to determine how many places are appropriate for aquaculture, and whether there will be a conflict between user groups for that area. Another essential consideration is whether an area being considered for aquaculture already serves as a spawning or nursery grounds for wild stocks of fish.

Proponents of aquaculture say that it will create new jobs. Salmon farming in particular could eventually displace at least as many people as it would employ. However, not enough research has been done to determine the economic impacts that salmon farming could have on the existing commercial fisheries. More research is needed in this area. Fishermen and fishing communities have invested heavily in their boats, their gear, their permits and in related service industries. When fishing no longer provides a viable livelihood, will fish farming fill those gaps?

Fish farming is extremely expensive. The high costs of feed, brood stock and labor will make the costs of running these farms exorbitant; whether or not they could produce a competitive product for market is problematic. Countries like Chile have much cheaper labor costs. Norway subsidizes much of their salmon farming industry, including the transportation costs of getting fish to market. None of those factors will come into play up here. Even if we started fish farming today, by the time that the fish got to market, they would be competing against countries that can produce fish cheaper, and would probably be facing a glut on the market. The production of pen-reared salmon from existing facilities is predicted to increase between 250% and 500% by 1990, while seafood consumption in this country anyway, is only expected to rise 25%. That spells over-production and market glut to me.
over to raising cod.

Since salmon farming is so expensive and capital-intensive, it is unlikely that the individual Alaskan will be able to participate as an owner/operator of a fish farm. There is no mention in the bills of any loan fund or financial resources to ensure that Alaskans are able to get into this industry at the management level. Any person can buy an Alaskan business license and get into aquaculture here, so it would be very easy for large corporations and/or foreign investors to monopolize the industry. Individual Alaskans may then only play a minor part in this industry, which may have far-reaching effects on the marine environment, and the existing fisheries resources, which are such an important economic base in Southeast Alaska. This makes no sense.

So I strongly disagree that we should rush through the "window of opportunity" offered by developing aquaculture at this time. It looks like Alaska could drop ten flights down to the pavement by jumping headlong into fish farming in particular. I do not believe that we should start an industry, and then develop a management plan as we go along either. That is extremely short-sighted, and could offer only band-aid solutions to the major problems that could arise.

Julie Hursey
Box 213
Petersburg, Alaska

Alaska has a legacy of a boom and bust economy. It is time that we learned from our mistakes. Rushing into something for quick gains, without an eye on the future has gotten us into trouble before. In fact, the commercial fisheries were almost destroyed earlier in this century by over-fishing. Now we have fairly effective management plans, and healthy wild stocks. It is our responsibility to protect these. All fishermen sacrifice in some way to these mamangement programs, either through giving up fishing time, or areas, or even through restrictions in the kinds of gear that can be used. Many of us have paid the high costs of limited entry permits. Much time, work and money have gone into the research and enforcement of our fisheries management plans. I cannot see why another new industry should be developed without careful study of impacts it might have on the existing fisheries resources, the commercial fishermen, and the marine environment. We stand to lose too much.

Please consider these arguments carefully. I think one day that aquaculture will be developed in Alaska but it must be done right. I oppose these two bills, House Bill 108, and Senate Bill 106, because they do not provide adequate planning for the development of aquaculture, and they do not outline safeguards against adverse impacts to the existing fisheries resources. Even if they did outline an adequate management plan, we cannot afford to fund it at this time, in the face of declining state revenues.

Thank you for taking the time to read and consider this.

RICK G. BRAUN, L.S.
Land Surveying
Construction Planning
207 Sixth Street P. O. Box 211
PETERSBURG, ALASKA 99833

(907) 772-3986

Memo
LETTER

To JOHN SUND
P.O. BOX V
JUNEAU, AK 99811

Date 3/15/87
Subject PUBLIC RADIO
MANUFACTURE

DEAR MR. SUND.

I'd like to express my opinion on two issues that are important to me. The first is funding for public radio, particularly radio station KFSK. Public radio is an essential service to our communities. If KFSK's funding is reduced to such a level that local news and community activities and events could not be aired, we in Petersburg would suffer a significant loss in our quality of life.

The second issue that concerns me is the Manufacture Bill HR 3398 / SB 1216 (AK), which it is essential that you work hard to ensure that this bill is passed in some form this year. In fact that the environmental and economic issues can be resolved. This country has shown that we have problems and we can solve. Solving problems in timber will strengthen not weaken timber's fragile industry and could provide a much needed boost to coastal communities.

☐ Please reply ☐ No reply necessary

SIGNED Rick G. Braun

3/17/87

Rep. John Sund:

I'm writing to you concerning House Bill 108 "An act relating to aquatic farming". I would urge you to consider this bill very carefully. Its far-reaching effects will loom large, both economically & environmentally.

This proposed bill has absolutely no provision for oversight by the Board of Fish.

Norwegian fish-farms, which have inspired recent activity here planned & implemented over many years, carefully, & with a high regard for natural stocks & economics of traditional fishermen. The Norwegian farms are highly regulated & subsidised to accomplish this.

Please do not let this bill become law in its present form.

Sincerely, William Flor
Box 262
Petersburg

March 15, 1987

David Barth
Box 304
Petersburg

Senator Jones, Representatives Sund and Taylor
Fifteenth Alaska State Legislature

Dear Sirs;

Even if you support salmon farming in Alaska you should not support HB-108 and SB-106. The repercussions should these bills pass could be devastating, both economically and environmentally.

Without proper safeguards, and these bills contain few, foreign investors would likely walk away with most of any profits the new industry might yield. This problem notwithstanding, the State quite simply can not afford the financial burden implied by HB-108 and SB-106.

When we consider the possible effects pens of fish might have on our environment, more questions arise than can yet be answered. Will a new disease be spread to wild stock Alaskan salmon? How many stocks of crab and other shellfish will be impacted or destroyed by these floating farms? We should not even consider salmon farming legislation until these questions and more like them can be answered.

Now I would like to tell you why I will never support pen rearing in Alaska. Quite frankly, Alaska may contain more first class pen sites than any other state or country in the world. We also lead the world in something else: wild salmon! In fact, "Alaska produces 43% of the world harvest of salmon." This is why I was astonished when I heard Ted Stevens announce to the United States Senate our "need" in Alaska for salmon farming..."to ensure a future supply of salmon."

I have been convinced for some time Alaska is our last hope to learn from past mistakes in how we treat our environment. The state of Washington, for example, is past saving as the world's great salmon producer. Twenty-seven dams on the Columbia River may be the least of the problem. Consider Elwell Creek for a minute. My wife's parents live on a bluff above this large tributary to the Skykomish River, northeast of Seattle. By coincidence Neil Peterson, who parks his boat next to mine in the Petersburg harbor, grew up on a farm across the Skykomish from the mouth of Elwell Creek. He can testify to the teeming hordes and herds of salmon, steelhead, and deer once present, when he was a kid, in and along Elwell Creek. There are still deer in the woods, but there are no fish left in the creek. The entire Skykomish system took a huge nosedive years ago when the first pulp mill opened up downstream on the Snohomish River. And I have visited my inlaws' enough to know Elwell Creek is a raging brown torrent within hours after rain hits the logged-off hills above.

And consider Redmond Creek. My sister lived on the stream in 1984

and 1985. Each fall she and her family were delighted to witness salmon spawning in their own backyard. And each fall they were horrified to wake up one morning to discover every fish belly up in a backeddy, dead on a sand-bar, or gone. It seems the farmer upstream would periodically dump large loads of cow manure into the creek, effectively suffocating every swimming thing. My sister called everyone she could think of, but what little action she got was much too late. These stories go on and on in Washington and the rest of the country. Will we let this happen to Alaska?

The catchphrase in the business world is "growth." The reality of life is "balance." When is growth enough? Before or after all of the old growth forests are cut? Before or after all rivers are dammed? Before or after every state in the union is developed? Alaska is and should remain the undeveloped state. Here in Southeast we have a rural economy unlike any other in the world. We don't pay much attention to the stock market because we are too busy earning a living. Our air is clean, our water is clean, the animals are in the woods and the fish in the rivers like they have been for eons. We have traditional native villages and immigrant Scandinavian towns coexisting peacefully as we earn our living from the sea. We have a salmon treaty with Canada, both to rebuild depressed wild stocks and to ensure future catch allocations. We also have made huge investments in the enhancement of wild salmon through NSRAA, SSRAA, FRED, and Fish and Game hatcheries. We do not need salmon farms and there is no good argument for them.

If pen rearing worldwide presents major competition to our own salmon markets, why should we even consider contributing to the problem? If salmon farms will provide jobs it will only be through displacement of existing jobs. If they will produce large profits these profits will mostly be lost to foreigners. And if no environmental disaster has happened yet elsewhere, where wild salmon are mostly non-existent, how can we know what future organism may arise from the muck beneath some corporation's pond? Can we afford to take the chance? No!

Please put down HB-108 and SB-106. And please do not ever support salmon farming in Alaska. Thank you.

Sincerely,

David Barth

Dear Jerry Sandy,

I am writing you today concerning H.B 108 and S.B 106 which are presently before the legislature. I have been reading "Aquaculture in Alaska" and as a fisherman am appalled by this "unbiased" report authored by Brad Pierce trying to sell Mariculture and specifically salmon farming to the legislature. Out of 105 pages there is one page devoted to "Negative Impacts", it is extremely hard to believe that an objective report compiled by a qualified researcher and paid for with state money would include only a bare bones statement of Negative Impact.

I am a fisherman residing in the state of Alaska and yes I do like my "Autonomy and Individual freedom", by exercizing this I would like to add a few observations that were obviously overlooked by Mr. Pierce in his report. You have read 104 pages urging you to rush through the "window of opportunity" into salmon farming, I only wish to point out a few pitfalls that may lay just beyond the sill and strongly urge a cautious approach.

Number one in my mind as a resident of Alaska is who is going to pay for the permintation, regulation, inspection and control of the proposed new industry. H.B 108 will put will the above burdens on the Dept. of Economic Development, Dept of Fish and Game and the Dept. of Environmental Conservation. Where is this money going to come from in a time of shrinking budgets without cutting already underfunded

programs. The cost will not be born by the salmon farms in the form of fees, all one has to do is look at other state regulatory agencies and compare state money required to run the agency with fees collected Is an anaylisis of the potential cost of this program to the state before the legislature?

In ALASKA we produce 43% of the world salmon harvest and we are working to maximize our wild stocks while supplimenting this production with various hatchery enhancement programs What will happen to our natural resource if a bacterial disease infects the salmon farms? Remember there is an unavoidable 1 to 2 percent pen escapeage, in 1983 such a disease struk the Norwegian Farms requiring the destruction of 2,900 metric tons of fish This type of disease or an even more virulent form produced by antibiotic resistant strains could wipe out enormous populations of wild salmon. Is there a research paper before you outlining these risks and listing the proper precautions against the possibility of this ocurring?

In these bills before you I do not see any consideration given to historical use of a potential salmon farm site. Sites could be permitted that would render unusable ① A traditional foul weather anchorage ② Present juvenile stock rearing grounds ③ Shellfish fishing grounds ④ Release sites for our existing enhancement programs. Before site permits can even be

considered this type of information must be compiled, has a study been completed and are these facts before the potential permitting agency?

My letter is getting a bit long but I hope my point is coming through. I am not against salmon farming because I have a "xenophobic attitude, we live in a wonderful state with bountiful natural resources and a historic economic dependency on the harvesting of that resource. I do not want to see us "going uncontrolled, without really looking at it carefully" as they are doing with salmon farming in B.C according to Vince Gobegan of the Canadian Standing Senate Committee on Fisheries. H.B 108 and S.B. 106 are of that approach. By contrast the Norwegians started slowly and carefully on their farming endeavor, studying closely their habitat with protection and full use in mind. This effort was also highly subsidized by the government and occured in a portion of the world with almost non-existant wild stocks. I trust this legislature will not be glittered into jumping on the wagon "before it's too late" ; rather than gathering all pertinent facts required to form solid legislation.

These are some additional areas that may require in depth research so that a good mariculture bill can be drawn up.

① Potential environmental damage due to feces and un-used fish feed.

② The effect of the possible forecasted glut of Pen salmon by 1990 on newly created

Alaskan farms (Dec. 1988 co. Fish Farming International)

③ Salmon Farm job breakdown- will Alaskans <u>really</u> obtain these newly created jobs.

④ Will small local Alaskan investors and residents be able to participate" A significant portion of the investment capital driving salmon-farming development in British Columbia is coming from foreign, mainly Scandanavian banks" Aquaculture in Alaska

⑤ Potential economic damage to Alaskan Fisherman by setting up in-state compitition. Possible job loss in the fishing industry and support industries

⑥ Impact on wild stock streams near pen sites

⑦ Cost effectiveness of feed prices and transportation in Alaska. Will the State end up subsidising these farms untill they become potentially profitable as was done in Norway?

I want to thank you for taking the time to read my letter and hear my concerns I also want to assure you that I am not anti-mariculture but feel we should not proceed on such a wide open scale untill more facts are before us. Please do not be pressured by fancy folders, persistant lobbyists, Big companies and promises of jobs and economic gain for Alaskans into passing a loosly structured bill like H.B 108 or S.B. 106.

When drawing up Mariculture legisla-

tion the Governors Mariculture Advisory Committee policy recommended that "every effort be made to assure that the developing Aquaculture industry: ① be complementary to and not in conflict with the existing fishing industry ② be economically viable and self-sustaining ③ provide opportunities for family and other small scale businesses ④ provide an overall enhancement to the marketing image of all Alaskan seafood products and ⑤ give due consideration to wild stocks"

Thank You
Chris Thompson
P.O 1255
Petersburg, Alaska
99833

MAR 3 1 1987

Julie Hursey
Box 213
Petersburg, Alaska
99833

Dear Representative Herrmann;

This is a petition that was circulated here in Petersburg, over a period of about two weeks. Actually, petitions were placed at the hardware store, and the Harbormaster's Office,and people signed as they passed through those places. Not all of these people are fishermen either. I realize now that we should have had a space for people to put down their occupations. I recognize the names of people who are boatyard workers, store owners, surveyors,fish buyers, and cannery workers. I am sorry that I did not have this included, as I think it would have been more meaningful in showing the breadth of people who expect that House Bill 108 could affect their lives. Well, I am learning.

It also would have been useful for people to note the fisheries they are involved in. This list represents seiners, gillnetters, crabbers as well as trollers.

I am hoping that you have been receiving letters from our community, and other communities throughout the state, telling you how the passage of this bill will affect their lives. We will have a few people from the community testifying next week during the teleconference, but many of them will be out fishing. I hope that those of us who do testify will be able to represent the others who share our opinions.

Thank you very much for your concern over this bill. I listened to the testimony all last week, and appreciated your focused questioning of the people who testified before the Resources Committee. Your questions showed that you quite concerned about the issue, and are thinking about it very carefully. That is what is needed now. Please keep up the good work!

Sincerely Yours,

Julie Hursey

Petition to the Legislature of Alaska

Concerning House Bill 108 "Acts relating to aquatic farming"

WHEREAS The introduction of a pen-reared salmon industry in Alaska would negatively impact existing fisheries and

WHEREAS Such an industry would compete with and possibly preclude customary uses of bays and estuary areas and

WHEREAS This industry would pose a serious biological threat to healthy stocks of wild Alaskan salmon and

WHEREAS The existing foreign pen-rearing salmon industry is already going to over-produce, making a fledgeling Alaskan industry untenable and

WHEREAS The pen-reared salmon industry will require substantial new funding to allow regulation and

WHEREAS House Bill 108 fails to properly address these concerns:

The undersigned urge the Legislature of Alaska to VOTE DOWN House Bill 108.

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DATE:	NAME:	SIGNATURE:	ADDRESS:
5-12	Frank White	Frank White	Box 20 PSG AK

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DATE:	NAME:	SIGNATURE:	ADDRESS:
			Box 1532
			Box 1532
5/23/87	DOROTHY ENGLE	Dorothy Engle	Box 315 Petersburg, AK 99833

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The undersigned urge the Legislature of Alaska to VOTE DOWN House Bill 108.

