ALASKA LEGISLATURE COMMITTEE FILES 1987-1988 8672 505
4936 HRES HB 108 (FILE 3)

SALMON FARM MANAGEMENT PLAN

All persons at the time of making application to the Ministry of Lands, Parks and Housing to lease/licence Crown land for Salmon mariculture purposes must submit a completed "SALMON FARM MANAGEMENT PLAN" which has been approved by the Fisheries Branch, Ministry of Environment.

The purposes of the SALMON FARM MANAGEMENT PLAN are to ensure that:

- All applicants have fully thought out and developed their proposed operations with consideration of the funds and the commitment in time required.
- All applicants have the major role in establishing management guidelines for their proposed operation.
- Once an application for Crown land has been made the processing time is decreased.
- Both the Ministries of Lands, Parks and Housing and Environment, Fisheries Branch, understand and have a documented guideline for the proposed mariculture operation.

The SALMON FARM MANAGEMENT PLAN requires the applicant to detail the physical and environmental characteristics of his farm site. This information will be used to evaluate the biophysical capability, and area suitability of the proposed site and to assign lease rental fees. A diagram of the planned site utilization (including location and configuration of seapens, buildings, docks etc.), facility completion schedule and estimates of expenditures are also required. An evaluation of the economic viability of the proposed development will be based on this information.

Various examples of what is expected are included with this "Plan". Please complete in full and return within 30 days to:

Ministry of Environment
Fisheries Branch
Marine Resources Section
Parliament Buildings
Victoria, B.C. V8V 1X5

All financial information which is submitted will be considered confidential. Further information as may be required by the Fisheries Branch may be requested during the future development of the farm.

Before you begin the task of completing your Management Plan a check should be made on the (1) status and availability of the desired waterlot, and (2) the status of the adjacent upland. This enquiry can be made at the regional office of the Ministry of Lands, Parks and Housing. If the adjacent upland is privately owned, the upland owner's consent must be obtained.

BIOPHYSICAL CAPABILITY - MARINE SITE

Location of Site: Latitude _____ Longitude _____

Name and description of site: _____

_____

Legal Description (if any) e.g. lease #: _____

Approximate size of foreshore lease applied for: _____ ha

Marine site exposure to winds and waves:

- _____ distance _____ direction Magnetic

- maximum wave height anticipated:_____ meters

- prevailing winds: spring _____ summer _____
fall _____ winter _____

Water depth below seapen at an average low tide: _____ m
Annual tidal range: mean _____m; minimum _____m; maximum _____m

Water circulation at seapens: ebb tide: _____ cm/second $^{-1}$

(see note 1) flood tide: _____ cm/second $^{-1}$

Annual water temperature: mean _____ °C

(see note 1) minimum _____°C

maximum _____°C

Salinity and temperature profiles - quarterly:

Depth	Spring: Date:		Summer: Date:		Fall: Date:		Winter: Date:	
m	Temp.	Sal.	Temp.	Sal.	Temp.	Sal.	Temp.	Sal.
0	°C	°/oo	°C	°/oo	°C	°/oo	°C	°/oo
1								
2								
3								
4								
5								
10								

Salinity Meter Make _____ Model _____

or

Source(s) of temperature and salinity data: _____

BIOPHYSICAL CAPABILITY - FRESHWATER SITE

Location of hatchery site: Latitude _____ Longitude _____

Legal Description: _____

Freshwater supply: surface (i.e. lake/stream) _____

or groundwater (i.e. well) _____

- if surface water name source: _____, and;
- describe watershed development including present or potential activities (e.g. logging, mining, recreation, subdivision etc.) present: _____

_____

potential: _____

_____

- water licence application filed: Yes ____ No ____
  Volume requested: _____

Water chemistry: date tested

pH . . . . . _____

Dissolved Oxygen (DO) . . . . . _____

Heavy metal scan (give details) . . . . . _____

_____

_____

MARINE SITE SUITABILITY

- give details of upland ownership: _____

_____

- distance to nearest road link: _____km

- distance from market or shipping point: _____km

- other available transport systems (e.g. ferries, coastal freighters, air service)

_____

_____

- hydro service available: Yes _____ No _____

- potential small hydro development: Yes _____ No _____
  if yes, give generation estimate _____kw

- communications: telephone Yes _____ No _____
  radiotelephone Yes _____ No _____

PRODUCTION INFORMATION

Briefly describe your production plans from the initial pilot phase to full production. Include the following pieces of information in your description: species to be reared, egg requirements, egg to smolt survival, smolt source if you plan on buying smolts, sterilization or feminization strategies, plans for brood stock, rearing densities both in fresh water and in sea water, seapen survival rates, size of fish at harvest and feed type to be used. ALSO complete the PRODUCTION STRATEGIES AND TARGET LEVELS table on the following page. An example to follow can be found in Figure 5.

PRODUCTION STRATEGIES AND TARGET LEVELS

Time(Months) Product	0 Eggs	8 Smolts	17 Pan-Size	25 3 lb+	37 8 lb+	48-60 Brood Stock	Smolt to Harvest Survival Rate
Cycle A _____ Brood							
Cycle B _____ Brood							
Cycle C _____ Brood							
Cycle D _____ Brood							

REARING FACILITIES AND SITE LAY-OUT

The following information is required as per the fictitous sample diagrams attached.

1- a map showing the location of your proposed site in relation to the surrounding coastal area (see Figure 1).

2- a lay-out of your site showing the location and configuration of the facilities including seapens, hatchery, processing plant, housing, docks, and any other improvements which will be incorporated into your farm. Prevailing winds, current patterns and water depths should also be displayed (see Figure 2).

3- a detailed diagram of your floats and seapens (top and side views) showing anchoring system, predator nets, seapens, etc. (see Figures 3 and 4).

4- describe hatchery and freshwater rearing facilities indicating number of heath trays, number of ponds or troughs etc., rearing densities, primary and back-up water systems, total volume of the freshwater rearing facility and water flow rates required for the facility at maximum capacity.

MANAGEMENT PLAN SCHEDULE

Complete the following MANAGEMENT PLAN SCHEDULE. An example is shown in Figure 6. Please keep in mind that this Schedule is an integral part of the SALMON FARM MANAGEMENT PLAN and that you are expected to abide by it. Some flexibility is expected though major variations from the schedule must be approved.

MANAGEMENT PLAN SCHEDULE

Nature of Improvement	Total area	Completion Date

FISH PROCESSING AND MARKETS

Do you have your own processing facilities? Yes _____ No _____
Will processing facilities be established? Yes _____ No _____
If yes, please attach a detailed large scale plan of the facilities.

If you do not have or plan to have processing facilities what distance is the seapen site from the intended point of processing? _____ km.
Name of processing firm _____

Does it have provincial _____ federal _____ licence or registration?
What is your intended product type and market? _____

_____

_____

Do you have any market contracts? Give details _____

_____

_____

COST ESTIMATES AND FINANCING

Give the following capital cost estimates associated with your farm at full production.

Freshwater facilities $_____
Seapen facilities $_____
Equipment $_____

Give estimates of the following operating costs:
Wages/yr. $_____
Feed/yr.(see Note 2.) $_____
Overhead (fuel, administration, utilities, etc.) $_____
Disease treatment/yr. $_____

Financial Outline-Start-up Costs
Amount of own capital $_____
Amount of loan capital $_____
Total Estimated Expenditures $_____

CONCLUSION

You have now completed your SALMON FARM MANAGEMENT PLAN. The information which was required was only that which you should have already gathered or thought about You will require a much more detailed plan if your farm is to succeed. Please sign your "PLAN", have your signature witnessed (p. 12), and submit it for evaluation.

This SALMON FARM MANAGEMENT PLAN must be approved and signed by Fisheries Branch staff before submission of an application for the lease site to the Ministry of Lands, Parks and Housing. Once it is approved, it will be returned to you so that you can submit it along with your formal lease application to the Ministry of Lands, Parks and Housing.

After a lease/licence application has been made and the Lands Branch referral system is complete, modification to the site or shape of the lease/licence may require changes in your SALMON FARM MANAGEMENT PLAN. If this is so, notations of correction will be made on your "PLAN" and you will be notified in writing. Once a final approval of your lease/licence has been made, a copy of your "PLAN" will be sent to you for your records. A copy is also attached to, and becomes part of, your lease contract.

As was stated previously, you are expected to abide by your plan. Some flexibility is expected though major variations from the plan must be approved. Written notification of major changes shall be made to the Fisheries Branch, Marine Resources Section. Amendments to the SALMON FARM MANAGEMENT PLAN shall be made following a consultative process with the proponent.

IMPORTANT: Under the new lease/licence policy an area showing diligent use will be allowed extended tenure when renewal is due. Leases/licences not showing diligent use will not be renewed and reassignment to a third party will not be allowed.

FINAL APPROVAL: _____ Applicant's signature

_____ Witness

_____ Date

_____ Signed on behalf of the Fisheries Branch

_____ Witness

_____ Date

NOTES

1) Currents and temperature/salinity profiles should be measured during both spring and neap tide conditions at the middle of the tide period. It is recommended that salinity/temperature profiles be recorded quarterly and including the peak rain/runoff period in winter and the warmest period in summer. The more profiles, the better.

2) Based on established growth rates and conversion ratios, and with an average feed cost of $.88/kg it will cost approximately $1.00-$1.10 to raise one (1) fish for the pan-size market and approximately $2.30 to raise one (1) fish to a size of 1 kg.

PERMITS AND LICENCES - CONTACT PEOPLE

SALMON FARM MANAGEMENT PLAN
Mr. L. Michael Coon
Fisheries Branch
Marine Resources Section
229 - 780 Blanshard Street
Victoria, B.C. V8V 1X5

Phone: 387-4573 - local 213

APPLICATION FOR CROWN LAND (FORESHORE LEASE/LICENCE)
Regional Director
Ministry of Lands, Parks and Housing
Regional Office

COMMERCIAL FISH FARM LICENCE
Mr. Leif Sunde
Fisheries Branch
229 - 780 Blanshard Street
Victoria, B.C. V8V 1X5

Phone: 387-4573 - local 222

NAVIGATION COMPLIANCE
COAST GUARD - WESTERN REGION
Attn: John Duduman
Senior Navigation Protection Officer
224 - West Esplanade
North Vancouver, B.C.
V7M 3J7

Phone: 984-3730

TRANPLANT APPROVAL - TRANSPLANT COMMITTEE

Mr. Leif Sunde
Fisheries Management Branch
229 - 780 Blanshard Street
Victoria, B.C. V8V 1X5
V8V 1X5