DATE:	NAME:	SIGNATURE:	ADDRESS:
3/21/87	Bonnie Westlund	Bonnie Westlund	Box 945 Petersburg, Ak
3/21/87	MARCIA A-FARRELL	Marcia A Farrell	BOX 1456 Petersburg
3/21/87	Jeff McFadyen	Jeff McFadyen	Box 572 Petersburg
3/21	[illegible] PARKS	[illegible] Parks	Box 787 Petersburg, AK
3/21	Mike Fillings	Mike Fillings	Box 305 PSG AK

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DATE:	NAME:	SIGNATURE:	ADDRESS:
18			
19	Kim McFarlane		Box 542
			Box 304 Petersburg
	Craig Curtiss		Box 1012 PSG
	Robert Haltiner		Box 848 PSG
8/19	~~Michael Medalen~~		
8/19	Michael Medalen		Box 1443

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DATE:	NAME:	SIGNATURE:	ADDRESS:
3-16	BRETT J. PAYNE		BOX 164
3-16			BOX 243
3-16	JOHN SVENSSON		BOX 704

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DATE:	NAME:	SIGNATURE:	ADDRESS:
3/16	Bill George	William George	~~305~~ Lumber St Petersburg
	James Stromoski	James Stromoski	1207 S Nordic Drive Box 1326
	Curtis R. Norwick	Curtis R. Norwick	Box 1165 Petersburg
	Michael L. Carter	Michael L. Carter	Box 1237 Petersburg
	[illegible]	[illegible]	[illegible]
3/17	James E. Mock	James E. Mock	Box 1558 Petersburg
	Joseph G. Deerr	Joseph G Deerr	Box 67 Petersburg
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
	Suzanne Fuqua	Suzanne Fuqua	Tokeen, Alaska 99950
3/22	Christopher Pace	Christopher Pace	Box 146 Petersburg

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DATE:	NAME:	SIGNATURE:	ADDRESS:
2/8/87	Sigrid C. Medalen	Sigrid C Medalen	Box 352 Petersburg
2-[illegible]	Schuyler Klein	[illegible]	[illegible] 716 Petersburg
2-22-87	James C White	[illegible]	[illegible]
2-22-87	Edward H Crawford	Edward H Crawford	Box 1421 Petersburg
2-24-87	Stetson K. Peterson	Stetson Peterson	Box 1245 Petersburg, Ak
2-24-87	Dean H. Schneiteen	[illegible]	[illegible]

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DATE:	NAME:	SIGNATURE:	ADDRESS:
2/9	Max Hattinger		P.O. Box 516 Petersburg, AK
2/9	Tom Capes		P.O. Box 645 Petersburg, Ak
2/9	John P. DeBoer	John P. DeBoer	Box 455 [illegible] AK
2/9	[illegible]	[illegible]	P.O. Box 455 Pt Baker, AK 99927
2/9	[illegible]	Don Hernandez	Box 45 Pt. Baker AK 99927
2/10	[illegible]		Box 503 Pt Alexander, AK 99835

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The undersigned urge the Legislature of Alaska to VOTE DOWN House Bill 108.

DATE:	NAME:	SIGNATURE:	ADDRESS:
	Patrick J Collins	Patrick J Collins	Box 153 Petersburg
2-3-7	[illegible]	FN PAULSEN	318 1st

NORTHERN SOUTHEAST REGIONAL AQUACULTURE ASSOCIATION, INC.

103 Monastery Street Sitka, Alaska 99835 (907) 747-6850

MAR 31 1987

March 27, 1987

Representative Adelheid Herrmann
Alaska State Legislature
Pouch V (MS 3100)
Juneau AK 99811

Dear Representative Herrmann:

Enclosed you will find a copy of a resolution adopted at a recent meeting of the Northern Southeast Regional Aquaculture Association Board of Directors. Since you are now considering HB 108 we felt that our opinion should be conveyed to you at this time.

If we can be of any assistance to you in making the best decision for Alaska's fisheries resource, please feel free to contact me at 747-6850.

Sincerely,

Pete Esquiro
General Manager, NSRAA

PE/sp

ENCLOSURE

NORTHERN SOUTHEAST REGIONAL AQUACULTURE ASSOCIATION, INC.

103 Monastery Street Sitka, Alaska 99835 (907) 747-6850

Resolution
of
The Board of Directors
Northern Southeast Regional Aquaculture Association

Whereas; NSRAA opposes the inclusion of finfish farming in Senate Bill 106 and House Bill 109 entitled Aquatic Farming. and

Whereas; Passage of legislation allowing the farming of finfish, particularly salmon, will have an affect on existing fisheries programs. and

Whereas, Alaska already has in place a very effective salmon ranching program with participation of the State. Regional Aquaculture Associations. as well as other private Non-Profit operators, and

Whereas; The affects upon the State. its existing programs. and the State's fishing industry have not yet been fully defined, and

Whereas; NSRAA's Board of Directors believes that allowing the farming of salmon in the State's waters will have long term affects on the industry as it exists today in terms of available enhancement sites. the ability to protect wild stocks, pathology, genetics as well as the marketing of fish currently being produced.

Now Therefore Be It Resolved That; the State of Alaska secure funding for a real socio-economic study of the effects of pen-rearing of salmon on the Alaska commercial fisheries, subsistence fisheries, communities, businesses, environment, and existing ocean salmon ranching programs.

Be It Further Resolved That; the State of Alaska impose, at a minimum. a two-year moritorium on issuing finfish farming permits until studies have been funded and completed, and

Be It Further Resolved That: the State of Alaska must consider the present and future economic values of tideland. bay, and coastal water resources and should require something comparable to an environmental impact statement (EIS) which evaluates the effect on existing fisheries prior to issuance of permits.

Be It Finally Resolved That. the State of Alaska as custodian of the State's resources has the responsibility to provide protection for existing resources and must be prepared to provide pathological, genetic. inspection and permitting services if these bills are enacted.

This resolution was unanimously approved by the Board of Directors at its annual meeting held on February 28, 1987.

Del Telfert, Secretary/Treasurer

MAR 3 1

Susan Stanford
Bare Island
Port Bailey alaska

Dear Rep Herrmann and Rep Cotton,

Iam a fisherman and am very upset by the proposed House Bill 108 I strongly urge the quick defeat of this bill and any more that address the same issue. I support fisheries reinnancement for the wild stock but do not under any circumstances support the house bill 108 for mariculture/ This bill directly threatens the small fishermen like myself and sets up Mega Corporations to furinish the fish from Alaska. I will be watching this very closely.

Sincerely

Susan Stanford

MAR 31 1987

March 24, 1987

Rep. Adelheid Herrmann
Rep Sam Cotten
Co-chairmen House Resources

This letter is to urge your opposition to HB 108.

I am a Limited Entry Permit Fisherman in the Kodiak area. As such I support and recently voted to impose a 2% tax on our fish for rehabitat work and all forms of enhancement of wild fish stock.

But I strongly oppose the fish farming in HB 108. We do not need the large mega buck corporations -- that are now waiting -- to jump into local fish farming. This has happened already outside.

Thank you for your opposition

Walt Cunningham
Bare Island
Port Bailey Alaska 99697

MAR 3 1 198?

March 24, 1987

Co-Chairman - House Resource Committee

Rep. Adelheid Hermann:

In regard to House Bill 108 and Senate Bill 106. We feel it is imperative that you do not allow these bills to pass, unless you amend them for shellfish and plant maricuiture only. We strongly oppose fish farming in Alaska. This bill would only benifit a few people, mostly non Alaskans, at the expense of many Alaskan people. We would hope you would better spend your time promoting State hatcheries, non profit aquaculture and wild natural Alaska salmon for the benifit of the vast majority of Alaskans.

Please do not pass any bills in regards to mining or logging, which would damage any salmon spawning streams. Thank you.

Sincerely,

Peter and Robin Blake

Peter and Robin Blake
Box 1792
Cordova, Alaska
thirty seven year Res.

MAR 31 1987

March 23, 1987

Rep. Adelheid Herrmann
P.O. Box V
Juneau, AK 99811

Dear Adelheid Herrmann,

We would like to bring up House Bill 108 and Senate Bill 106 on the Aquatic Farming in Alaska.
Our feelings on these Bills are for support for the Shellfish and Plant Mariculture under a Controlled development, but we "Oppose Fish Farming" in the Senate and House Bills.
My wife 29 years old and myself 30 years old have two children and have lived our entire lives in Alaska all of which has been in Cordova. Our only means of livelihood and financial support is from commercial fishing and has been that and that of many generations of our families in Alaska.

We feel that if Fish Farming is allowed in Alaska it will threaten our livelihood and our traditional fishing grounds non the less will be in direct competition with the commercial fish markets. There are other misconceptions by the general public that Fish Farming will be a cheap and inexpensive investment to get into. Wrong, with studies already completed the average starting cost is 180 - 220 thousand dollars for a small Fish Farm.

Since there is a several year wait for any return of any income this brings a question to me - Who can afford to invest into Fish Farming?
Is the State of Alaska going to loan 220 thousand dollars to the average Alaskan who wants to get into a new business, and has no experiance in this feild ? NO !!

So what do we have left but huge corporations and investment firms, but not the average Alaskan. So there goes more easy money taken from Alaska, but does the money stay in Alaska ?
Where does the money go ? Who gets it ? How many jobs does Fish Farming create for Alaskans at the same time , how many jobs does it ruin and take , how many businesses and fisherman lose do to the effect of Fish Farming in Alaska ? Has there been any research on this subject ? What about the disease problems or the contamination of our wild stocks ? Where are these Fish Farms going to go, and are they going to take over beaches and shorelines used by traditional Sports, commercial and subsistence user groups ?

What about the impacts on our natural enviroment from the use of Toxics (THT) , Antibiotics etc.. used by Fish Farms ? Where do the Fish Farms get their eggs or smolt ? Do we take a chance of a fish pen or pens of imported salmon getting loose and mixing with our local wild stocks ? What would happen ?

I can understand you thinking this letter a bit of a doomsday and paranoid outlook on a new Fishery for Alaska, but as so far none of of the questions in this letter and many many more have so far been answered.
So what it all comes down to is, if Fish Farming is allowed in Alaska then the decsion is a Premature and Irrational decsion and under what basis would the decsion be made ?
For the good af all Alaskans or a very few outside Alaskan Investors ? What is the long term effect to Alaska and our children ? Let's take our time and think before we react.
There could be very much at stake here.

Thank You,

John & Kim Johnson

MAR 3 1 1987

4458 Melan Drive
Fairbanks, AK 99712

March 27, 1987

Rep. Adelheid Herrmann
Co-Chairmen House Resources Commmittee
P.O. Box V
Juneau, AK 99811

Dear Representative:

I am opposed to a bill allowing fish farming. I am a commercial fisherman myself and have worked at the little Port Walter research station as a fish tech for ADF&G.

It may be that fish farming is a growing industry but I don't feel that that reason alone is enough to force Alaska into it. I also realize there are many Alaskans eager to get into fish farming but in my experience they don't have a very good understanding of commercial fishing or its impact as a longstanding industry.

It may be inevitable that fish farming come to Alaska but I fail to see the urgency to develop it. Other countries are making mistakes that we in Alaska could benefit from if fish farming is developed in the future.

Other topics that should be strongly addressed before legislation is passed is how these farms should be started, who will start them, or how the environmental problems will be handled.

In light of Alaska's current economic situation I realize there is a desire to get more industry started but I don't think Alaska is desperate and I don't think we are going to be.

Therefore, I think fish farming in Alaska should be entered into very slowly and with consideration for current and longstanding businesses. I suspect fish farming in Alaska will have a serious impact on Alaska commercial fishing regardless of what extent fish farming is being done outside the state.

Sincerely,

Ronald W. Bennett

3/23/87

MAR 23 1987

Julie Hursey
Box 213
Petersburg, Alaska

Dear Representative Herrman;

I am a commercial fisherman from Southeast Alaska, and I am very concerned about the passage of House Bill 108 and its counterpart Senate Bill 106. Before outlining my arguments against the passage of these bills, I would like to say that I am not opposed to aquaculture ever being developed in Alaska. In fact, shellfish aquaculture could be an economically viable industry here, and co-exist well with the existing fisheries. However, the development of any kind of aquaculture must follow a careful management plan, so that our existing fisheries resources are not adversely effected. My main argument with these bills is that they do not outline a careful or specific plan for development of aquaculture, and they leave too many crucial issues unresolved.

I have worked at several hatcheries around the country, and also helped establish a shellfish hatchery and management program back in Massachussetts. I have seen what thoughtful planning and development of aquaculture can be. In order for it to be successful, a management plan must be in place prior to development, to oversee site selection and to monitor water quality. This program must also be responsible for conducting inspections of the sites to maintain health standards and to ensure the protection of the environment, as well as control any problems with disease.

My particular concern is the effects that uncontrolled development of salmon farming could have on our wild stocks. It is a fact that if salmon farms are not carefully sited, fish wastes and excess feed can cause a pollution problem. Also, if the site is not carefully located, salmon populations become stressed and subject to disease. The effects of the disease problem on our wild stocks is not known. There were very few natural stocks in Norway to worry about. Eventually they developed "green zones" though, which were aquaculture-free, to protect what few stocks they had. No "green zones" are mentioned in these bills. Canada is already experiencing problems with the improper siting of salmon farms, and they now have a moratorium on new permits.

Neither of these bills mention a specific management plan for the development of aquaculture. Much of the responsibility for health inspections and the permitting procedure will be given to the Department of Fish and Game, but there is no indication as to where this money will come from. With the state's declining revenues, there is no extra money in the budget to fund this essential management program. It would be expensive to run such a program too. It would require quite a staff to oversee permitting, and also run a pathology lab, not to mention the costs of transportation to remote sites for inspections. This could not be funded at this time without diverting funds from our existing fisheries management programs. This is not an option.

Another issue that is not addressed in these bills is how disputes over an area will be resolved between conflicting user groups. Salmon farms could be located in areas that have been traditionally used as anchorages, fishing grounds, recreational areas, or even as marine transportation corridors. Canada is already having problems with these kinds of conflicts now, and it has reached serious proportions, according to Vince Goboyan, a Canadian delegate from the Canadian Standing Senate Committee on Fisheries. According to these bills, there would be no opportunity for fishermen to have any input into the decision-making process of site selection, since the Board of Fish is specifically precluded from participating. This hardly seems fair.

Julie Hursey
Box 213
Petersburg, Alaska

There has not been adequate research done on the resources available to develop a successful aquaculture industry. I have seen no mention of studies that show an inventory of the areas that are available to support aquaculture projects. This is not sufficient preparation for developing a viable new industry, and more research must be done on the feasibility of aquaculture before money is earmarked for its development. Research is necessary to determine how many places are appropriate for aquaculture, and whether there will be a conflict between user groups for that area. Another essential consideration is whether an area being considered for aquaculture already serves as a spawning or nursery grounds for wild stocks of fish.

Proponents of aquaculture say that it will create new jobs. Salmon farming in particular could eventually displace at least as many people as it would employ. However, not enough research has been done to determine the economic impacts that salmon farming could have on the existing commercial fisheries. More research is needed in this area. Fishermen and fishing communities have invested heavily in their boats, their gear, their permits and in related service industries. When fishing no longer provides a viable livelihood, will fish farming fill those gaps?

Fish farming is extremely expensive. The high costs of feed, brood stock and labor will make the costs of running these farms exorbitant; whether or not they could produce a competitive product for market is problematic. Countries like Chile have much cheaper labor costs. Norway subsidizes much of their salmon farming industry, including the transportation costs of getting fish to market. None of those factors will come into play up here. Even if we started fish farming today, by the time that the fish got to market, they would be competing against countries that can produce fish cheaper, and would probably be facing a glut on the market. The production of pen-reared salmon from existing facilities is predicted to increase between 250% and 500% by 1990, while seafood consumption in this country anyway, is only expected to rise 25%. That spells over-production and market glut to me.
over to raising cod.

Since salmon farming is so expensive and capital-intensive, it is unlikely that the individual Alaskan will be able to participate as an owner/operator of a fish farm. There is no mention in the bills of any loan fund or financial resources to ensure that Alaskans are able to get into this industry at the management level. Any person can buy an Alaskan business license and get into aquaculture here, so it would be very easy for large corporations and/or foreign investors to monopolize the industry. Individual Alaskans may then only play a minor part in this industry, which may have far-reaching effects on the marine environment, and the existing fisheries resources, which are such an important economic base in Southeast Alaska. This makes no sense.

So I strongly disagree that we should rush through the "window of opportunity" offered by developing aquaculture at this time. It looks like Alaska could drop ten flights down to the pavement by jumping headlong into fish farming in particular. I do not believe that we should start an industry, and then develop a management plan as we go along either. That is extremely short-sighted, and could offer only band-aid solutions to the major problems that could arise.

Julie Hursey
Box 213
Petersburg, Alaska

Alaska has a legacy of a boom and bust economy. It is time that we learned from our mistakes. Rushing into something for quick gains, without an eye on the future has gotten us into trouble before. In fact, the commercial fisheries were almost destroyed earlier in this century by over-fishing. Now we have fairly effective management plans, and healthy wild stocks. It is our responsibility to protect these. All fishermen sacrifice in some way to these mamangement programs, either through giving up fishing time, or areas, or even through restrictions in the kinds of gear that can be used. Many of us have paid the high costs of limited entry permits. Much time, work and money have gone into the research and enforcement of our fisheries management plans. I cannot see why another new industry should be developed without careful study of impacts it might have on the existing fisheries resources, the commercial fishermen, and the marine environment. We stand to lose too much.

Please consider these arguments carefully. I think one day that aquaculture will be developed in Alaska, but it must be done right. I oppose these two bills, House Bill 108, and Senate Bill 106, because they do not provide adequate planning for the development of aquaculture, and they do not outline safeguards against adverse impacts to the existing fisheries resources. Even if they did outline an adequate management plan, we cannot afford to fund it at this time, in the face of declining state revenues.

Thank you for taking the time to read and consider this.

Julie Hursey

3-20-97

Mrs. Ray Arnold Jr.

I am writing to ask you to take no action on the farming portion of Spec Bill 108. This will threaten our livelihood as commercial fishermen and the economy of many Alaskan coastal towns.

It takes an awful lot of money to buy a commercial fishing boat and it is not the only investment. Gear, farming and the actual fishing must also be considered. Many of us have worked very hard to put ourselves through school and college.