Phone: 387-4573

or

Mrs. Dorothee Keiser
Pacific Biological Station
P.O. Box 100
Nanaimo, B.C. V9R 5J6
V9R 5J6

Phone: 756-7051

EGG AQUISITION
Mr. Ted Perry
Dept. of Fisheries and Oceans
1090 West Pender Street
Vancouver, B.C.
V6E 2P1

Phone: 666-0287

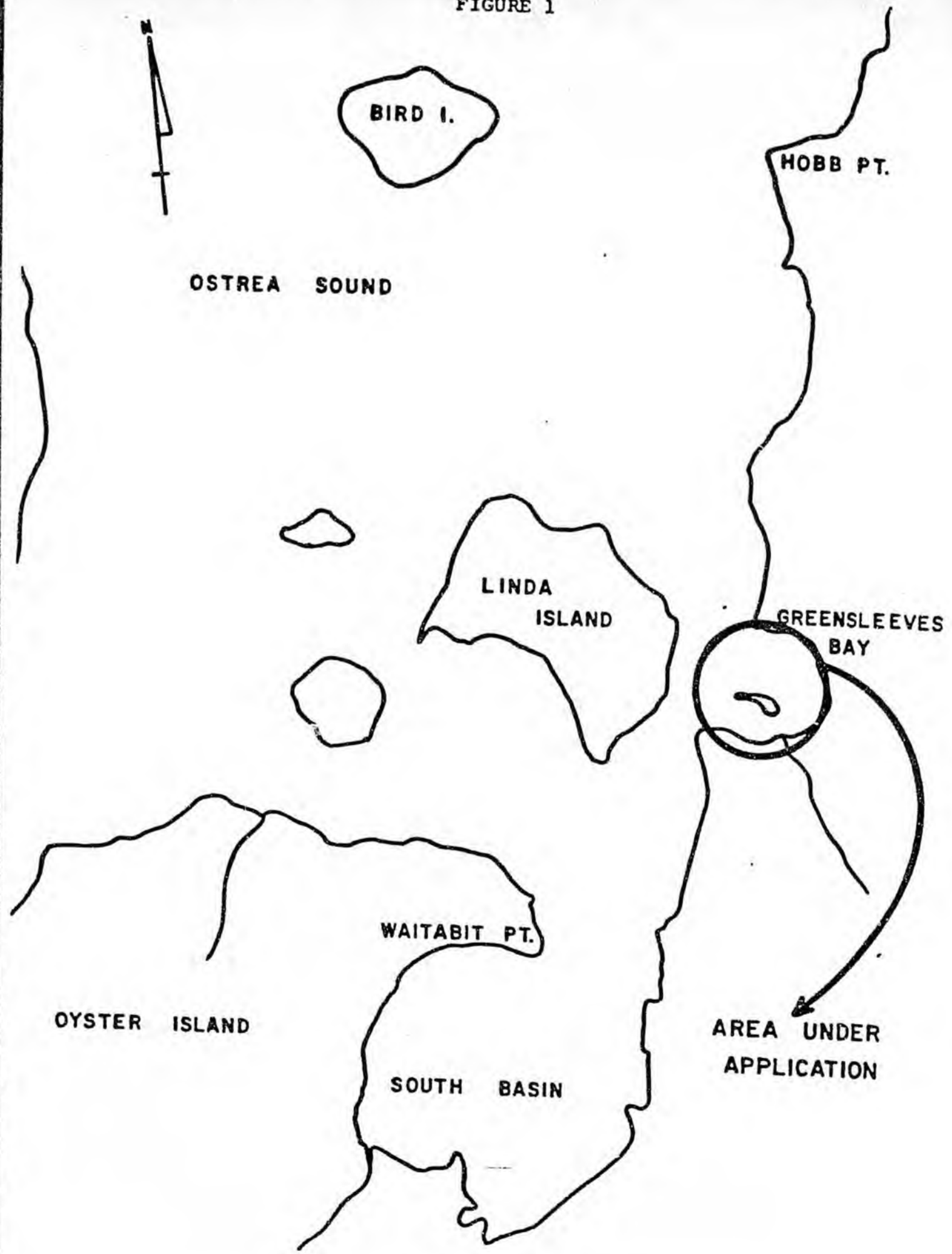
WATER LICENCE
Regional Water Manager
Ministry of Environment
Regional Office

AQUACULTURE PERMIT
Ms. Frances Dickson
Dept. of Fisheries & Oceans
1090 W. Pender Street
Vancouver, B.C.
V6E 2P1

Phone: 754-0255

POLLUTION CONTROL PERMIT
Waste Management Branch
Ministry of Environment
Regional Office
(Hatchery effluents only)

FIGURE 1


N
BIRD I.
HOBB PT.
OSTREA SOUND
LINDA ISLAND
GREENSLEEVES BAY
WAITABIT PT.
OYSTER ISLAND
AREA UNDER APPLICATION
SOUTH BASIN

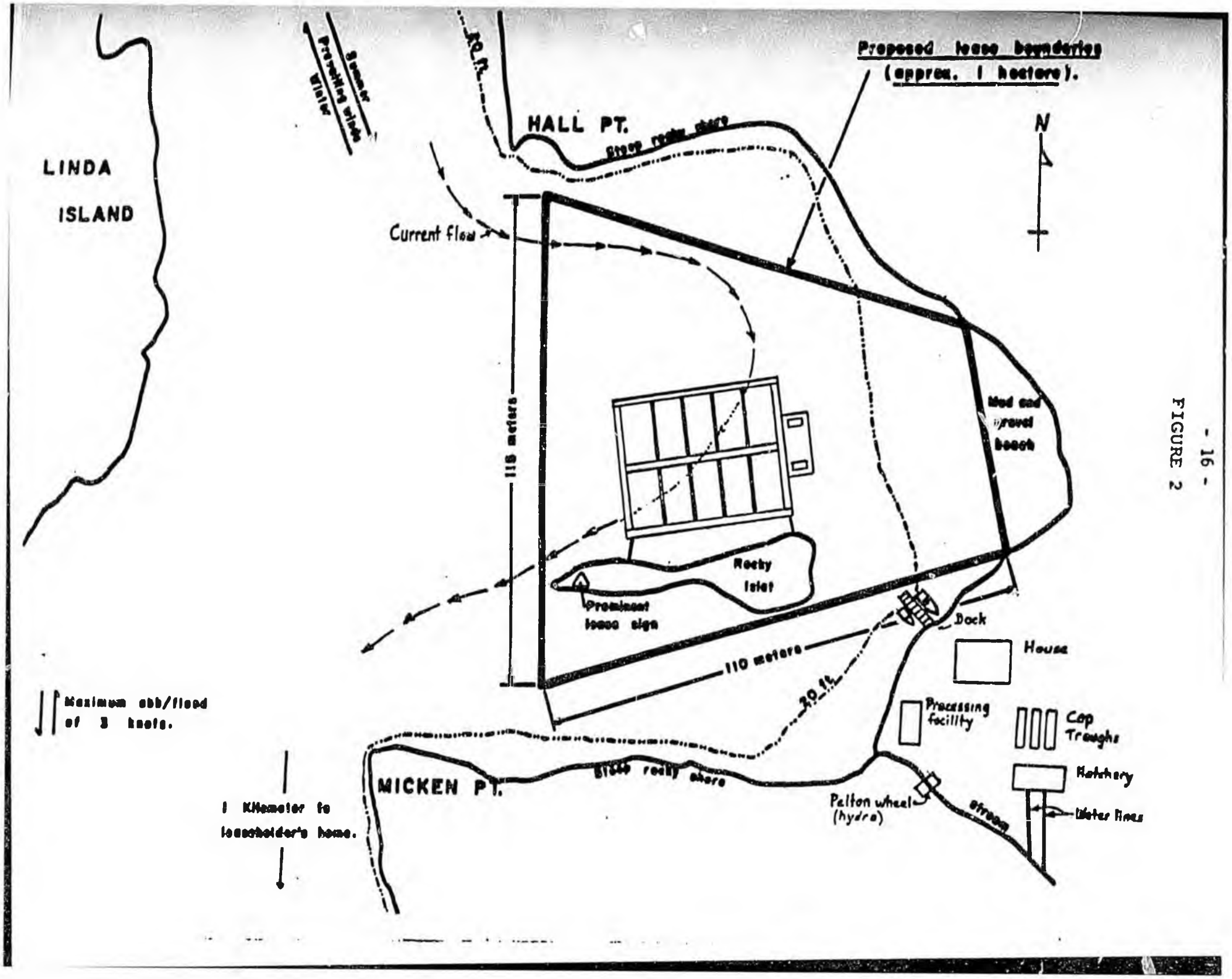

LINDA
ISLAND
Seaward
Prevailing winds
Blow
R.O.R.
HALL PT.
Steep rocky shore
Proposed lease boundaries
(approx. 1 hectare).
N
Current flow
115 meters
Mud and gravel beach
Rocky
Islet
Prominent
lease sign
Dock
House
110 meters
30 ft.
Processing
facility
Cap
Troughs
Hatchery
Water lines
Pelton wheel
(hydro)
stream
Steep rocky shore
MICKEN PT.
Maximum ebb/flood
of 3 knots.
1 Kilometer to
leaseholder's home.