The state has invested millions of dollars in a very successful hatchery program. It would make sense to cut funding there and channel it into fish farming.

Please protect commercial fishing and the economy of Alaska.

Sincerely,

Roberta + Lee Carter

MAR 24 1987

3-20-87

REP Adelheid Herrman

I would like to go on record
for opposing HB 108 AND
SB 106. (Providing a basis for
Aquatic farming in Alaska)
If this type of thing
continues Commerial Fishing
in Alaska by individuals
will be a thing of the past.

Thank you
Dennis Brown
Copper Center AK
99573

FROM THE DESK OF

KEN MUELLER, PH.D.
EAST ANCHORAGE PSYCHIATRIC GROUP
1709 BRAGAW, SUITE B
ANCHORAGE, ALASKA 99508
TELEPHONE (907) 276-7374

MAR 2 4 19[illegible]

Dear Rep. Hallford Herrmann.

I urge you to oppose fish farming since it ultimately will threaten the price structure for your district's fishermen & will transfer economic value from the "little" fishermen to the hands of large corporations.

House Bill 108 & SB 106 must be opposed.

Thanks,

Ken Mueller MD

MAR 2 4 1987

Re: House Bill 108: Relating to aquatic farming, specifically the pen-rearing of salmon.

From: Jean Shannon
Box 1211
Petersburg, AK., 99833

20 March, 1987

Dear

My name is Jean Shannon, I live in Petersburg and am a permanent, seasonal Fisheries Technician for the Department of Fish and Game. I am very concerned with House Bill 108 which addresses the issue of aquaculture and, more specifically, the pen-rearing of salmon in Alaskan waters.

In it's present form, were it to pass, the bill leaves too many questions unanswered and doesn't adequately provide for the safety of the Alaskan environment or its wild stocks of fish. Where I am not opposed to various other forms of aquaculture, for example, oyster or scallop farming, which would mean the development of a heretofore unexploited resource, I fail to see why anyone would find it necessary to pen-rear salmon when Alaska already contributes 43% of the world harvest of salmon.

As a state employee, I am acutely aware of the pressure that has been brought to bear on the department as a result of our failing oil revenues. Fewer employees generally means a more conservative management policy which in turn leads to a smaller harvest and less return to enhancement programs and the state in the form of the fish and aquaculture taxes.

It will be interesting to see this year how well the Bristol Bay fishery is managed without the benefit of their counting towers, a system that provided vital daily escapement statistics and played a key role in determining what areas to open and close. Fish and Game already has a tough time keeping a handle on their management responsibilities and increasing these duties

without allocating additonal funds only promises a more conservative management policy, hence reduced harvests, less money in local communities and less revenue to the state.

House Bill 108 does not sufficiently provide for careful management of an aquaculture program. Fish and Game offices are struggling to maintain the programs they already have in place, I don't see how they will be able to perform such tasks as site selection and inspection, issuing of permits, and the implementation of a disease control center, not to mention the additional personnel they would be required to hire. Any bozo could obtain a permit to pen-rear salmon (there are no educational qualifications or restrictions included in this bill), but it would fall on the shoulders of the Fish and Game to make sure the operation were properly carried out.

With the Norwegians experiencing a 1-2% escape rate from their facilities and virtually no wild stocks of their own to threaten, how could we take such a chance when our natural stocks are still so strong and diverse? Let's protect and cultivate what we're lucky enough to still have. Why play genetic roullette when the stakes are so high?

This bill makes no provisions or requirements for the protection of the environment or its wild stocks of fish. From House Bill 108, page 3, section c, "The commissioner of Fish and Game... may attach conditions to an aquisition permit..." and, further down the page, section e, "The commissioner of Fish and Game may deny or restrict a permit...if...the proposed harvest will...impair sustained yield of the species". The burden of proof rests solely with the department and requires them to give facts explaining their action. The benefit of the doubt seems to rest exclusively with the permit holder.

In addition, the bill states that Fish and Game will provide brood stock for these facilities. Does this mean that fishermen will be shut down in order to attain those goals?

Finally, one of my greatest concerns has to do with the displacement of fishermen and their family's as these farms get going. I do not believe they are compatible with commercial fishing nor do I believe that most Alaskans would benefit from their influx. It is my impression that as foreign investors, like Nor-

way, who are ready and eager to move in and set up pen-rearing in Alaska. Is this because they are quickly using up available sites in their own country? They have already had to destroy 20 facilities due to disease and are in the process of converting others for rearing cod and halibut.

Fishing, especially here in Southeast, represents a traditional way of life and is inextricably interwoven in our communities. I see how budget cutting strained our local Fish and Game offices last year and these next few years won't be much better. The Stikine River project was forced to shut down after 6 weeks instead of running for its original 4 months. I don't know if I'll have a job this summer. It would be foolish to thrust even more responsibility in the departments lap.

House Bill 105 (and Senate Bill 106) is full of holes and I urge you to not only vote against it but to labor actively in committee for its defeat.

Sincerely,

Jean Shannon

Jean Shannon

Dear Mr. Herrmann

I understand that House Bill 105 has recently come into the Resources Committee which you sit on & I hope you will carefully consider the proper-ations this bill would have on our state's fishing industry. Please vote "no" and urge your fellow representatives to do the same.

Thank you

3-21-87

MAR 24 1987

Dear Michael Berman.

I am sorry that I did not file an answer in the divorce proceeding on behalf of Jeff Gerstein. The document must reach Mr. Gerstein and put it in the hands of the executors

personal feeling as Andrea man attorney, dirty with other women but she has been filing a depraved testimony - the world may add to it, with many more out of work.

She has many divorces that fit her natural nature - more the case that you protect the Fiduciary. Fiduciary.

Thank you.

William Gerstein

Irene Gerstein

MAR

Irene Miller
P.O. Box 995
Petersburg, Alaska 99833

March 20, 1987
Fifteenth Alaska State Legislature
First Session, 1987
P.O. Box V,
Juneau, AK 99811

I am concerned about House Bill 108, particularly the pen rearing of salmon. I make my living by trolling for salmon in S.E. Alaska. If Alaska lets these salmon farms in the State (which is eliminated for foreign investors) it will directly affect my livelyhood and investments.

The jobs created by salmon farms will not justify the number of commercial salmon fishermen you will be eliminating. Why destroy an already productive industry that is in Alaska and for Alaska?

Where is the money going to come from to maintain these 'farms' in an already scarce state government budget?

State loans to commercial fishermen may be in jeopardy and present loans may be forced into non payment if we can't sell our product. There are already more than enough salmon farms to supply our countrys fish needs and by 1990 we will see a flooding of the market, driving down prices which already is happening.

We have a viable source of wild salmon which is renewable. Norway's salmon farms are subsidized by their government. Current information on salmon farming shows environmental impacts which have not been considered in this bill. More research is needed before we can allow pen reared salmon in Alaska.

Pen rearing of salmon does not belong in bill 108. We need to address these problems and others before we let this bill through.

Irene Miller

Irene Miller

MAR 2 - 1

March 19, 1987

Dear Rep. Adelheid Hermann,

I would like to address House Bill 106 + House Bill 103 currently in the Alaska State Legislature.

I oppose both of these bills about fish farming, not about shellfish or plant mariculture.

I believe the State of Alaska has not performed an in depth study of the biological economic and sociological problems and potentials of salmon pen rearing in Alaska.

State funds and service for DEC, DNR and F&G divisions at DF&D, already cut back due to shrinking revenue, will have to be further reallocated to address salmon farming.

The potential for disease contamination of the wild stocks has not been explored at all. In 1985 a Russian fish farm well free to choose 10,000 units [illegible] of farmed salmon. All to contaminated stock, but since

Norway doesn't have its own salmon runs who know what would have happened.

It is my firm belief that it is essential that studies be done and safeguards be developed to ensure that Alaska's already healthy commercial fishing industry is protected.

Thank you for your time.

Ernest Hickman
P.O. Box 770061
Eagle River, Alaska
99577

THE PRECEDING DOCUMENT(S) MAY NOT FILM LEGIBLY BECAUSE OF POOR QUALITY OF THE ORIGINAL.

4-2-87
DATE

TO: REP. HERMAN, REP. GRUSSENDORF, SEN. ELIASON

FR: SITKA WITNESSES *

SENT BY SITKA, ALASKA LEGISLATIVE INFORMATION OFFICE.

NUMBER OF PAGES INCLUDING THIS ONE: 3
PLEASE NOTE THAT WE HAVE A RAPICOM 230 AUTOMATIC TELECOPIER, THIS MACHINE CANNOT TRANSMIT PAGES LARGER THAN 8½" x 14". OUR TELECOPIER DIRECT LINE IS (907) 747-5807.

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BILLED TO: _____

* Testimony is provided from:

AL BROOKMAN (pgs 2-3)

MR. BROOKMAN SHORTENED HIS TESTIMONY & PRESENTED THE FOLLOWING REMARKS DURING THE APRIL 2 TELECONFERENCE:

My friends and Fellow Alaskans:
I am Al Brookman, Sr., and I am grateful for this opportunity to testify against Senate Bill 106 and House Bill 108 in this statewide teleconference. I have researched this subject of mariculture carefully and feel that the name 'mariculture' is just a red herring to hide the real meaning, which is salmon farming. After careful consideration, I think that the meaning and intent of these identical companion bills is deceitful and downright dangerous to all salmon fishermen in the State of Alaska, including sportsfishermen. Mariculture covers a wide range of aquatic endeavors, and there is a lot of opposition to the whole concept of farming in the sea, in Alaskan waters.

I know that the Japanese are trying to get control of the macrocistic kelp that grows in its natural state around Sitka, but the local mosquito fleet would never permit that to get started without their participation because we had a good thing going before the bungling efforts to preserve law and order by the Alaska State Troopers failed, and a gang of out-of-town drunken outlaws brazenly stole over a million dollars worth of roe on kelp in front of the rightful owners, almost causing a massacre.

So there is a lot of angar directed against the authorities in locking us out from this valuable and important fishery.

As for shellfish farming, there is the ever present spectre of paralytic shellfish poisoning (PSP) that would prohibit the harvesting and sale of shellfish.

Pen raised salmon would be a glut on the market and dangerous to Alaska's burgening wild salmon stocks that are a gourmet fish eater's delight. In spite of the high pressure advertizing, pen raised salmon are a very poor product. These small juvenile salmon raised in a crowded environment have a low-oil content and are devoid of the life saving OMEGA-3 found in all seafoods and would not even make a decent pet food! So the whole enabling bill should be defeated and political retaliation taken against its sponsors.

A SPEECH TO BE DELIVERED TO A TELECONFERENCE ON SENATE BILL 106 & HOUSE BILL 108

by Al Brookman, Sr. Reading Time 6 minutes

The ruling class cannot rule without the consent of the governed, and I deeply resent the fact that we/who intend to present rebuttal to an endless flock of tame pigeons extolling the blessings of salmon farming will have to wait two weeks before we get a chance to be heard.

These bills have been introduced by a consortium of unthinking people that have no regard for the more than 20,000 voters that make their living from fishing ocean-going wild salmon stocks in the clean, pure environment of the Gulf of Alaska and adjoining waters.

If this monstrous bill is crammed down our throats we will retaliate in every way possible. First, by taking political revenge on the sponsors of these bills. Then by every legal means at our disposal. Because we will never give in to the curse that has been visited on the decent people of British Columbia by a few dishonest politicians and the moneyed people of Japan, Norway, and probably English, French, and South African capital as well.

The truly big money of the world knows no boundaries and pays allegiance to a $1,000.00 bill waving gently in the breeze. What the Japanese failed to do with warfare has now been accomplished by turning our rotten monetary system against us.

Before we knew what was happening, the Japanese moneyed interests moved in and bought controlling interests in 80% of the processing plants in Alaska. So now the Alaska salmon industry is held in bondage by our Japanese masters..

We go fishing when they give the word, and the season ends when they give the command because they control the market. Salmon farming expansion had to be stopped in Norway because of the filth from salmon excrement polluting the water and causing highly contagious viruses to attack the juvenile salmon, causing the farmers to use huge amounts of antibiotics to save all the stocks from destruction. Then the government stopped further expansion. Even when they have no wild stocks to protect like we have.

This dumping of tasteless, immature salmon has undermined the price structure that we have nurtured so carefully with quality control and millions of dollars in advertizing.

Sincerely, Al Brookman, Sr.

4-2-87
DATE

APR 0 2 1987

TO: Rep. Herrmann, Rep. Grussendorf, Sen. Eliason

FR: Sitka Witnesses *

SENT BY SITKA, ALASKA LEGISLATIVE INFORMATION OFFICE.

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* Testimony is provided from:

- Bill Froust (pgs 2-3)
- Steve Laposk (p. 4)
- City & Borough (p. 5-8)

TO: REP. HERRMANN, REP. GRUSSENDORF, & SEN. ELIASON

FR: BILL FROUST, BOARD OF ALASKA TROLLER'S ASSOCIATION & CHAIRMAN OF TROLL PAC
3009 HFR - SITKA, AK. 99835

RE: TESTIMONY CONCERNING MARICULTURE LEGISLATION /HB 108

MY OBJECTIONS TO MARICULTURE OF SALMON

Pen rearing of salmon is too dangerous to the existing resource to even consider in Alaska. There's the ever-present danger of disease spreading to our natural stocks. We are told that due to the unusual stresses of confinement, disease runs rampant in the pens. In Norway, in 1988, they had to destroy the entire stocks in 29 out of 40 pens, at a loss of approximately $110 million. Studies tell us that an average escape rate of 1% is to be expected. In Norway, their major salmon streams had already been destroyed, so they had little risk, but here in Alaska, we produce 90% of all U.S. wild salmon--43% of the total worldwide. We're doing everything we can to increase this percentage through state and private aquaculture work. The fishermen in Alaska are the only fishermen in the world who have voluntarily taxed themselves to produce more fish. Nature is a fragile resource and it is only man that upsets it. We can only enhance it very crrefully. If, through greed, we destroy the natural runs of salmon, all of Alaska would pay for it. Why take a chance to allow a few out-of-state (and probably out-of country) people a shot at the "pot of gold at end of the rainbow" when we already have the best pot of gold, being shared by the people of Alaska?

The use of modern technologies without adequate knowledge of the consequences can be disastrous. Consider: Ever since salmon farming was begun, they've been using TBT to control scum on the nets. These fish are confined in the contaminated area throughout their life-span, absorbing this deadly poison. How many pen-reared fish consumers are walking around with TBT in their systems? It was our own Little Port Walter facility, concentrating, not on the commercial aspect, but on the scientific aspect, of fish farming that discovered this. Why wasn't it discovered sooner? Also, antibiotics have been used routinely in farm animals for many years, and although it has been known for a long time that the indiscriminate use of antibiotics can lead to virulent disease strains that are resistant to treatment, it has only been recently discovered that these strains can be transmitted directly to humans through the meat. (See the Sitka Sentinel, March 9, page 8).

One of my major concerns in this area of a lack of knowledge is what we do NOT know about the spread of disease. I have talked with some of the researchers at Little Port Walter, and they have confirmed my suspicions. NOBODY knows just how these diseases are spread, whether strictly through direct contact, or through feed-fish, algae, other natural organisms, or even through the water itself. If it's only through direct contact, our worries would be limited to the escapees, but I don't think anybody believes THAT! If it's carried through the water itself, how far does it reach? And if it's through the food chain--it makes me shudder to think of the damage we might do.

Now, how about the economics of the situation? Is it really the bonanza that some seem to think it is? Norway got into it first, and they really made a killing, because they had no competition. Now 13 nations have fish farms. By 1995, according to "Fish Farming International", there will be a projected excess of 23,000 tons. They go on to say that only the larger farms that produce 500 tons or more per year will be able to survive. A farm this size is estimated to cost around $3 million or more. So tell me..how is our "younger generation of Alaskans", who can't break into the present fishing industry, going to benefit from "getting in on the ground floor of this marvelous new opportunity"? Where is ANY individual going to get that kind of money?

All this won't be free to the state, either. I have a copy of the study that was done to estimate the cost vs. revenue to the state. It shows that by 1992, the projected cost will be around $600,000 per year, for managment and pathology as opposed to revenue of about $70,000, from licenses and permits. If this is such a lucrative business, why is it necessary for the state to subsidize it to the tune of $530,000 per year?

How can Alaska compete against Washington, Oregon, and Canada when we would have to fly the fish out? I submit that Alaska is too late and the investors are likely to find that their "pot of gold" is only "fool's gold" after all.

Bill Tunnell
Board of A.T.A.
Chairman of Zull Pac

TO: Rep. Herrmann, Rep. Grussendorf, & Sen. Eliason

FR: Steve Laposki, Oysters 'n Such
146 Wolff Drive, Sitka, AK 99835

RE: Testimony Concerning Mariculture Legislation

4-2-87
AFTER 10 AM

I AM A SHELLFISH GROWER IN S.E. ALASKA.
I ADAMANTLY OBJECT TO HAVING MY OYSTER
FARM THROWN IN WITH THE QUESTIONABLE BILLS
106 & 108. I AM OPPOSED TO A GENERAL BILL
THAT ENCOMPASSES BOTH FINFISH & SHELLFISH.