FIGURE 2

FIGURE 3

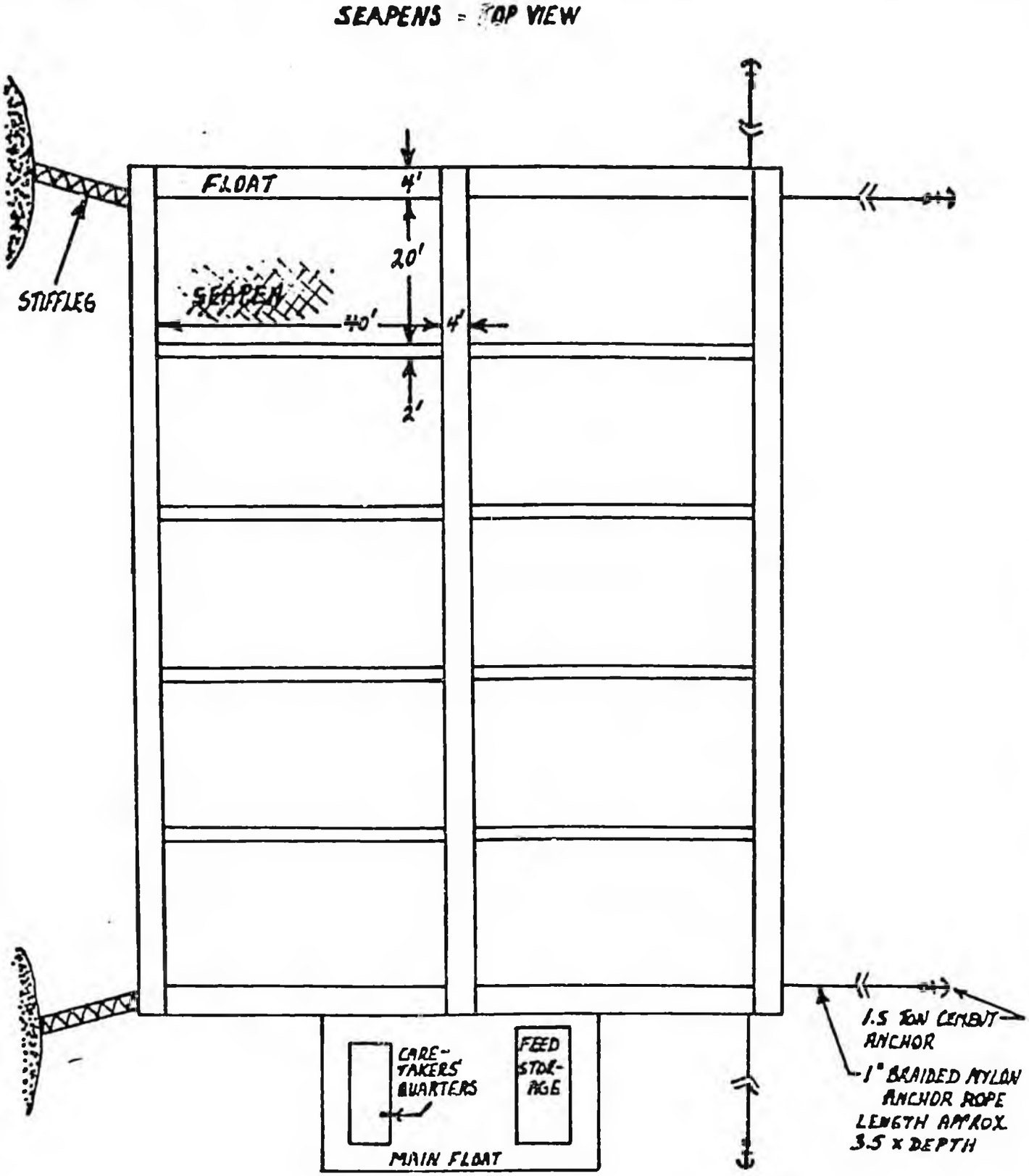
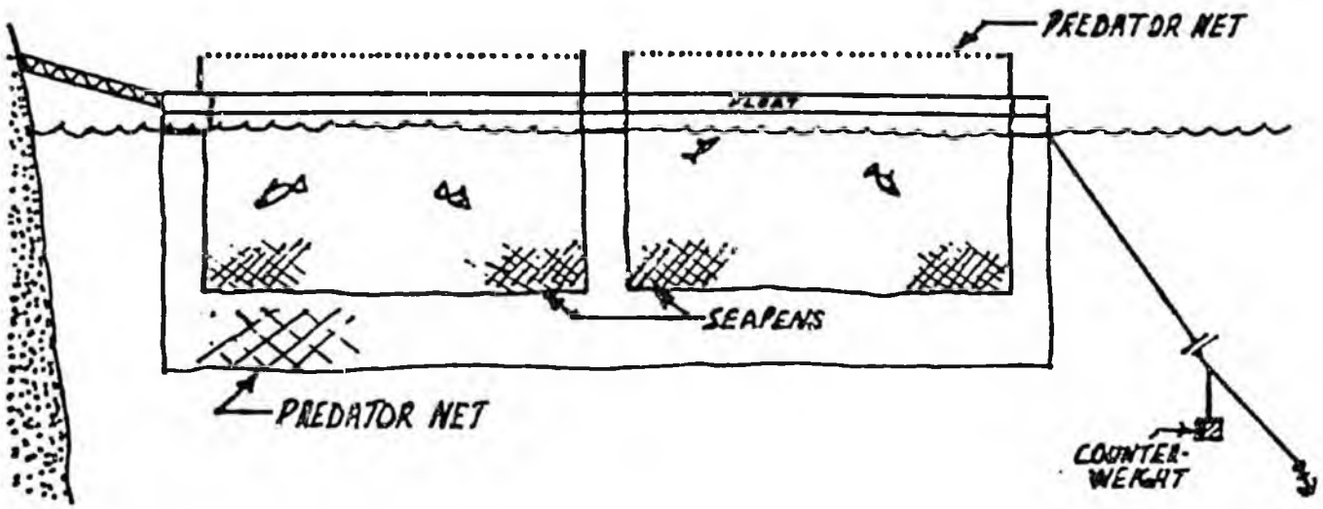

SEAPENS - TOP VIEW
FLOAT
4'
20'
SEAPEN
40'
4'
2'
STIFFLEG
CARE-TAKERS QUARTERS
FEED STORAGE
MAIN FLOAT
1.5 TON CEMENT ANCHOR
1" BRAIDED NYLON ANCHOR ROPE LENGTH APPROX. 3.5 x DEPTH
SCALE: 20'

FIGURE 4

SEAPENS - SIDE VIEW



SCALE: 20'