TO: REP. HERRMANN, REP. GRUSSENDORF, & SEN. ELIASON

FR: MAYOR DAN KECK / DEPUTY MAYOR MAXINE BRITELL

CITY & BOROUGH OF SITKA, 304 LAKE ST. RE: TESTIMONY & RESOLUTION RE: MARICULTURE

M A R I C U L T U R E T E S T I M O N Y

Good morning. My name is ~~Dan Keck~~ and I am presently the Mayor for the City and Borough of Sitka. I would like to take this opportunity to explain our position regarding Mariculture in general and pen raising of salmon in particular.

Sitka as some of you might not know has been mentioned in "National Fisherman" as being one of the highest value rated ports in the entire United States. At present, approximately 28% of our economic work force is in some way related to fisheries. Due to our outside location and water quality, Sitka is being strongly viewed as a excellent location for major mariculture activity. While we realize that it is the state that will determine the future of this industry, locally, we have the following concerns.

A shellfish mariculture appears to hold promise in S.E. Alaska. The problems associated with it such as importation of spat, proper health testing and good site selection all appear to be technical or scientific aspects that can be overcome. Its prime appeal, is that it might create a NEW UNDEVELOPED growth industry for the state. It is my understanding that most communities and the fishing groups have no major problem with this side of the mariculture proposal. Where the debate and concern all focuses, is on the pen raising of salmon.

There is an old saying that we have all heard. "If it ain't broke, don't fix it." I have a great deal of difficulty understanding the reasons for the great rush to allow salmon farming. Alaska has invested over the years

in State hatcheries. The aquaculture bill allowed private non-profits to also engage in hatchery production. The common thread is that they all release salmon into the common property fishery. This not only increases commercial catch of salmon for the growing world market for fish but it increases the recreational sport fish catch which not only assists all of us in our subsistence and recreation but contributes to the potential for tourism growth, our second largest state industry. Tourism assists the charter boats, the general business retail community and the effects ripple throughout the economy. If Alaska feels we need to proceed with a larger world market share for our salmon, we have the mechanisms in place to increase production. ASMI or the Alaska Seafood Marketing Institute as well as the State Department of Commerce and Economic Development can both increase efforts to market Alaska salmon.

Pen raising of salmon immediately raises several concerns of private single ownership rather than common property fisheries, potential large scale investment requirements inviting speculation, foreign control and direct competition with a healthy existing industry and the unnecessary fixing of a industry that is NOT in difficulty such as the oil industry. From our point of view, salmon farming is speculative, has many negative implications and would only hurt, not help our existing fisheries.

At their regular meeting of March 24, 1987, the Assembly of the City and Borough of Sitka, passed Resolution 87-343. This resolution requests that the Legislature OPPOSE any legislation that would permit the pen raising of salmon in Alaska. While we all realize the efforts within the State to seek new industry to augment and reduce our economic dependance on a single industry such as oil, Sitka does not believe that salmon ranching is the answer.

RESOLUTION NO. 87-343

A RESOLUTION OF THE ASSEMBLY OF THE
CITY AND BOROUGH OF SITKA
REQUESTING THE ALASKA STATE LEGISLATURE
TO OPPOSE ANY LEGISLATION WHICH WOULD PERMIT THE
PEN RAISING OF SALMON IN ALASKA

WHEREAS, the salmon fishing industry is the major contributor to the economy of Sitka and many other rural Alaska towns; and

WHEREAS, the pen reared salmon industry would be a direct competitor for markets; and

WHEREAS, Alaska's fishermen have voluntarily taxed themselves for the purpose of fisheries enhancement; and

WHEREAS, the loss of local and winter markets due to competition by pen reared salmon would destroy the winter troll fishery, which depends on higher market value for its existence; and

WHEREAS, the pen rearing of salmon would increase the competition for protected sites which are already required by existing aquaculture projects, log transfer facilities, safe anchorages, troll drags, and crabbing areas; and

WHEREAS, the creation of a pen rearing industry will put an additional financial burden on state agencies that are already feeling a budget squeeze; and

WHEREAS, the numbers of "new" jobs created for local residents of Alaska are likely to be fewer than the "old" jobs destroyed by competition with the existing fishing industry,

NOW, THEREFORE, BE IT RESOLVED by the Assembly of the City and Borough of Sitka that it requests the Alaska State Legislature to oppose all legislation which would permit the pen raising of salmon in Alaska.

BE IT FURTHER RESOLVED that the City and Borough of Sitka request the State of Alaska work to develop a marketing program to promote "Wild Alaska Salmon" to help offset the impacts caused by the world production of pen reared salmon.

PASSED, APPROVED, AND ADOPTED by the Assembly of the City and Borough of Sitka, Alaska this 24th day of MARCH, 1987.

Dan Keck, Mayor

ATTEST:

Dolores Engwersen,
Municipal Clerk

p. 8 of 8

APR 0 1 1987

March 25

Dear Rep. Addbbid Hermann

Regarding House Bill 108 and Senate Bill 106, I would like shellfish & plant mariculture to be considered separately. I am <u>opposed</u> to <u>fish</u> farming at this time, however controlled development of shellfish and plant mariculture in an orderly fashion should be encouraged.

Thank you.

Sincerly,

Janet Apell
Box 3885
Kodiak, Ak. 99615
(commercial salmon
fisherma'am)

APR 0 1 1987

PUBLIC OPINION MESSAGE

DEAR: REPRESENTATIVE HERRMANN

NAME: CHRISTOPHER PACE
TITLE:
ADDRESS: P. O. BOX 146
CITY: PETERSBURG, AK ZIP: 99833
PHONE: N/A-
BILL NO: HB 108
SUBJECT: MARICULTURE
MESSAGE: HB 108 IS A CRITICALLY FLAWED PIECE OF LEGISLATION. IT SHOULD RECEIVE A "NO PASSAGE" AT SOONEST OPPORTUNITY. DO NOT TRY TO RE-WRITE TO REMEDY ITS PROBLEMS. I'M AGAINST REMOVING HATCHERY PERMITTING AUTHORITY FROM COMMISSIONER OF ADF&G AND REGULATION BY BOARD OF FISHERIES. I FAVOR ANOTHER COMPREHENSIVE AQUACULTURE PLAN BY ADF&G/FRED.

POMID: 15140250
DATE: 03/31/87
TIME: 14:02:50
LIONAME: PETERSBURG LIO

COPIES:

REPRESENTATIVES	SENATORS
GOLL	ELIASON
SUND	JONES
TAYLOR	ZHAROFF
COTTEN	
DAVIDSON	
HOFFMAN	
NAVARRE	
PEARCE	
SHULTZ	
SPRINGER	

____ NO RESPONSE REQUIRED

APR 0 : 1987

March 30, 1987

Adelheid Herrmann
Co-Chair of House of Resources Committee
P.O. Box V
Juneau, Alaska 99811

RE: House Bill 108

Dear Ms. Herrmann,

I would like to comment on House Bill 108. I am a surveyor in Wrangell and Petersburg, and although I'm not directly involved in the Fisheries, I feel if House Bill 108 passes, it will affect my livelihood in Southeast Alaska. I feel that House Bill 108 mainly affects Southeastern waters, since certain areas are protected from weather, they would make excellent locations for pens, etc. I would not like to see anchorages spoiled or protected bays used for aquatic farming. I'm concerned about the possible disease that may spoil our natural habitat.

I urge you to vote no on House Bill 108. Thank you for your time.

Sincerely,

Lisa M. Scheff

Lisa M. Scheff
Box 850
Petersburg, AK 99833

APR 0 1 1987

3/29/87

From: Donald R. Lane, P.O. Box 2921, Homer, Ak. 99603. 907-235-7898
To: Adelheid Herrmann, Pouch V, Juneau, AK. 99811
Subject: Mariculture, pen-reared salmon, H.B. 108, S.B. 106.

Dear Adelheid Herrmann,

I have some real concerns with the legalizing of pen-reared salmon. I am a commercial fisherman. I do not fish for salmon, however I plan to in the future.

While there appears to be many benefits to mariculture in general, and I appreciate the need to diversify the states economic base, I feel this move to establish a pen-reared salmon industry should be carefully scrutinized. I feel there is terrific potential to do major harm to an existing industry. In light of the tremendous effort in other countries to raise salmon I am not convinced the state economy will see any real benefits. The numbers that I have seen show potential for a glut of salmon on the market in 1990. Alaskan industry has tremendous overhead problems. Pen-reared salmon from Alaska will not be cheap. I cannot see them competing with Canadian, European, or South American farm salmon; countries where government subsidies in the market place are a way of life.

Another problem I see in regards to pen salmon are the impacts, as yet unstudied, the industry will have on already existing industries. As a dungeness crabber I am concerned that these pens are going to be right in the middle of the bays and estuarys that I currently fish. Am I expected to give up my fishery. I see potential for many conflicts, lawsuits, allocation problems.

The movers behind mariculture would have you believe that it is a "mom and pop" type business. From what I have read the investment (minimum) to make a go of it for salmon would be several hundred thousand and no return expected for four years. I haven't seen many mom and pops with that kind of financial ability.

I do not have any problems with shellfish mariculture and if you feel it necessary to move then pass those segments on but I urgue you to hold back the pen-reared salmon part until more information on the impacts can be made clear. I do not buy the arguement that we will miss the boat if we don't move now. If a marketable product can be produced it will always have a place. Let's not risk an important existing industry for very questionable gains, and lots of <u>real</u> headaches.

I am a member of United Fisherman of Alaska and I suggest you look to my representatives for further information.

Sincerely,

Donald R. Lane

APR 0 1 1997

Kelliman

TELECOPY COVER SHEET

KENAI PENINSULA INFORMATION OFFICE

(SOLDOTNA)

TO: Juneau FOR: H. Resources committee PHONE: _____

FROM: Eileen Mullen PHONE: 262-4715

ADDITIONAL INSTRUCTIONS: _____

_____

DATE/TIME SENT: 10:37 PLEASE ACKNOWLEDGE RECEIPT: ✓

DISPOSAL OF ORIGINAL: _____ THROW AWAY

_____ HOLD FOR PICK UP

NUMBER OF PAGES: 1 (NOT COUNTING COVER SHEET)

BY: Shauna

APR 01 '97 11:40 LEG. AFFAIRS - SOLDOTNA

APR 0 1 1987

I have recently invested a great deal of money to purchase a Cookinlet drift permit. With 17 years fishing experience, my plan is to raise my two children as a commercial fisherperson. The mariculture bill is a very real threat to my livelyhood and hundreds of others in the same boat. We need to get a good price for our fish when we deliver. I feel penn-reared salmon would be in direct competition with us at the market place. The state would find many defaulted loans if they allow this to happen. In essence, it would be like burning a candle at both ends

Thank you
Eileen Mullen-Kasilof
Box 519
262-4719

APR 01 '87 11:40 LEG. AFFAIRS - SOLDOTNA

APR 0 1 1987

Madame Chairman, members of the Resources Committee, my name is Dave Bedford. I live in Petersburg. I appreciate this opportunity to speak with you.

In the past months, proponents of salmon pen rearing have presented a lot of figures which purport to show the profitability of that industry. On examination, the plausibility of some of these figures and their applicability to Alaska seem questionable. The cost per pound of Alaskan farmed salmon would be very high compared to that of our competitors. In the market crunch of the 1990's we could expect an Alaskan farmed salmon industry to be vulnerable.

Statistics used by salmon farming advocates suggest that the business is not very costly to get into and that it is highly profitable. $60,000 it is claimed in table 6 of "Aquaculture in Alaska" will get you into a 50 MT Mom & Pop salmon farm in the Vancouver, B.C./Seattle area. What is omitted is the assumption in the original SeaAlaska report that you already have buildings which can be adapted for storage and a slaughterhouse, a dock in place, a truck and trailer for transport and a skiff with motor.[1]

The $60,000 figure is cast into further doubt by data from the Vancouver, B.C. area which indicate the start-up cost for a 50 MT farm to be on the order of $150,000 Canadian dollars or about $110,000 U.S.[2]

The start-up costs for a Mom & Pop salmon farm in Alaska are unclear, but they will certainly be higher than in southern B.C. The SeaAlaska Report suggests that construction costs in Alaska are 70% to 130% above those for the Vancouver/Seattle area.[3] So a 50 MT farm in Alaska will cost considerably more than $110,000 to set up.

1. Sven Eric Lindgren, " SeaAlaska Corporation Aquaculture: Opportunities and Constraints in Cultured Salmon Production - Phase II", August 30, 1985; p. 106. Few pen sites in Alaska will have existing buildings, a dock, road access and utilities already available as these figures assume for the Vancouver B.C., Seattle area.

2. Calculated from J. Michael Dean "Economic Benefits of Salmon Farms in the Sunshine Coast Regional District" British Columbia Mariculture Newsletter. June 1986; p. 37.

3. Sven Eric Lindgren, "SeaAlaska Corporation Aquaculture: Opportunities and Constraints in Cultured Salmon Production - Phase II", p. 106.

Operating costs are also considerably higher in Alaska. Labor will cost about 20% more than down south.[4] Feed costs in Alaska are presently more than double those presented by SeaAlaska for the Vancouver/Seattle Area.[5] Insurance for an oyster farm in S.E. Alaska of similar capitalization as a 50 MT salmon farm runs $4,000- $5,000.[6] Adjusting only these three factors and allowing for some drop in Alaskan feed prices which might or might not occur[7], the annual operating expenses for a 50 MT salmon farm in Alaska swell to $258,000.[8]

Higher start-up costs, operating costs 40% above those for southern B.C. and higher shipping costs would combine to inflate the cost of salmon pen reared in Alaska. SeaAlaska suggests that producers in the Vancouver area will be able to get their fish to market for almost $1.00 per pound less than Alaskan fish from a large 200 MT farm.[9] At present real feed costs, the Canadian advantage jumps to $1.48 per pound. The margins are even worse for small Alaskan producers.

4. Sven Eric Lindgren, "SeaAlaska Corporation Aquaculture Executive Summary", p. 8.

5. Brad Pierce, "Aquaculture in Alaska", House Research Agency Report 87-B, p. 79-80.

6. Raymond Rolande, "Economic Considerations of Alaska Oyster Farming", Sheldon Jackson College.

7. This represents a 13%-20% decrease from present prices. In Norway feed prices of $.55 to $.65 are paid for silage type feed which is less preferred than Alaska Dry Pellet feed and usually cheaper per pound. See Duane Kelly, "Salmon Farming Norwegian Style", Pacific Fishing, November 1984; p. 54 and Brad Pierce, "Aquaculture in Alaska", House Research Agency Report 87 B, February 1987 pp. 79-80 and W.A. Kennedy "Handbook on Rearing Pan Size Pacific Salmon Using Floating Sea Pens", Fisheries and Marine Service Industry Report 107, April 1978, pp. 26-34.

8. SeaAlaska's figures from Table 6 in Aquaculture in Alaska substituting a price of $1200/ton for feed, an additional 20% for labor and $4500 for insurance for facilities.

9. Table 23 from "SeaAlaska Corporation Aquaculture: Phase II", p. 101. Note that a price of $1200/ton for feed raises the cost per pound for Alaskan salmon from a 200 MT farm to $3.24. This gives our Canadian competition a very broad margin of profitability. The margin will be [illegible] for a 50 MT [illegible]

The Norwegians[10], the Irish Sea Fisheries Board[11] and the Canadians[12] recognize the likelihood and implications of over-production in the farmed salmon industry. Prices have already dropped substantially on the European market.[13] Alaska as a high cost producer will occupy a very vulnerable position. The industry knows how to insulate that position.

The SeaAlaska Aquaculture executive summary calls on government for financial, research, training and other support programs as well as "appropriations to provide the most competitive advantage possible for fresh Alaskan products". (p. 13) They want to see "Government support (for smolt production) by subsidies, incentives or loan guarantees for the industry during the first phase of development..." (p. 22) They see the necessity for "adequate loan guarantees" for salmon farms "as the industry will not succeed without adequate and available financial support." (p. 35)

All that is in the near term. How much more support will this industry need when the market pressure foreseen by the Norwegians, Irish and Canadians becomes a reality?

David Bedford
Box 1211
Petersburg, Ak. 99833

10. Patricia Riely and James L. Anderson "The Status of Atlantic Salmon Aquaculture", NOAA Sea Grant Marine Technical Report 92.

11. "Fish Farming International", December, 1986.

12. J.A. Spence "Aquaculture and World Market Trends for Fresh and Frozen Salmon", Gillespie Report, Appendix III, December 12, 1986 p. 9 and p. 20.

13. J.A. Spence, p. 9.

APPENDIX 11

It should also be noted that the operator of a 50 MT farm will be deeply in debt by the time his product reaches the market--1990 at the very earliest. Nor will he be able to mitigate this by producing pan sized fish. The cost of smolt, feed and transportation to Seattle price him out of the pan size market.

	USD/lb of production
Smolt	1.30
Feed	1.20
Freight	.24
	2.74

By the time his farm begins to send fish to market the small farmer will have spent start up costs as well as two full years of operating costs.

Start-up	$110,000
First Year	$103,000
Second Year	$219,000
	$423,000

This assumes the money comes out of his own pocket. Financing this amount would push the cost well over $500,000.