Figure 5

PRODUCTION STRATEGY AND TARGET LEVELS

Time(Months) Product	0 Eggs	8 Smolts	17 Pan-Size	25 3 lb+	37 8 lb+	48-60 Brood Stock	Smolt-Harvest Survival Rate Rate
Cycle A 1985 Brood	23,000	20,000	n.a.	10,000	1,700	300	60%
Cycle B 1986 Brood	44,000	40,000	n.a.	20,000	5,500	500	65%
Cycle C 1987 Brood	90,000	80,000	n.a.	40,000	11,500	500	65%

Figure 6

MANAGEMENT PLAN SCHEDULE

Nature of Improvement	Total Area	Completion Date for Improvement
Hatchery building, primary and back-up water supplies	400 ft^2	October, 1985
3 Capilano Troughs		January, 1986
Power House with Pelton Wheel delivering 15kw		February, 1986
House	800 ft^2	April, 1986
20'x40' Main Float (Topper Design) with Caretakers trailer and Feed Storage Shed	800 ft^2	May, 1986
2-20'x20'x20' 1/2" mesh Seapens and Walkways	400 ft^2	May, 1986
2-20'x40'x20' 3/4" mesh Seapens and Walkways	1600 ft^2	August, 1986
Dock		September, 1986
4-20'x40'x20' 3/4" mesh Seapens and Walkways	3200 ft^2	May, 1987
Fish Processing Facility	600 ft^2	May, 1987
3-20'x40'x20' 1" mesh Seapens and Walkways	2400 ft^2	May, 1988
etc - to full production	etc.	etc.

Fisheries and Oceans
Pêches et Océans

Fisheries - Pacific Region
1090 West Pender Street
Vancouver, B C
V6E 2P1

Pêches - Région du Pacifique
1090 rue Pender ouest
Vancouver (C B)
V6E 2P1

Your file Votre référence

Our file Notre référence

APPLICATION FOR AQUACULTURE LICENCE

The following application must be completed prior to the issuance of an Aquaculture Licence. While a separate licence is issued for each seapen site or hatchery, it is possible to apply for more than one site on this application form.

1. APPLICANT

   Name of Company/Person_____

2. ADDRESS

   Street/Postal Box_____

   City_____ Postal Code_____

   Telephone_____(Home)_____(Business)

3. AQUACULTURE SITE(S)

   (i) Name of Location

   Legal Description

   Name of Facility Manager (if known)_____

   Telephone_____(Home)_____(Business)

   Freshwater Hatchery_____Seapen Operation_____

.../2

Canada

(ii) Name of Location

Legal Description

Name of Facility Manager (if known)_____

Telephone_____(Home)_____(Business)

Freshwater Hatchery_____Seapen Operation_____

4. ATTACHMENTS REQUIRED:

(i) Site drawing must be attached giving scale, which will show location of facilities, depth of water at low tide, below seapens if applicable (seapens should not be located or anchored in an area with less than 30 feet of depth at low water, and a minimum of 10 feet of water must be available at low tide between the net and the sea bottom).

(ii) For a seapen site, an identification of sub-tidal flora and fauna in the proposed use area by means of SCUBA inspection must accompany this application - complete FISH HABITAT CHARACTERISTICS OF PROPOSED SEAPEN SITES, APPENDIX I. Also attach a copy of the Ministry of Environment Salmon Farm Management Plan; it is not necessary to include financial information.

(iii) For a hatchery, complete HATCHERY INFORMATION SHEET, APPENDIX II. Also include a copy of Ministry of Environment, Fish and Wildlife Branch, application for a commercial fish farm licence.

Signature _____ Date _____

Once your licence application has been approved, please indicate which Department of Fisheries and Oceans office you would like to go to, to sign for your licence: (i) 1090 West Pender Street, Vancouver, B.C. or (ii) other _____

Note: This form is an application only and completion of it does not guarantee issuance of an Aquaculture Licence. Before a Department of Fisheries and Oceans Aquaculture Licence will be issued, the applicant must show that he has received approval for his Salmon Fish Farm Management Plan from Ministry of Environment, that a Foreshore Lease has been granted by Ministry of Lands, Parks and Housing and that navigation compliance has been granted by Canadian Coast Guard.

*Completed form to be returned to: Aquaculture Co-ordinator
Field Services Branch
1090 West Pender Street
Vancouver, B.C. V6E 2P1
666-0519

APPENDIX I FISH HABITAT CHARACTERISTICS OF PROPOSED SEAPEN SITES

LOCATION _____

DATE _____ TIME _____ TIDE _____

DIVER'S NAME _____ TELEPHONE # _____

WHAT IS MINIMUM DEPTH BELOW SEAPEN ANCHORAGE AREA? _____

SUBSTRATE CHARACTERISTICS (RECORD % SILT, SAND, GRAVEL, ROCK)

i IMMEDIATELY BELOW PROPOSED PENS _____

_____

ii BETWEEN PROPOSED PEN SITE AND SHORELINE _____

_____

VEGETATION CHARACTERISTICS (RECORD % COVER BY BULLKELP, OTHER KELPS, ROCKWEED, SEAGRASS, JAPWEED, SEA LETTUCE, IRRIDESCENT SEAWEED, RED FILAMENTOUS SEAWEED)

i IMMEDIATELY BELOW PROPOSED PENS _____

_____

ii BETWEEN PROPOSED PEN SITE AND SHORELINE _____

_____

_____

INVERTEBRATES (RECORD NUMBERS AND SPECIES OF CRABS AND VISIBLE BIVALVES, EG GEODUCK SYPHONS, CLAMS ON SURFACE, PRESENCE OF URCHINS, SEA CUCUMBERS AND OTHERS)

i IMMEDIATELY BELOW PROPOSED PENS _____

_____

_____

ii BETWEEN PROPOSED PEN SITE AND SHORELINE _____

_____

FISH (RECORD NUMBERS AND SPECIES SEEN DURING INSPECTION) _____

_____

IS THIS A KNOWN HERRING SPAWN AREA? _____

IS THERE A SALMON SPAWNING STREAM NEARBY? _____

DESCRIBE ANY BEACH CONSTRUCTION REQUIRED _____

_____

Using Aquatic Land For

A Q U A C U L T U R E

Policy Branch

Ministry of Lands, Parks and Housing

October, 1985

Note: This handout provides information on Crown land tenures for aquaculture. Contact the Ministry of Agriculture and Food for information pertaining to all other matters related to aquaculture.

APPENDIX II

HATCHERY INFORMATION SHEET

1. The water supply will be groundwater or streamwater? _____

   1.1 If the supply will be a water intake or infiltration gallery in or adjacent to a stream, the total withdrawal required is _____ CFS.

   1.2 If the supply requirement is variable throughout the year, specify for periods of the year _____

   1.3 During summer low flow periods, the stream flow rate is _____ CFS. The source of this information is _____

   1.4 Attach plans showing location and design of intake structure or infiltration gallery. Intake structures require a minimum unobstructed screen area of 10 sq.ft. per CFS. below minimum water level. In-stream construction is normally limited to low flow periods.

2. Describe any filling, dyking or stream bank protection works that will be required to establish the hatchery site. Submit plan. A 10 metre leave strip is required adjacent to streams.

   _____

   _____

3. The hatchery effluent discharge will be to ground (infiltration field), a septic field, to a freshwater stream, or to the marine environment?

   _____

   3.1 For discharges to streams or the ocean, provide a drawing showing discharge location. Construction timing restrictions may be required.

4. Will the site also include washroom facilities or kitchen facilities? If so, specify the means of disposal.

   _____

   _____

SALMON FARMING IN BRITISH COLUMBIA

Prepared by the B.C. Salmon Farmers Association

TABLE OF CONTENTS

LIST OF TABLES

WHAT IS THE B.C. SALMON FARMERS ASSOCIATION?

The B.C. Salmon Farmers Association was incorporated July 11, 1984 under the Societies Act of British Columbia to serve as a producers' organization dedicated to furthering the salmon farming industry and the interests of its members.

Starting with nine charter members, the Association's membership now totals 75, which represents some 95% of active salmon farmers in British Columbia. A ten member Board of Directors, representing a cross-section of members with respect to size of operation and geographic location, establishes policy. A full-time staff of six implements policy and administers the affairs of the Association.

To broaden the range of services delivered to members, the Association has recruited a Director of Communications, a Director of Research and a Director of Marketing. Comprehensive programs will be developed in each of those areas and implemented early in 1987.

The Association has initiated and now operates active programs in the following areas:

- disease screening
- egg allocation
- brood stock development
- marketing studies
- education

Disease Screening

A program to halt the vertical transmission of disease from parent salmon to offspring was initiated by the Association in 1985. Screening techniques and protocols were developed in conjunction with Malaspina College, Nanaimo, and with the staff of the Pacific Biological Research Station, Department of Fisheries and Oceans, Nanaimo. The program ensures that all diseased eggs are destroyed and only disease-free eggs are distributed to salmon farmers.

Disease screening is not utilized on eggs used in the Department of Fisheries and Oceans' Salmonid Enhancement Program (SEP), thus increasing the risk of disease being introduced into the wild salmon stock.

Program costs of $250,000 in 1985 and $600,000 in 1986 were paid by farmer members of the Association. In addition, salmon farmers paid for some $100,000 worth of laboratory and other equipment required by Malaspina College to conduct the disease screening program.

In 1986, the Ministry of Agriculture and Fisheries provided $60,000 to fund development of a comparative method analysis for disease screening. This method is expected to increase screening effectiveness at reduced cost in future years.

Egg Allocation

One of the Association's principal functions is to allocate eggs to farmer members, a role the Association accepted in 1985 at the request of the Department of Fisheries and Oceans. Up until that time, a salmon farmer ordered eggs direct from the Department. But as the number of farms increased, the Department found it increasingly difficult to satisfy demand on an equitable basis, and asked the Association to develop and administer an equitable egg allocation system.

The Association's present allocation system is based on three main principles:

1. New farms are assured enough eggs to start their own brood stock.

2. Existing farms expanding their capacity have the same egg rights as new farms, to the extent of the expansion.

3. Farms with product in the ater get first right to egg quantities equivalent to those received in the past, provided that total industry needs are considered.

Historically, all eggs have been purchased from the Department of Fisheries and Oceans hatcheries. These eggs are from fish returning to Salmon Enhancement Program hatcheries and are surplus to S.E.P. management needs. Any of these returning fish not used by B.C. Salmon Farmers Association members for eggs are sold to processors; thus, any eggs not used by the industry are wasted.