APPENDIX I

Salmon Production Costs[1] in Alaska: 50 MT farm

	US$/lb.
Smolt	.31
Feed	1.20
Salary	.92
Interest and Depreciation	.10
Others	.30
Transportation	.64
	3.45

[1] Assuming SeaAlaska's costs from Table 23 of the Phase II report for a 200 MT farm for interest and depreciation and "others" but substituting $1200/ton for feed and 20% higher labor costs than those given for a 50 MT farm in SeaAlaska's Table 24. In fact, costs would actually be higher than this since a 50 MT farm has higher depreciation and "other" costs per pound of production. Given a price which SeaAlaska uses of $3.50 per pound CIF Los Angeles/Houston this yields a gross profit of $.05 per pound or about 1½ %.

DATE

TO: Rep. Herman, Rep. Grussendorf, Sen. Ellason

FR: Sitka Witnesses *

SENT BY SITKA, ALASKA LEGISLATIVE INFORMATION OFFICE.

NUMBER OF PAGES INCLUDING THIS ONE: 3

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* Testimony is Provided From

Mike Schmidt
Sitka City Planner

MARICULTURE HEARINGS 4/2/87

Testimony regarding HB 108 and SB 106 relating to mariculture in Alaska.

My name is Michael Schmidt. I am employed as the Planning Director of the City and Borough of Sitka. At present, our community is in the process of updating our Coastal Management District Program.

One of the features emerging from our coastal planning effort is the increasing difficulty in maintaining the multiple use management theory where everyone shares coastal resources. A variety of major national programs including the D-2 National Interest Lands Bill, ANSCA or the Native Settlement Act and the placement of 34% of the Tongass National Forest into a Wilderness category, have all focused increasing competition on the remaining portions of S.E. to accommodate all competing land and water uses. Timber vies with recreation for use of areas. Fishing competes with development of lodges. Environmentalists argue with developers. Out of all these squabbles over the past ten years, some unescapable facts emerge. We must begin to look at some limitations of use or allocations of most beneficial use. The bill now proposes to add to competing groups, all vying for limited available territory.

The problems I have with the concept of mariculture, involve the pen raising of salmon. I do not believe Alaska, especially in these times of declining revenues, should deliberately attempt to add to revenue problems, but seek solutions. Salmon fishing is a growth industry. It exists and contributes heavily to local economies, tax revenues and to the State. Alaska should seek to capitalize on the shellfish or the portion where the fisheries business can expand our economy. The finfish side only seeks to replace one persons job to give it to another and could have adverse effects on a developed industry, both in terms of shoreside process facilities and long term investments in harbors and fishing economies.

Speaking to the mechanics of the bill itself, it too appears to have some problems that need to be addressed.

1. Why is the Department of Commerce and Economic Development involved at all in the permit process. The bill speaks to ADFG, ADNR and ADEC as the three agencies that are required to be the major participants. The tideland lease or site permits, the health aspects and the fisheries aspects already combine to make permitting a long drawn out affair as was spoken to in earlier testimony. To add yet another state agency into this permitting process appears ludicrous and unnecessary.

2. There is no public hearing process discussed in the legislation. This should be added to make sure that permits are not issued, like in British Columbia, then find out there are multiple site conflicts "after the fact". If Alaska is going to give an honest shake to a mariculture development, we should at least be up front with the need for public hearings in the permit procedure.

3. There needs to be some specific language in the bill requiring a development plan, timeframe and schedule for use. I believe, as was also stated in earlier testimony, that good mariculture sites are limited. Anyone who obtains a permit, should be required to use it or lose it and not tie up a site as a tool to limit or stop competition. If we are going to allow it, then performance is a must.

4. I would like to reiterate the potential that shellfish should be separated from finfish and eliminate one of the largest controversial aspects of this bill.

5. From all the publicity, news articles, books, and impacts shown in other areas where mariculture is proceeding, Alaska should proceed with a cautious approach to maximize the true potential but minimize the problem areas. A comprehensive study of this industries problems rather than a glossy sales pitch is needed to ascertain where the pitfalls are located and what specific regulatory and enforcement measures are needed and will prove beneficial. To jump, just for the sake of jumping, into a new area of economic competition is not in anyone's best interest.

Thank you for the opportunity to present this testimony.

Southeast Alaska Conservation Council

SEACC • P.O. Box 021692 • Juneau, Alaska 99802 • (907-586-6942)

Testimony before the House Resources Committee on HB 108, April 2, 1987

Madame Chair, members of the committee, my name is Laura Dameron and I'm an intern with the Southeast Alaska Conservation Council. SEACC is a coalition of 12 groups from 10 communities in Southeast plus over 700 individual members. Many of our members are very interested in this bill because the mariculture industry poses a potential, and in a few cases already existing, threat to their chosen way of life. Mariculture development that occurs without proper planning and limitations will harm not only the interests of our members who fish commercially, but also those who depend on subsistence harvest, the tourism industry, sport fishers and hunters, recreational boaters, and wilderness recreation guides and participants. This threat is not only found in the pen rearing of fin fish but in the uncontrolled development of shellfish and aquatic plant farms as well.

SEACC is not opposed to mariculture in itself, but our members hope that development of this industry will be in an orderly and well-thought out manner. There are many issues that should be addressed, before privatization of the state's tidelands begins taking place at an ever increasing rate. SEACC strongly urges that a moratorium be placed on issuance of mariculture permits until regional plans have been developed so that the public has a chance to be involved in the disposition of state tidelands. Through the

planning process, the existing uses of an area would be known before a conflicting use would be permitted. It is only with such forethought that we can protect subsistence use areas, the wilderness tourist industry, recreation, sport fishing, and culturally and historically signficant areas while allowing the mariculture industry to develop in Alaska. A logical component of that planning process would be to determine the maximum number of sites that could be designated for mariculture purposes before the developing industry greatly restricts competing uses. While the concept of limited entry can be controversial, SEACC believes it is the most fair manner in which to apportion a public resource into a private one and maintain multiple-use options.

Other areas of concern for SEACC include the land grab potential inherent in the present permitting process, the lack of recognition of upland conflicts and the impacts the mariculture industry will have on the adjoining lands, and the problems of maintaining water quality. Tideland speculation could be minimized by making the permits non-transferable, thus ensuring that the state could implement its screening process of applicants in each case. Upland conflicts should be addressed in the regional planning process I mentioned earlier, and the state or federal agency administering the adjacent uplands should be involved in this planning process. This planning stage would also be the point at which determinations would be made of the physical adequacy of the tidelands for the different types of mariculture, thereby limiting the designated use of an area to activities having the least impact on the marine and upland environment. Regional planning would also allow for meaningful public participation and comments. Many times, local residents have intimate knowledge about an area that is not otherwise available to state planning officials.

We appreciate having the opportunity to comment on this bill. SEACC asks that the state not rush blindly into mariculture. A moratorium, during which a reasonable planning process can be instituted, would allow the greatest amount of public participation and agency review to determine the best use of the tidelands, both environmentally and economically, for all of Alaska. SEACC would like to be involved in the planning process for Southeast Alaska and hopes the Forest Service, EPA, the Corps of Engineers and all other interested parties will also be actively involved.

Mariculture will have very broad impacts on all Alaskans. While another planning process is probably the last thing most of us want to go through, taking time to implement this program carefully from the beginning will cost us much less than losing our commercial fisheries, recreation, wilderness tourism industry, subsistence, cultural resources, and the "bush" way of life. SEACC believes mariculture will be an important economic development for Alaska, but we must enter it in a well planned and careful way, or it will become a resource disaster, rather than a boom.

APR 03 '87 15:54 LEG. AFFAIRS - KETCHIKAN

TELECOPY COVER SHEET

KETCHIKAN LIO(225-9675)

TO: Juneau LIO PHONE _____

FROM: Ketchikan LIO (for Michael Round) PHONE 225-9675

INSTRUCTIONS: TESTIMONY ON HB 108/MARICULTURE FOR THE HOUSE RESOURCES COMMITTEE MEMBERS

RECEIVED: DATE 4/3/87 TIME 3:50 pm

SENT: DATE 4/3/87 TIME 4:00 pm

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NUMBER OF PAGES: 2 (NOT COUNTING COVER SHEET)

SENT BY: emj

To: House Resources Committee

Subject: Mariculture in Alaska

Ref.: Mariculture in Alaska
Rpt.#87-B

Dear sirs,

My name is Michael Round; I have lived in Ketchikan for twelve years and have commercially fished for salmon for ten years. I have listened to most of the testimony on the teleconference concerning house bill 108, and have read the "Mariculture in Alaska" report.

I found that report ebullient in it's financial outlook; and,yet, disstressingly blind in it's consideration for the existing salmon industry.I found it subjective not only in it's conclusions but even in it's wording.

I am, admittedly, one of the "small but vocal group (trollers)"; but Klawock, Pelican, Elfin Cove,Pt. Baker, Port Protection,Craig,Wrangel, Ketchikan, Petersburg, Sitka, and even Juneau are "small" towns. However,they are a significant part of the state, and trolling is a big contributor to their economies. These "small" towns are saying quite clearly "no" to pen raised salmon and supporting their resident fishermen.

We trollers have worked long and hard to maintain our right to harvest fish. We used our own money in negotiating a better deal in the Canada/ U.S. Salmon Treaty. The whole state benefitted from our stand in augmenting the Alaska quota on Chinook. We still suffered from the cut backs and even the federal government recognised our sacrafice and directed mitigation monies for enhancement of chinook for the Alaska troller.

We voted to take 3% of our gross fishing revenues and put them into enhancement projects to keep our natural runs strong. This enhancement activity benefits every user group -sport, commercial, and even tourism. In short, what is good for the trollers and commercial fishermen of Alaska is good for the state. This fact is not just coincidental but has evolved through co-operative interaction between fishermen, management, and the Board of Fish.

We are harvestors of a renewable resource under conservative management with little ,if any, impact to the natural environment. We harvest fish, but we introduce and leave nothing that impacts the environment in which they thrive. Fish farming will mean various levels of pollution in our surrounding bays and estuaries, which are vital habitat for our natural outmigrating salmon fry.

Maintaining fish for their entire life within the confines of a pen necessitates that these fish be fead antibiotics to keep them alive in an environment little better than a cesspool. We are just starting to

APR 03 '87 16:00 LEG. AFFAIRS - KETCHIKAN

g to
realise the dangers inherent in feeding antibiotics to beef cattle - salmon will be no different. There are no wild herds of cattle to contaminate with antibiotic resistant pathogens - that is not the case with Alaska's salmon stocks. We have a lot to lose.

Are we willing to prostitute our healthy salmon runs and pristine environment for the sake of a few individuals, who may or may not

make the state any money. Should we crap in our own back yard just because everyone else is doing it! The big push to the Northwest Pacific for pen raising is largely do to the fact that it has some of the last unpolluted habitat. After we open the door to fish farming we may not be able to claim such status.

If salmon farming is such a good thing, it should be able to stand the test of time. It may be the smartest thing the state of Alaska could do is be the last to get into it - or not get into it at all. As with salmon hatcheries, we learned alot by other peoples "mistakes." We have some of the cleanest and best run hatcheries in the world due to the fact that we were not the first. I don't believe that what we have to gain is worth the risk of what we have to lose.

If, in fact, the trollers are the only part of the salmon industry to be adversely impacted by pen raised fish, then the state has little too lose by waiting. However, I believe that with the same media hype that created demand for fish raised in a cesspool, we could be equally effective in creating a niche in the market place for wild troll caught salmon.

I hope some of the inherent wisdom of creating the permanent fund is not totally lacking in our existing legislature. We the people of the state of Alaska are in a custodial position for the state land,water, and wild-life. We do not own it; so let's not jeopardise that which belongs equally to posterity. I hope the state and it's people can see that a head-long plunge into salmon farming may decapitate its existing slamon industry. Further, that the rush for revenues does not sell out something that is priceless.

Sincerely,

Michael B. Round
F/V CHERI MARIE
Box 8476
Ketchikan, AK. 99901

APR 03 '87 16:01 LEG. AFFAIRS - KETCHIKAN

PUBLIC OPINION MESSAGE

DEAR: REPRESENTATIVE HERRMANN

NAME: JULIE HURSEY
TITLE:
ADDRESS: BOX 213
CITY: PETERSBURG ZIP: 99833
PHONE: 772-3967
BILL NO: HB 108
SUBJECT: AQUATIC FARMING
MESSAGE: PLEASE DON'T SUPPORT HOUSE BILL 108. THE POTENTIAL FOR ADVERSE EFFECT O MARINE ENVIRONMENT AND EXISTING COMMERCIAL FISHERIES NOT CONSIDERED FULLY. S SERIOUS POTENTIAL FOR HABITAT DEGRADATION PLUS DISEASE THREAT TO WILD STOCKS. STATE CANNOT AFFORD TO FUND ESSENTIAL, STRICT MONITORING PROGRAM FOR QUATIC FARMS DUE TO DECLINING REVENUES.

POMID: 15153457
DATE: 03/13/87
TIME: 15:34:57
LIONAME: PETERSBURG LIO

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	NAVARRE	
	PEARCE	
	SHULTZ	
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PUBLIC OPINION MESSAGE

MAR 18 1987

DEAR: REPRESENTATIVE HERRMANN

NAME: ERIC GLOS
TITLE:
ADDRESS: SRC BOX 8485
CITY: PALMER ZIP: 99645
PHONE: 745-6323
BILL NO: SB 60
SUBJECT: ALASKA COMMUNITY COLLEGES
MESSAGE: PLEASE VOTE TO MAINTAIN AN INDIVIDUAL AND AUTONOMUS COMMUNITY COLLE SYSTEM, AS I FEEL IT IS IN THE BEST INTERESTS OF THE LOCAL AREAS AND PEOPLE T SERVE. DO NOT LET THEM BE ASSIMILATED INTO THE UNIVERSITY SYSTEM AS THEY HAV SEPERATE INDIVIDUAL PURPOSES. COMMUNITY COLLEGES ARE 34 THIS YEAR.

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	DONLEY	ELLIS	ELIASON
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	GRUSSENDORF	HANLEY	FISCHER
	HOFFMAN	HUDSON	HALFORD
	KOPONEN	LARSON	HENSLEY
	MARTIN	MENARD	JONES
	MILLER	NAVARRE	JOSEPHSON
	PEARCE	PETTYJOHN	KELLY
	PHILLIPS	POURCHOT	KERTTULA
	RIEGER	SHULTZ	RODEY
	SPRINGER	SUND	STURGULEWSKI
	SWACKHAMMER	TAYLOR	SZYMANSKI
	ULMER	WALLIS	UEHLING
	ZAWACKI		ZHAROFF

Julie Hursey
Box 213
Petersburg, Alaska
F/V Thunder

I am opposed to the passage of House Bill 108, but before outlining the arguments I have with this bill, I will say that I am not opposed to mariculture ever being developed in Alaska. In particular, I think that shellfish mariculture could coexist well with the existing fisheries. However, the development of any kind of mariculture must follow a careful management plan to minimize adverse effects to the marine environment and our existing fisheries resources. My main argument with this bill is that it does not outline any such specific management plan, and too many crucial issues are left unresolved. Some of these issues include possible environmental degradation and adverse impacts on wild stocks of fish, realistic costs to the state, and conflicts over area use by different groups. I will address each of these in turn.

In order to ensure that development of the mariculture industry does not damage the environment, it is essential that a thorough monitoring plan is in place PRIOR to development. This program would oversee site selection, monitor water quality, conduct inspections of sites to maintain health standards and control any problems with disease. However, BEFORE such a monitoring program can be designed, and BEFORE the costs to state agencies can be assessed, there must be some sort of policy on the development of mariculture which would delineate the ultimate size and direction of industry growth. This bill fails to address controls over size and rate of growth of the mariculture industry.

Without knowing the ultimate number of farms, what size they will be or even where they will be, it is impossible to design an adequate environmental monitoring program, or to ensure environmental protection. According to the Gillespie Report "An Inquiry Into Finfish Aquaculture in British Columbia", environmental monitoring represents a major deficiency in the regulation of fish farms. In fact, this report mentions that site inspections have become infrequent because "approval agencies were too busy with the backlog of plans to conduct field inspections". To jeopardize environmental health because of such poor planning is inexcusable. We can learn from Canada's mistakes.

My particular concern is the effects that the uncontrolled development of salmon farming could have on environmental quality and the health of our wild stocks. It is a fact that if salmon farms are not carefully sited, fish wastes and excess feed can cause a pollution problem. Also, if a site is not properly located, penned salmon populations can become stressed and subject to disease. Canada is already having problems with farms that are improperly sited, and this in part led to the moratorium on new permits.

Julie Hursey
Box 213
Petersburg, Ak.
F/V Thunder

The probability of disease transmission from farmed salmon to wild salmon is unknown at this time. In Norway, where most of the research has been done, there were few natural stocks to worry about. Eventually, however, even they are planning to develop "green zones" or areas that are aquaculture free to protect what wild stocks they do have. House Bill 108 does not adequately address the question of protecting the health of the wild stocks. Perhaps these "green zones" should be considered. In any case, no industry should be allowed to develop at the expense of our healthy marine environment, and our wild stocks of fish.

If mariculture is to benefit state revenues, then we must have an accurate assessment of its costs to state agencies. Questions raised last week during testimony indicate that this is an area which needs to be addressed more carefully.

The number of farms that will be developed will determine the costs in part. According to Bryan Alle, the Fish and Game fiscal note is predicated on 100 permits being issued the first year, and an actual 20 farms being operational by 1992. What if this prediction falls short? Alle says that then costs will go up. But how much would they increase, and does the state have the resources to cope with a greater than expected increase in the numbers of farms? It is obvious that a range of fiscal scenarios must be presented by each agency, in order to have a more realistic picture of the probable costs, and to be able to plan accordingly.

In Canada, staff and funding levels have not kept pace with industry growth. According to Bryan Alle, there is a critical lack of pathologists in British Columbia, and we could face the same problem here if the mariculture industry grows beyond present predictions. Do these agencies have a contingency plan to deal with such a problem if it arises? What will happen if there are not adequate funds to cover the costs? Diverting funds from existing fisheries management programs is not an option. I must admit, the zero fiscal note submitted by the Department of Environmental Conservation mystifies me. Now they are reassessing that note. Good idea. I think this entire area needs more thorough investigation.

Another issue that is not addressed in this bill is how disputes over use of an area will be resolved between conflicting user groups, and the possible pre-emptive use of areas by the mariculture industry. Fish farms could be located in areas that have been traditionally used for anchorages, fishing grounds, gear storage areas, recreational uses, and even marine transportation corridors. Another source of conflict would arise if fish farms were placed in areas that are already used as spawning or nursery grounds for wild stocks. Canada is already having problems with these kinds of conflicts now, and it has reached serious proportions, according to Vince Goboyan, a Canadian delegate from the Canadian Standing Senate Committee on Fisheries.

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Julie Hursey
Box 213
Petersburg, Alaska
F/V Thunder

A coastal zone management plan is urgently needed, to take inventory of our coastal resources, and to designate areas for specific uses. At this time, no such plan exists in the areas where mariculture could occur. It is essential to acknowledge the multiple uses of coastal waters and tidelands, and the diversity of user groups in order to minimize conflicts.

This brings to mind the question of how decisions will be made on area designations. Will this be made on a site by site basis, or will there be a comprehensive plan with public hearings? How much will it cost? Will the user groups have any input into this process, and what avenues will be available? The bill specifically precludes the Board of Fish from participating in site selection, but does not address the question of public participation in the process. This hardly seems fair.

In summary, I will say that I strongly object to the passage of this vaguely worded bill. I do not believe that enough planning and research has gone into determining an adequate environmental monitoring program to protect the marine environment, or our wild stocks of fish. I don't think that the costs to the state have been adequately assessed. I think the great potential for conflicts over area use could create a miasma of problems. I do not believe that we should start this industry, then develop the management plan as we go along. This would be extremely short-sighted, and could offer only band-aid solutions to the major problems which could arise. I think we can learn from the mistakes that Canada has been making.

House Bill 108 does not adequately address the problems that could arise from the development of mariculture. Until we have a better plan for avoiding problems, and until we know that we have the resources to deal with these problems as they occur, I am opposed to the passage of House Bill 108. Thank you very much for taking the time to consider this.

PUBLIC OPINION MESSAGE

DEAR: REPRESENTATIVE HERRMANN

NAME: CHRISTOPHER PACE
TITLE:
ADDRESS: P. O. BOX 146
CITY: PETERSBURG, AK ZIP: 99833
PHONE: N/A-
BILL NO: HB 108
SUBJECT: MARICULTURE
MESSAGE: HB 108 IS A CRITICALLY FLAWED PIECE OF LEGISLATION. IT SHOULD RECEIVE A "NO PASSAGE" AT SOONEST OPPORTUNITY. DO NOT TRY TO RE-WRITE TO REMEDY ITS PROBLEMS. I'M AGAINST REMOVING HATCHERY PERMITTING AUTHORITY FROM COMMISSIONER OF ADF&G AND REGULATION BY BOARD OF FISHERIES. I FAVOR ANOTHER COMPREHENSIVE AQUACULTURE PLAN BY ADF&G/FRED.

POMID: 15140250
DATE: 03/31/87
TIME: 14:02:50
LIONAME: PETERSBURG LIO

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NAVARRE	
PEARCE	
SHULTZ	
SPRINGER	

____ NO RESPONSE REQUIRED

APR 07 '87 11:37 LEG. AFFAIRS - KETCHIKAN

TELECOPY COVER SHEET

TO: Rep Cotton and CH. Resources
KETCHIKAN LIO (225-9675)

TO: ~~Rep Hermann~~ PHONE

FROM: Keith Johnson PHONE

INSTRUCTIONS:

Please deliver one copy to each. -
Thank you

RECEIVED: DATE TIME

SENT: DATE 4-7-87 TIME 12:45

DISPOSAL OF ORIGINAL: THROW AWAY HOLD FOR PICK UP

NUMBER OF PAGES: 2 (two) (NOT COUNTING COVER SHEET)

SENT BY: ~~2 (two)~~ Bonnie (KTN LIO)

S.S.R.A.A.

TESTIMONY ON HOUSE BILL 108

Keith A. Johnson
Operations Manager
1621 Tongass
Ketchikan AK 99901

The Southern Southeast Regional Aquaculture Association (SSRAA) has taken a position opposed to the inclusion of salmon in the mariculture legislation - House bill 108.

This is based upon the perception of market competition with products of existing salmon fisheries, competition for sites, and a lack of recognition between salmon farming and ocean ranching. The nonprofit format for salmon ocean ranching is to provide benefits for commercial fishermen and all the other users of this common property resource.

Technical issues which have not been adequately addressed.

1. Exotic Species or Non-indigenous Stocks.

   Current statutes prohibit the importation of exotic species and non-indigenous stocks. This is a good idea and it is imperative that it continues for the protection of wild stock salmon populations. The enforcement of this will require frequent site visitations and this carries a cost which has not been addressed.

2. Broodstocks

   Alaskan chinook and coho stocks are basically wild fish and the genetics policy of ADF&G provides for the periodic infusion of wild gametes every three generations. Our coho and chinook stocks have not been genetically selected for growth in net pens, delayed sexual maturity, fecundity, and other characteristics suited for captive rearing.

   Norway has a very active broodstock development program which began in the late 1960's and is now into its fifth generation. This program specifically selects for traits beneficial for netpen culture. The system is so sophisticated that smolts of these stocks command different prices depending on the experience of the grower.

   Domsea Farms in Puget Sound has had a selection program for its coho salmon for about the same length of time.

I think it is naive to use the economics of these culture systems to model the growth of an industry in Alaska using stocks that are wild. There is a large lag time to attain culture efficiency. I don't see that this form of a broodstock development program will be funded with state dollars through the ADF&G genetics laboratory.

3. TBT Treatments

Previous teleconferences on House Bill 138 have dealt with the TBT treatments for aquaculture nets. The study commissioned by Sealaska on salmon farming specifically identified the need for an antifouling net treatment. However, we no longer have this available and no replacement is in sight.

Madam Chairwoman, I wanted to bring these technical issues before the House Resources Committee and thank the committee for their attention.

PUBLIC OPINION MESSAGE

APR 0 3 1987

DEAR: REPRESENTATIVE HERRMANN

NAME: ROY M. ALLEY
TITLE:
ADDRESS: P.O. BOX 969
CITY: VALDEZ ZIP: 99686
PHONE: 835-4816
BILL NO: HB 108
SUBJECT: AQUATIC FARMING
MESSAGE: I SUPPORT ORDERLY DEVELOPMENT OF SHELLFISH AND PLANT MARICULTURE BUT I'M OPPOSED TO FISH FARMING. LET BRITISH COLUMBIA TAKE THE INITIAL PIONEER STEP. ALASKA CAN START UP DOWN TH ROAD IF PRESENT FEARS ARE LAID TO REST: I.E. DISEASE - COMPETITION WITH PRESENT SALMON FISHING. ALASKA HAS TOO MUCH INVESTED SALMON.

POMID: 17103114
DATE: 04/02/87
TIME: 10:31:14
LIONAME: VALDEZ INFORMATION OFFICE

COPIES:

REPRESENTATIVES	SENATORS
CATO	KELLY
COTTEN	KERTTULA

- X - NO RESPONSE REQUIRED

Alaska Environmental Lobby, Inc.

204 N. Franklin Street, Suite 3 Juneau, Alaska 99801 907-586-2345

Testimony on HB 108-Mariculture
Prepared by Kelly Kavanaugh 3/31/87

Madame Chair, members of the committee, my name is Kelly Kavanaugh and I'm a volunteer for Alaska Environmental Lobby. Our organization represents 19 environmental groups statewide with 5,000-7,000 members. Interest in mariculture has generated a number of questions regarding existing laws, regulations, policy and actual implementation. The Alaska Environmental Lobby is concerned with these issues for several reasons. First, we are interested in all legislation affecting conservation and natural resource development. Alaska's unpolluted, productive waterways are described as ideal for mariculture development. The potential size and extent of development warrants our special attention. Second, mariculture ventures are slated for undeveloped areas of the state. We want to ensure that planning and development of mariculture activity is environmentally responsible. Third, there are unanswered policy issues which need to be addressed before legislation is passed and development progresses.

The primary aim of this legislation is to clarify regulatory statutes and remove administrative barriers to development of Alaska's mariculture industry. A major part of this process will include setting up clear permitting guidelines. At present, state tideland permitting and leasing guidelines and regulations appicable to mariculture development have not been established. The process does not address necessary safeguards for upland use of state lands. We need to prevent another defacto land disposal program, caused by permitting after the fact and encouraging land speculation. Legislation should provide general criteria for development of a regulatory program to discourage speculation and include intent language to prevent after the fact permitting. The Alaska Environmental Lobby recommends establishment of an operating plan requiring non-transferable permits; a "prove up" system which would require applicants to demonstrate project viability through preparation of a development schedule; reclamation bonds for clean-up of an operation if necessary and regulations giving DNR stronger rights of refusal and authority to revoke permits from non-compliant operators.

Many potential conflicts exist between recreational, subsistence and commercial fishing users. None of these conflicts are addressed in the tidelands permitting and leasing process. User groups are concerned with blocked access to favorite coves, bays and beaches, loss of park, wilderness and recreational shoreline; loss of anchorages and access for commercial fishing and deteriorated aesthetics of coastal areas. DNR currently deals with user conflicts through a "best interest" finding process. This case by case process is arbitrarily based on economics. It is necessary that best interest finding conflicts are addressed before legislation is passed. The Alaska Environmental Lobby recommends that DNR develope guidelines directing an all-encompassing review of permit and lease applications rather than the current case by case approach. We feel this could be accomplished through initiation of coastal resource identification studies and development of regional plans. Each plan could include a zoning process to identify and designate sites best suited to certain uses. Zoning would address user conflicts by directing mariculture applicants away from recreational and other potential high use areas.

We are concerned with potential water quality and sedimentation problems associated with finfish farming. We recommend that water quality issues be addressed through identification of siting criteria which would restrict mariculture operations to areas where tidal action or currents are sufficient

In view of recent state resource policy, we have seen a move towards privatization of public resources. Mariculture industry may affect many of our states coastal waters, tidelands, and adjacent upland areas. We need to ensure development follows an appropriate public review process and provides adequate returns to the state. We recommend a comprehensive evaluation of the mariculture industry to ensure returns for the private use of public resources. Permitting or leasing of any public lands or water rights must go through the public hearing process and hearings must held be in local communities to ensure all user interests are taken into account.

The Alaska Environmental Lobby is not opposed to mariculture development in Alaska. The opportunity for development isn't going to go away and we feel there's no need to hurry the process. Many policy questions still need to be addressed before further development and leasing programs proceed and we want to help ensure it will be done properly.

Rec'd 04-07-8;

Dear Ms Furmann,

Enclosed are a couple of pages of the Petersburg petition against AB 108 that sort of slipped through the cracks. As a counter to Bill Pauliches anecdotal information on how Sitka trollers wanted to know more about salmon farming and weren't against it, I'd like to say that in the few hours I spent collecting seventy or so signatures to the petition that only one person declined to sign because he was for salmon farming. Less than a dozen declined because they were either from out of state or didn't know enough about the issue. All the fishermen I approached -- crabbers, seiners, gillnetters, trollers, longliners, -- except two signed.

I, too, believe that in the long haul mariculture is the way to go. And Alaska is to be congradulated for having gotten into it ten years ago. Record coho catches in SE Alaska can be attributed in large part to effective aquaculture programs run by the PNP and FRED hatcheries. Within five years our king salmon harvest will be more than doubled by 300,000 hatchery kings available to the common property fisheries. These are programs which benefit the thousands

& small businessmen who comprise the salmon fleet in our communities.

Salmon farming will be an industry for big business and big business in the fisheries is bad news for the fishermen. HB 108 mandates ocean ranching for broodstock by private for profit hatcheries. In Oregon the traditional fisheries were closed down to allow ocean ranch, ie to get back to the private hatcheries run by Weyerhaeuser. Before these private hatcheries were permitted Weyerhaeuser made much of how they would add to the sport & commercial catches. Once they were in place traditional user groups were up against a powerful big money lobby which closed down the fisheries so the hatcheries could profit.

If it passes HB108 the legislature will be putting Alaska on what I feel is a dangerous course. The decline of the fisheries in Oregon is an example to reckon with. As the fisheries decayed the economic health of the coast ~~declined~~ declined. I think the social impact of mariculture, particularly salmon farming will be to erode the place of the individual fisherman. And I doubt that the 1900 jobs it will create can begin to counteract

a subsequent decline of our coastal communities.

The social and economic implications of HB 108 are far-reaching. I don't believe that ~~this~~ we should travel the path it suggests until we have thorough non partisan studies of its effects.

Sincerely,

David Bedford
Box 1211
Petersburg, Ak. 99833

Petition to the Legislature of Alaska

Concerning House Bill 108 "Acts relating to aquatic farming"

WHEREAS The introduction of a pen-reared salmon industry in Alaska would negatively impact existing fisheries and

WHEREAS Such an industry would compete with and possibly preclude customary uses of bays and estuary areas and

WHEREAS This industry would pose a serious biological threat to healthy stocks of wild Alaskan salmon and

WHEREAS The existing foreign pen-rearing salmon industry is already going to over-produce, making a fledgeling Alaskan industry untenable and

WHEREAS The pen-reared salmon industry will require substantial new funding to allow regulation and

WHEREAS House Bill 108 fails to properly address these concerns:

The undersigned urge the Legislature of Alaska to VOTE DOWN House Bill 108.

DATE:	NAME: PRINT	SIGNATURE:	ADDRESS:
3/16/87	Joe Short	Joe Short	Box 1224 - Petersburg
3/16	Dennie Wentlund	Dennie Wentlund	Box 415 Petersburg
3/16	Pete Thynes	Pete Thynes	Box 583 Petersburg
3/16	Wayne Short	Wayne Short	Box 1136 Petersburg
3/20	Patrick Shannon Mahr	Pat Mahr	" 1763 "
3/20	DANIEL GOODRICH	Daniel D. Goodrich	Box 1523 Petersburg
3/20	RON REED	Ronald D. Reed	Box 1437 PETERSBURG

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WHEREAS House Bill 108 fails to properly address these concerns:

The undersigned urge the Legislature of Alaska to VOTE DOWN House Bill 108.

DATE:	NAME:	SIGNATURE:	ADDRESS:
3-15-87	HAROLD D. MEDALEN	Harold D. Medalen	Box 821, PETERSBURG A
15/87	Fred L Birch	Box 54	
15/87	HAFTOR A. GJERDE	Haftor A. Gjerde	Box 171 PETERSBURG
15-87	HAROLD MEDALEN	Harold Medalen	Box 352 PETERSBURG AK
15/87	DAVID M. BEEBE	David M. Beebe	BOX 148 PETERSBURG AK
15 87	Kerry K. Beebe	Kerry K. Beebe	Box 148 Petersburg AK

John McMullen
P.O. Box 021875
Juneau, Ak 99802

Hon. Ackerhild Herrmann, Co Chair
House Resources Committee
P.O. Box V
Juneau, AK 99811

Dear Rep. Herrmann:

Aquatic farming for salmon and shellfish should be allowed to proceed in Alaska, but House Bill 108 and Senate Bill 106 should be held over until 1988.. The present bills should be re-drafted to describe what the mariculture program is to become. Will preference for sites and permits be afforded Alaskans? Will production capacity for individual farms be capped to promote competition, and therefore lessen the probability of economic failure of individual farms?

If aquatic farming develops in the absence of state policy, I could envision a scenario in which well financed organizations would obtain the expensive sites near transportation centers for the operation of large production facilities, which would probably contain costs through the manufacure of their own fish food. Less well heeled Alaskans might well end up at more remote sites, with smaller production units, and the need to buy higher cost commercial fish food, which would result in a relatively low profit margin.

The State's "Fisheries Cabinet", comprised of the commissioners of several state agencies performed a review of the aquatic farming bills. Their staffs also met several times to discuss the problems that might be involved in administering the program. My conclusions after listening to some of those discussions are: (1) the program could easily be swallowed in the bureaucratic process, and (2) it is going to take awhile to define the regulatory process by which the program is to be administered.

A recent Attorney General's opinion stated that fish farming is legal in Alaska anyway. However, I think the state should sit on that until legislation is in place which names the Department of Commerce as the agency responsible for the program. The Department of Fish and Game is far too conservative to adequately promote this program, but does have the biological expertise in place to deal with the technical aspects of disease prevention, as an example.

Therefore, my recommendation is that HB 108 and SB 106 be held back a year and re-written while the regulatory process is ironed out. The result could be a program for Alaskans, which will be ready for implementation.

This letter is being sent to the Commerce and Labor, and Resources Committees of the House and Senate. I wish you well in your deliberations.

Sincerely,

4-9-87
DATE

TO: Rep. HerrMANN

FR: Tamara & Richard Lundahl

SENT BY SITKA, ALASKA LEGISLATIVE INFORMATION OFFICE.

NUMBER OF PAGES INCLUDING THIS ONE: 3

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BILLED TO: _____

Testimony for House Resources Committee re HB 108

STATEMENT FROM RICHARD LUNDAHL, Member Pelican ADFSG Advisory Committee

Alaska has a very well developed and strong salmon fishery in all areas of the State that is totally depended upon by the majority of people in many of the towns and villages along the entire coast and even the interior. It is my understanding that every salmon fish farming venture is either subsidized by their government, a money losing proposition or a shakey venture at best. With all these countries and individuals experimenting with salmon farming, if the concept is viable and if the potential for profit is there, then when the technology has improved, then and only then is the time for Alaska to get into salmon farming.

Pelican is dependent upon salmon fishing. The individuals that fish, that service the fishermen, and that process the fish have invested their own money and laid their entire livelihood on the line. To allow salmon farming as these promotors want, is to jeopardize the entire economic structure of this town, to end up with the same product. The people of this town cannot afford to write off their investments. If Alaska has such a great environment for (salmon) farming, then 5-10-20 years down the line we will still have the same environment. Why jeopardize the major established, renewable, economic resource of the state to satisfy the curiosity of the current world-wide fad of these salmon fish farm promoters.

SUBMITTED THROUGH THE SITKA LEGISLATIVE INFORMATION OFFICE AS TESTIMONY ON HB 108. April 9, 1987.

Richard W. Lundahl
Box 793
Pelican, Ak. 99832

STATEMENT FROM TAMARA LUNDAHL, Pelican, Alaska

As a wife of a commercial salmon fisherman, I can see that the salmon fisherman's expenses have increased over the years, but our salmon fishing prices haven't. Salmon fishermen, fishing in State waters, pay 3 percent of their gross income for hatcheries for salmon enhancement. We fishermen haven't seen much benefit from this 3 percent enhancement tax we pay. Our optimum yield quotas certainly haven't increased over the years and our fishing seasons continue to be shortened. It's getting difficult to make a living salmon fishing with all our restrictions and salmon farming certainly wouldn't benefit individual salmon fishermen and their investments.

SUBMITTED THROUGH THE SITKA LEGISLATIVE INFORMATION OFFICE AS TESTIMONY ON HB 108. APRIL 9, 1987.

Tamara Lundahl
Box 793
Pelican, Alaska 99832

CITY of WRANGELL, ALASKA

INCORPORATED JUNE 15, 1903

BOX 531, 99929 (907) 374-2381

April 6, 1987

ADOPTED AUGUST 1972

Representative Adelheid Herrmann
House Resources Committee
Alaska State Legislature
Post Office Box V, (MS 3100)
Juneau, Alaska 99811

Re: City of Wrangell Resolution #03-87-267 relating to proposed House Bill 108, and Senate Bill 106.

Dear Representative Herrmann:

As per your request during the March 31, 1987 teleconference regarding the above captioned legislation, I am enclosing a copy of the City of Wrangell Resolution #03-87-267 relating to proposed legislation for "Aquatic Farming".

Quite a large segment of Wrangell's economic base is derived from the commercial harvest of wild salmon stocks. It appears there has been no truly qualitative analysis of the short, or long range biological effects of pen raising salmon in Alaskan waters, consequently we feel it is premature to enact legislation that would legalize pen rearing of salmon at this time.

Such a simplistic approach to finfish farming may be expedient in the eyes of the potential investor, but to jeopardize our highly successful and growing salmon enhancement programs without conclusive evidence of the effects on the delicate eco-system of the existing salmon stocks and other aquatic life, would indeed seem foolhardy.

We in Wrangell are excited about the future economic potentials of mariculture and aquaculture, and have been supportive of its development, however we feel that, as the old adage says, "You should always look before you leap."

We hope you will consider our position in this matter.

Sincerely,

Jim Gove

Jim Gove
Economic Development Director

cc: Members House Resources Committee
Members Senate Resources Committee
Representative Robin Taylor
Senator Lloyd Jones

encl.

CITY OF WRANGELL, ALASKA

RESOLUTION NO. 03-87-267

A RESOLUTION OF THE COUNCIL OF THE CITY OF WRANGELL, ALASKA, RELATING TO LEGISLATION PROPOSED IN HOUSE BILL #108 AND SENATE BILL # 106, "AN ACT RELATING TO AQUATIC FARMING AND PROVIDING FOR AN EFFECTIVE DATE", URGING A THOROUGH STUDY OF THE BIOLOGICAL AND ECONOMIC EFFECTS OF PEN REARING SALMON BEFORE ENACTING LEGISLATION LEGALIZING THE PEN REARING OF SALMON IN ALASKAN WATERS.

WHEREAS, the proposed program for pen rearing salmon in Alaska has the potential of having a negative effect on our existing fisheries and commercial fishing fleet; and

WHEREAS, the existing enhancement and hatchery program in alaska has been highly successful to date; and

WHEREAS, there have been no biological or economic studies to determine the effects the pen rearing of salmon may have on our existing fisheries economy, or the environment of existing wild salmon stocks; and

WHEREAS, the City of Wrangell has been supportive of controlled mariculture of shellfish, aquatic plant life, and existing salmon enhancement programs; and

WHEREAS, the proposed legislation encompasses the unknown of pen rearing salmon in Alaskan waters.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF WRANGELL, ALASKA:

1. The Council of the City of Wrangell Does hereby respectfully request that the Fifteenth Legislature of the State of Alaska eliminate any reference to fish farming or pen rearing of salmon in proposed House Bill No. 108 and Senate Bill No. 106.

2. The Council of the City of Wrangell further requests that the Fifteenth Legislature of the State of Alaska support the completion of a thorough study of the economic and environmental effect of pen rearing of salmon in Alaskan waters before proceeding with any legislation directed toward legalization of fish farming.

PASSED AND APPROVED: MARCH 24, 1987

Mayor

ATTEST: Janice K. Lundeson
City Clerk

Eugene Dursin
Box 365
Sterling, AK 99672
(907) 262-2274

I've been a resident of the Kenai Peninsula since 1965, the same year I started fishing Bristol Bay. I've been a driftgillnetter in that area ever since that time. I've also been involved in the halibut and herring fisheries in Prince William Sound.

I just returned from a two month trip to British Columbia where I became involved in their aquaculture industry. I travelled from Vancouver to Egmont, from Victoria to Campbell River. I visited fish farms, hatcheries, processors, and feed mills. Talked to aquaculture associations, government agents and research labs. At Malaspina College in Nanaimo, I took two aquaculture courses that dealt specifically with salmon farming.

We have before us House Bill 108, a proposal that will affect thousands of miles of coastline, that will affect untold generations of Alaskans. You have heard from various experts. You've heard of aquaculture's potential; you've been warned of its hazards. However, I am not certain that you have grasped its enormity. It's as if you have partly developed the wheel, and you are preparing to issue licences. The rest of the vehicle has yet to be designed. There are no rules formulated, no regulations tested, no speed limit, no police force, no funding; why, the highways haven't even been built. I do not believe it has yet dawnwed on youthe enormity of the task that lies ahead. The bad news is that it is going to cost millions of dollars to properly design and implement a decent aquaculture

APR 09 '87 16:16 LEG. AFFAIRS - SOLDOTNA

plan that will benefit all Alaskans. The good news is that it does not have to be done right now. The only action you need to take now is to start planning for the future. Hopefully, by the time it comes time to implement the PLAN , the State will be fiscally better off, and aquaculture can get the funding it deserves.

Throughout these hearings most of the talk has centered around salmon farming, an area of considerable concern. At this time I would like to present some figures that will possibly spark further debate as to the feasibility of salmon farming itself, and of the State's role in the industry.

Smolt, young salmon ready for salt water rearing pens, cost between seventy-five cents and a dollar (depending on whether they are S_0 or S_1 smolt.) Salmon are capable of converting one and one-half pounds of high quality fish feed into one pound of flesh. Fish feed cost about ninety cents per pound. (All these figures are in Canadian dollars; to convert into U.S. funds, multiply by .76). Let's say we are dealing with a salmon that weighs four pounds at harvest; our costs would be as follows: smolt- .75, feed- $5.40. The cost of our four pound coho is now up to between $6.15 and $6.35. Unfortunately, mortality rates run, on the average, about 50%. This means that the costs of raising this four pound fish have now doubled to between $12.30 to $12.70 per fish. As of three weeks ago, the Egmont Fish Plant in B.C. was paying three dollars per pound for coho and chinook in the two to four pound range. At these prices our four pound salmon that cost us close to $12.50 to produce is actually worth twelve; we just lost lost fifty cents per fish. (And we have not even begun to discuss our other expenses such as fish pens, nets, labor, housing, insurance, etc...)

You may well ask... then why are Canadians getting into fish farming in such large numbers? First, there is the question of site availability. Many rush in before the more favorable sites are all taken; this has been referred to as the "new gold rush."

APR 09 '87 16:17 LEG. AFFAIRS - SOLDOTNA

Secondly, fish farmers expect a large price drop in the market for ~~farmed salmon (as more~~ and more farms, worldwide, come into production). The rush is to get your loans paid off before the "BIG CRUNCH." The feeling is that those who are not financially extended at that that time will be able to weather the storm. The third reason fish farmers continue to develop farms is because, like all gamblers, they are optimists. They are hoping that with competition, feed prices will drop. That given enough time, strains of West Coast salmon will be developed that will better withstand confinement. Another reason so many in British Columbia are getting into aquaculture is because it is the first province-wide opportunity to come along in a long time; we are dealing with an area that has been economically depressed for a generation.

My point is that fish farming is a risky business. Banks will not loan money to fish farmers in British Columbia. As one banker explained to our group,"You have no useful collateral. Virtually all your capital is tied up in your fish in the form of smolt costs, labor and fish feed. If they die, we are left holding an empty bag." Enter the Norwegians. They will provide loans to fish farmers on the condition that the farmers buy Norwegian pens, Norwegian nets, and Norwegian feed; and that you sell them your fish when they need them. Is this what we want?

You need to decide soon whether this fishery is to be controlled by large corporations, by Norwegians, by Alaskan puppets, or by mom and pop. To say, "Let the market forces dictate the terms" is both naive and irresponsible. Plan now or pay later!

My last point is that you need to emphasize other species that have market potential. I recently came across an enlightening publication produced by the Science Council of British Columbia. It lists 18 species with aquaculture potential. It would perhaps pay us great dividends if we took advantage of the research that has already been done in an environment similar to our own.

APR 09 '87 15:17 LEG. AFFAIRS - SOLICITOR

It isn't enough just to vote "NO" on HB 108; if we are to vote it down we should start preparing something more comprehensive to take its place. With this in mind, I have prepared a five point plan I would like to summarize and present at this time:

1. A twelve to twenty-four month moratorium on the issuance of all mariculture licences. This would allow you time to organize the next four items.
2. Have fisheries experts determine the aquaculture potential of the entire Alaskan coastline. Through local input, they could eliminate areas of potential conflict right at the start. Maps could be issued for each specie with potential. No need to look for sites outside the approved areas.
3. Design educational programs that will teach potential mariculturits how to grow, harvest and market specific species. Upon completion of the course, qualified graduates would receive a license allowing them to engage in specific aquaculture activities (i.e. scallop license) These courses would be offerred statewide to enable all interested Alaskan to get involved.
4. Send our legal and fisheries experts to British Columbia to take advantage of their errors and successes.
5. Have a program that would help licensed aquaculture farmers find suitable locations. This would inolude a simplified application process (since you have already eliminated the speculators.)

A program based on the above plan, or one similar to it, will result in an informed, enthousiastic and well planned development of an important resource.

APR 09 '87 18:18 LEG. AFFAIRS - SOLDOTNA

APR 1 3 '87

Cook Inlet Seiners Association

P.O. Box 421
Homer, Alaska 99603

April 7, 1987

House Resources & Finance Committee
House of Representatives
Pouch V
Juneau, Alaska 99811

Att: Representative Adelheid Herrman, Chairperson

Dear Sirs & Madams:

I am writing on behalf of the Cook Inlet Seiners Association, representing Area H salmon permit holders, their crews and families. Our group has quite a few reservations about HB 108. We have obvious concerns about the general threat of finfish mariculture to the fishing industry, including disease, pollution, threats to wild stocks and economic competition.

We are especially worried about diluting ADFG capacity to manage and monitor commercial stocks by increasing Departmental responsibilities without adding personnel or funding. The only hatchery in our area, Tutka Bay, is being slated for closure due to a lack of state funding, and our group would certainly advocate funding existing state hatcheries before venturing financially into a new industry which appears to be both expensive and disruptive to the state.

In addition, our group is concerned about a land, or rather water rush, with nterests from outside areas and even other countries staking out choice sites in locations sensitive to both environmental and recreational pressures. We would hate to lose our traditional common property fishing grounds to fish pens and political pressure.

In summation, the Cook Inlet Seiners Association would not oppose a shell fish mariculture bill if a cautious approach on leasing is followed and state finfish mariculture in this legislation at this time.

Thank you,

PHILIP BRUDIE

Vice President
Cook Inlet Seiners Association

PB:jsm

TESTIMONY OF ALASKA TROLLERS ASSOCIATION REGARDING

FISCAL NOTES ATTACHED TO HB 108 and SB 106 - APRIL 6, 1987

You have heard quite a number of comments regarding the fiscal notes attached to these companion mariculture measures - HB 108 and SB 106. We think much of the criticism is justified. At one point during the testimony last week it was asserted that permit and other user fees on mariculture licensees could be expected to largely defray the costs of regulating the new industry. We think this is extremely unlikely. Even a simplistic analysis of the existing fiscal notes indicates FY88 - FY92 program costs of some $2.245 million against expected receipts of just $247,000 - leaving a shortfall of some $2 million over five years. Moreover, these cost estimates are optimistically low.

The Department of Environmental Conservation has already retrenched from its original $0.00 fiscal note. Doug Donegon of DEC indicated that after listening to extensive testimony he would have to rethink their entire approach to the issue of regulating a new mariculture industry. Given the responsibilities of his agency I believe it is only prudent to expect a fairly significant fiscal note from DEC, which would add to the cost side of the fiscal estimates just cited.

The Department of Fish and Game submitted a fiscal note dealing with only one of its divisions - Fisheries Rehabilitation Enhancement and Development. While FRED will surely bear the brunt of responsibilities for mariculture within ADF&G, we think it is unrealistic to believe that additional costs will not be incurred in other areas too.

Increased burdens for the Habitat Division come to mind most immediately. One criticism we have of FRED's fiscal note is that it anticipates 100 permit applications in FY88, resulting in 20 operational farms by 1992, but does not project an ongoing stream of applications in years subsequent to FY88. Still, FRED's projections work out to $11,900 per application, or $59,500 per successful farm over 5 years. Quite obviously, recovery of such costs through permit fees is unrealistic in the extreme, as the financial burden on applicants would be excessive. This is particularly so since at least some of these cost would be ongoing beyond the FY92 projection limit of the fiscal notes.

The Department of Natural Resources fiscal note also indicates a significant shortfall, although given the language of their note it is impossible to indicate per permit costs over the five year projection period. In gross terms DNR posits some $989,400 in administrative costs against $147,000 in revenues for an $842,400 shortfall over the period.

Commerce and Economic Development's fiscal note is the most optimistic of all, projecting an actual surplus of revenues over costs of $33,900 from FY88 through FY92. However, we believe that DCED's cost estimates are seriously flawed. As written these two bills would establish DCED as the lead agency for development of this industry in Alaska. As such the cost estimates are hopelessly out of whack. It seems fairly clear to us that actual lead agency responsibility must ultimately rest with one of the agencies having the greatest regulatory responsibility. It

appears that DCED envisions its role actually diminishing from its current "road show" responsibilities even as the industry grows! In our view this reflects a very unrealistic view of the complex set of issues that establishment of a new, technologically sophisticated industry would pose in such a large, diverse and difficult development environment as Alaska. Even the simplest of coordinative roles will impose a greater burden on DCED than that projected in its fiscal note. As "lead agency" precisely what sort of services does Commerce see itself providing - either to the public or other agencies - for a mere $16,100 in 1992?

One of the most disconcerting things about these fiscal notes is that they are all based on entirely different assumptions about the number of potential applicants.

Commerce projects a straightline increase of 50 new permit applications per year through 1992. They apparently don't think any of those permits applications will be denied and/or abandoned, as revenues at the rate of $100 per permit are projected through the entire period of the fiscal note, with a projected 300 active permits in FY 92.

Fish and Game calls for 100 permit applications in FY 88 resulting in 20 operational farms in FY 92. There is no mention of expected new permit applications subsequent to FY 88. Are we to assume that the projected costs through FY 92 are based solely on tracking those initial 100 applications through the period? If so can we expect an additional increment of 100 new applications to be received in FY 89,

and each year thereafter, with a similar additional cost increments over each subsequent five year period?

Natural Resources's fiscal note suffers from a similar discontinuity, as they too provide an estimate of the number of applications - some 70 - only in the first fiscal year of the projection period. How many additional applications do they expect through FY 92? What effect will those new applications have on their fiscal note?

This whole issue raises questions about lead agency responsibility once again. It seems only reasonable for the Administration to have come into these Legislative hearings with a set of agency fiscal notes based on a set of common assumptions. First year estimates of permit applications vary from 50, to 70, to 100. No two agency estimates are the same. Projections in subsequent years are completely muddled. The proper approach on this would be to develop a set of mutually agreed upon assumptions upon which every Department would base its fiscal projections. These assumptions should include low, mid and high range estimates of the number of permit applications and ultimate number of operators. Further, a careful analysis of all State government agencies expected to be involved in the regulatory processes of this new industry should have been completed well in advance. Each should have been provided with the basic assumptions and been directed to complete a timely and complete fiscal note. To us, that's what lead agency responsibility is all about. Unfortunately, Commerce's "road show" doesn't seem to have included much in the way of inter-agency

coordination, and their projected fiscal note indicates no planning to take on that role.

Clearly, a great deal more fiscal analysis is required before the State leaps into this mariculture business. We need fiscal analyses from all effected agencies. We need analyses based on a set of clear, consistent assumptions about industry growth and regulatory requirements. Finally, we need some cogent analysis of the impacts of these new budgetary inputs on the conduct of vital existing management programs. This last point is absolutely crucial given sharply declining State revenues and already severely curtailed budgets in key resource management agencies. As so many others have already testified, the Alaska Trollers Association strongly believes that the State's limited funds would be far better spent in strengthening our existing fisheries.

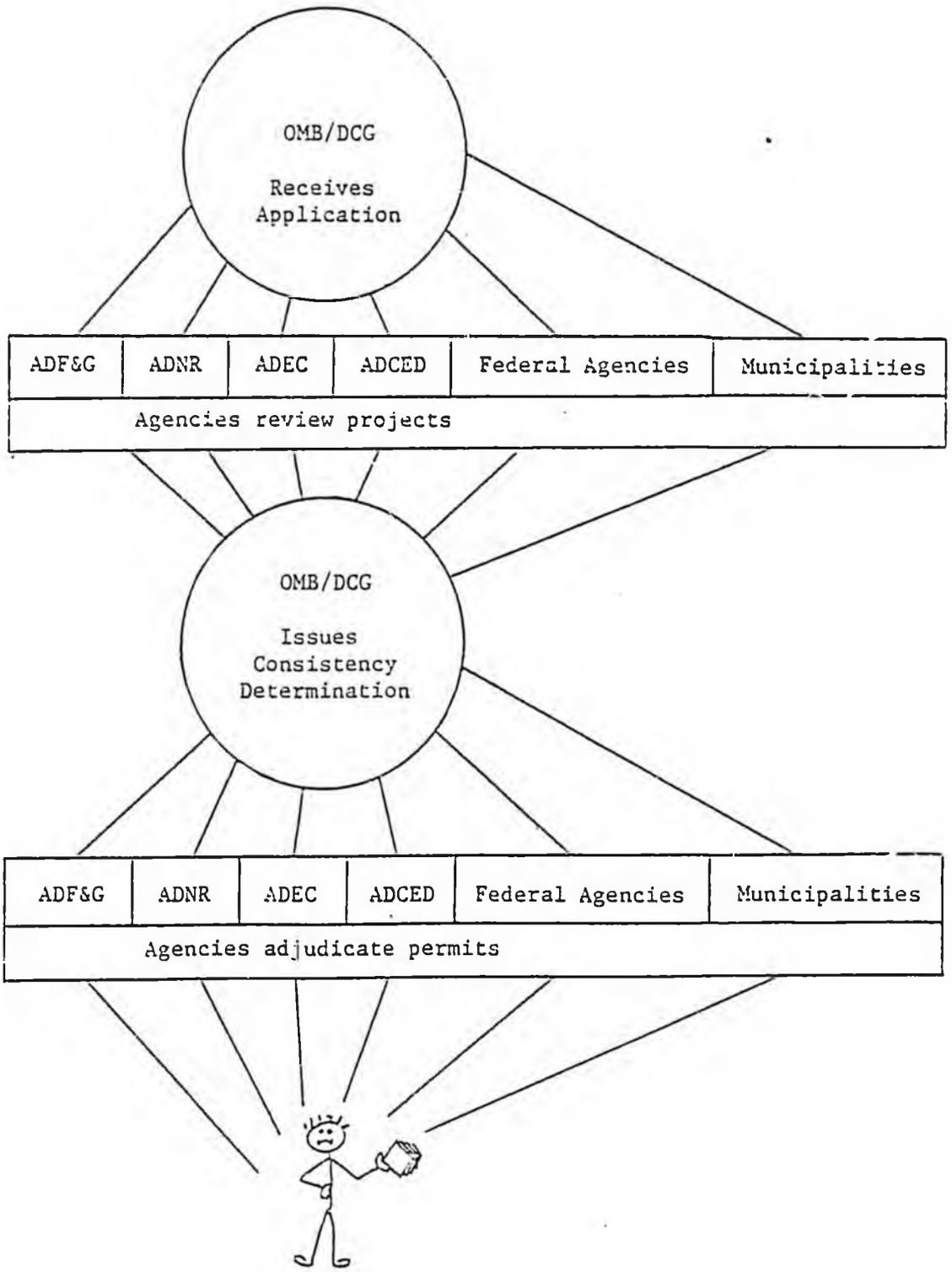
Agency	Regulatory Issues	Legislative Questions	Policy Questions
ADF&G	1. Broodstock acquisition a. from hatchery --charge PNP law --state sale b. from wild stock --need Board of Fish regulations 2. Broodstock Hatchery a. Pathology --disease control for brood --prevention in facility design and maintenance b. Genetics c. Siting --habitat protection --protection of natural stocks d. Water --quality --quantity e. Management --qualifications of managers --on-site personnel f. Site selection 3. Fish Farm a. Use of certified brood --disease control --genetic protection b. Adequate control of stock --prevent release into wild c. Siting	1. Size and scope of operations 2. Broodstock acquisition (sale of eggs 16.10.420 (7) (8) PNP) 3. How do we control size of program (B.C. Goldrush) 4. State-approved facility design	1. Impacts on traditional fisheries at site 2. Highest and best use of the site 3. Conflicts with recreational, subsistence, and other uses 4. Board of Fisheries involvement in developing regulatory framework
CFEC	1. License for broodstock acquisition a. Interim use permit 2. Oversite for limited entry permit use		
DNR	1. Water rights --highest and best use 2. Tidelands lease and permits --use conflicts 3. State-owned uplands --leases --parks	1. Size and scope of operations 2. Need for guidance for resolving use conflicts for tidelands	1. Highest and best use of the site (Is it in state's interest to use tidelands this way?) 2. Aesthetic concerns 3. Conflicts with recreational/log transfer facilities, and other uses 4. Speculation on sites 5. Bonding requirements (clean-up bonds) 6. Cumulative impacts 7. Fair return to the state for tidelands
DEC	1. Water quality --site selection criteria --on-shore hatchery discharge 2. PSP testing --shellfish 3. Product quality --inspection	1. Size and scope of operations 2. Change produce wholesomeness statute to allow inspection of fish farms	
DCED	1. Without new legislation DCED not directly involved in regulation 2. Assistance in fisheries economic development and promotion	1. Without enabling legislation, DCED cannot assess economic viability of proposed projects or be involved in industry regulation	1. Economic viability of project 2. Bonding requirements 3. Cost recovery of administrative cost
Revenue	1. Fish farm licensing --when to issue --need to formalize relationship with ADF&G --need to tie in with OMB review		
OMB/DGC	1. Multiagency project review --new questionnaire needed --czm compliance		1. Require applicant to submit project plan

DRAFT

EXISTING PERMIT STRUCTURE

for

RESOURCE AGENCIES



3/24/87

Alaska Department of
NATURAL RESOURCES

LEASING OF STATE LANDS AND TIDELANDS

A.S. 38.05.070

State land, including tide, submerged and shore land is available to lease by any member of the public, business or organization that can demonstrate a need for appropriate development. Leases may be offered competitively through public auction or negotiated directly with the applicant. If the fair market annual rental is determined to be less than $5000.00, the law allows the State to negotiate that lease directly with the applicant for 10 years or less. However, if it is determined that a competitive interest exists or if the annual rental is greater than $5000, the lease will be offered at a public auction to the highest bidder. The minimum bid will be the appraised fair market value annual rental.

Competitive leases can be issued for a term not to exceed 55 years, while negotiated leases can only be issued for a term of 10 years or less. Within those parameters, the determining factors are the estimated life of the project or the estimated time that the applicant thinks the land will be needed and the extent of the improvements. Land leases that are offered by competitive bid are renewable at the director's discretion. The renewal must be applied for in a timely manner. Leases negotiated under A.S. 38.05.070(b) are not eligible for renewal.

The owner or lessee of land that fronts on tide or submerged land is entitled to acquire a negotiated lease for the tide and submerged land if the requirements of A.S. 38.05.075(c) are met.

Negotiated leases may also be requested by: 1) commercial operators of fishing or hunting camps within an exclusive or joint use guiding area, 2) commercial operators of duck shacks, and 3) shore fishery setnetters seeking an upland lease for use in conjunction with their fishing sites. Parcel size should be limited to the minimum acreage needed. In the case of setnetters, they must provide evidence that they have necessary limited entry permit to participate in the local fishery and the term of the upland lease should coincide with the term of their shore fishery lease. If they do not have a shore fishery lease, they should apply during the filing period.

Leases may be transferred by assignment with the approval of the chief of Contract Administration. Before approving an assignment of lease, the individual receiving the lease must be determined eligible to participate in the program under which the lease was created and the lease must be in good standing.

It is the responsibility of the applicant to arrange and pay for survey, appraisal and legal notice publication, and to see that these tasks are carried out in a timely manner when directed to do so by the State. Depending on the time of year, these tasks could be time consuming. If the lease is negotiated, the decision on whether or not to require a survey will be made on a case by case basis and will depend on the type and extent of existing monumentation, the existing uses of the surrounding land, the likelihood that the surrounding land will be developed during the lease term and any other pertinent factors which may apply to a particular parcel of state land.

The following is a general time table for processing a lease:

1.	Application received, serialized and photo copied.	*30 days
2.	In-house and agency review	30 days
3.	Preliminary decision	30 days
4.	.945 notice letters (AS 38.05.945(c)	30 days
5.	.945 public notice (newspaper ad) (AS 38.05.945(b)	30 days
6.	Survey and appraisal (11 AAC 58.400 - .410)	60 days
7.	Final decision	10 days
8.	.945 notice letters (if competitive offerings)	30 days
9.	.945 public notice (if competitive)	30 days
10.	Lease offering	10 days

In addition to the above mentioned times, applicants must take into consideration delays that may occur if the land is not classified or needs to be reclassified (approximately 90 days - 11 AAC 55). If the land is located within an organized borough, the survey plat must be approved by the local platting authority which requires additional time (11 AAC 53). Applications are processed in the order received and there is currently a backlog of over 2000 casefiles.

Applicants should include the following information with their completed application form:

- Filing fee.
- USGS map 1:63,360 scale with the location marked.
- Development plan and time schedule.
- A clear statement of the intended use of the property.
- Any applicable licenses.

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* Some upland leases and all tideland leases are within the "coastal zone" and other permits may be required from other agencies. These go through another review for consistency with the Alaska Coastal Management Plan or approved local coastal plans. Normal review period is 50 days.

The development plan should contain the following information:

- A description of the type and location of the temporary and/or permanent structures and a scale drawing depicting all proposed structures.
- The intended access to the site.
- An explanation of any clearing or cutting of trees.
- A description of the intended power source and fuel storage area.
- An explanation of the intended solid waste and waste water disposal method.

Applicable statutes for reference:

A.S. 38.05.035 -- Powers and duties of the director.
A.S. 38.05.070-.105 -- Leasing of lands other than for the extraction of natural resources.
A.S. 38.05.840 -- Appraisal
A.S. 38.05.920 -- Assignment
A.S. 38.05.945 -- Notice

Additional information may be obtained from the local office of the Division of Land and Water Management, Department of Natural Resources.

Southcentral Regional Office
OFFICE LOCATION:
3601 "C" Street, Tenth Floor
Anchorage, Alaska
Phone: (907) 762-2202
MAILING ADDRESS:
P.O. Box 7005
Anchorage, Alaska 99510-7005

Mat-Su Area Office
OFFICE LOCATION:
Century Plaza, Suite 202
Mile .5 Knik Road
Wasilla, Alaska
Phone: (907) 376-4595
MAILING ADDRESS:
P.O. Box 874008
Wasilla, Alaska 99687

Northern Regional Office
OFFICE LOCATION:
4420 Airport Way
Fairbanks, Alaska
Phone: (907) 479-2243
MAILING ADDRESS:
4420 Airport Way
Fairbanks, Alaska 99709

Southeast Regional Office
OFFICE LOCATION:
400 Willoughby Avenue,
Suite 400
Juneau, Alaska
Phone: (907) 465-3400
MAILING ADDRESS:
400 Willoughby Avenue,
Suite 400
Juneau, Alaska 99801

Alaska Department of
NATURAL
RESOURCES

FACT SHEET - LAND USE PERMITS ON STATE LAND

Division of Land and Water Management
Southeast Regional Office
400 Willoughby Ave., Suite 400
Juneau, Alaska 99801
Tel, No. 465-3400

WHAT IS A LAND USE PERMIT?

A land use permit is authorization for the temporary use of state land, tideland or resources. It conveys no right in the land and is essentially a guarantee that so long as the activity is conducted under the terms of the permit the holder is immune from prosecution for trespass. All permits are revocable immediately with cause, and they are revocable without cause upon a thirty day notice. Permits are not transferable. Permanent structures are prohibited on a permit area. Therefore, any structure placed on the permit area must be readily removable.

FOR HOW LONG IS A PERMIT ISSUED?

It is division policy that a permit may not exceed one year in length. A permit may not be renewed, but it may be re-issued by submitting a new application.

HOW DO I OBTAIN A LAND USE PERMIT?

A permit may be obtained by making application to the Southeast Regional Office at the address listed above. The applicant must submit a completed land use permit application, a filing fee, a sketch map and a completed coastal project questionaire.

WHAT COSTS ARE INVOLVED?

An applicant must pay a fifty dollar filing fee. There are no user fees for non-exclusive permits, however, user fees of fifty dollars per acre per year with a one-hundred dollar minimum will be charged for all permits for exclusive use or commercial use.

WHAT IS THE PROCESSING TIME?

Normally the processing time is about thirty days. This allows time for review of the application by other state agencies and for a determination of consistency with coastal zone management statutes.

WHAT ARE GENERALLY PERMITTED ACTIVITIES?

Regulations specify certain activities which will be allowed on state lands without the issuance of a written permit. These are called generally permitted activities. A list of generally permitted activities is on the attached page.

Prepared 8/29/86

The following constitutes the list of generally permitted activities on state lands:

A. Hiking and backpacking, horse and dog team travel, cross-country skiing and snowmachining, camping and warming fires, mountain climbing.

B. Light plane and helicopter landing; use of water equipment such as boats, rafts and canoes.

C. Hunting, fishing and trapping; use of state land for setting up fish camps or hunting camps when such camps are for the individual's own temporary use and do not constitute a preference right. Placement of crab and shrimp pots in accord with fish and game regulations is allowed.

D. Harvesting small number of wild plants for personal use; securing dead or down firewood for personal use; harvesting mushrooms, berries and other plant materials for personal use as food.

E. Non-exclusive recreational use or other use that is temporary and has no noticeable effect on vegetation, drainage or soil stability nor involves any harassment of wildlife other than lawful hunting, trapping and fishing.

F. Recreational gold panning.

Although the following activities are generally permitted on the state public domain, a written permit is required for surface uses of lands designated as part of the state park system, fish and game sanctuaries, refuges, and critical habitat areas, or areas where use is limited by classification or special use designation including university grant lands:

A. Mineral prospecting using pick and shovel; hard rock prospecting by backpacking; gold or other mineral recovery utilizing small hand held or floating suction dredging apparatus.

B. Brushing survey lines or trails less than three feet wide where there is no disturbance of the root system and when such trails do not constitute a right-of-way.

C. A livestock drive of less than 100 animals.

D. Anchoring of mooring buoys or construction of private floats and docks by the upland owner for his own personal noncommercial use on state tide or shore lands.

E. Use of vehicles such as 4-wheel drive vehicles, pickups and all-terrain vehicles (wheeled and tracked) off established right-of-way easements.