As domestic brood stocks develop, reliance on S.E.P. sources will decrease over time. The point at which the industry achieves self sufficiency in egg supply will depend on its rate of growth, but the advantages of domestic versus wild stock should ensure relatively rapid development.

By the end of 1986, the Association allocated some 30 million eggs to 85 farms; in 1985, 11 million eggs were distributed to 45 farms.

Brood Stock Development

With the ultimate goal of achieving industry self sufficiency in egg supply the B.C. Salmon Farmers Association launched, in 1985, a two-year $650,000 program to develop domestic Chinook salmon brood stock.

Participating farms contributed $400,000 of the cost and the National Research Council $250,000 through the Program for Industry/Laboratory Projects.

Five salmon farms are participating in the program, which produced some 6 million domestic Chinook eggs in 1986. The program will produce new technological applications that will help to improve domestic egg production in future years.

Marketing Studies

Early in 1986 the B.C. Salmon Farmers Association commissioned a $50,000 marketing study as a first step toward developing a comprehensive marketing plan for the farmed salmon industry. Ten percent of the cost was borne by the Association with the remaining 90% funded through a joint federal-provincial agreement.

The study has three primary objectives:

1. to examine post-production industrial linkages affecting market access and penetration;

2. to detail strategies and methods in production, distribution and promotion with a view to maximizing returns to farmed salmon producers;

3. to examine Association organization and by-laws in relation to market development targets.

Quality Control and Processing

As an integral part of its marketing strategy, the Association is now developing a "superior" grade standard for farmed salmon, together with quality control and processing regulations to enable continuous monitoring of product quality.

Working in conjunction with representatives of the processing, distribution, transportation and packaging industries, and with regulatory authorities, the Association has developed detailed quality and processing guidelines.

Education

The Association has, since its inception, taken an active role in disseminating information about aquaculture to its members and to interested groups and individuals outside the salmon farming industry. In 1986, for example, the Association, utilizing scientists, expert consultants and experienced salmon farmers, conducted four two-day workshops for farmer members. These comprehensive working sessions dealt with fish nutrition, production strategies, phyto-plankton hazards, processing and quality control.

In addition, Association directors and staff spoke at some fifteen different information seminars organized by groups and individuals interested in aquaculture.

A major responsibility of the newly recruited Director of Information is to increase the Association's information/education activities in 1987 and beyond.

A "TYPICAL" SALMON FARM IN BRITISH COLUMBIA

Experience has shown that to be economically viable as a full-time aquaculture business, a salmon farmer requires the capacity to produce 50,000 fish annually.

To achieve that capacity, the farmer will require a capital investment of approximately $1 million during the first two years of operation. No revenue from product sales will be generated until the third year of operation.

The farmer would have to place an initial order of 100,000 eggs to ensure production of 50,000 fish. He would require eight 50-foot by 50-foot net pens the first year and an additional eight pens of the same size the second year, plus another 100,000 eggs to start the second crop.

Some 8,000 square feet of surface area (approximately one-fifth of an acre) is required to accommodate the 16 pens. On-shore facilities for housing, feed and equipment storage require perhaps a half-acre of space.

From three to six on-site and management employees are required to operate the farm efficiently.

Expenditures for feed and supplies, excluding pens, salmon eggs or smolts, and on-shore facilities would average approximately $60,000 in the first year and $200,000 in the second year of operation.

In British Columbia today, the size of operating salmon farms ranges from some 40,000 fish produced annually to the large integrated operations that produce upwards of 1 million fish per year.

THE ECONOMIC IMPACT OF SALMON FARMING IN BRITISH COLUMBIA

The Association has not yet had an opportunity to develop detailed data on the economic and financial contribution generated by salmon farming in British Columbia. This matter will be addressed as part of the Association's expanding service capability in 1987. We have, however, canvassed industry members, financial institutions and investors and have developed order of magnitude numbers that we feel accurately describe the scope of the industry in today's economy.

The 75 farms now in operation represent a direct capital investment of some $75 million. Upwards of 40% of that total has been provided by foreign investors, largely from Norwegian banks, where understanding of the salmon farming industry is more highly developed than among Canadian financial institutions.

Operating farms now provide direct employment for some 375 people and spend an estimated $50 million on services and supplies annually.

Of particular note is the fact that many of the farms now established and planned are near coastal and island communities that have relied historically on one primary economic generator, such as logging, fishing, tourism, etc. The advent of aquaculture broadens the economic base and growth potential of such communities.

If the industry continues to grow at current rates salmon farming will, within two years, develop into a major component of the provincial economy and contribute positively to Canada's balance of payments through export sales.

Based on egg orders now in hand and on the number of licence applications now in process and pending, the industry will by 1988:

- have capital investment in excess of $200 million;
- employ 2,000 people directly;
- generate some $250 million in product export sales.

Indirect Benefits

A full economic impact model would be required to identify all of the indirect economic benefits generated by salmon farming industry activity. Some indirect benefits are already evident.

1. Every new job created by direct employment in salmon farming generates at least two additional new jobs in related service industries.

2. The growth of British Columbia's salmon farming industry is directly responsible for the emergence of a strong fish feed industry in the province: two new mills commenced manufacturing during 1986 and two major European manufacturers purchased existing suppliers and are broadening their range of product supplies.

3. Manufacturers and suppliers of nets, pens, construction materials and other related equipment and supplies report significant increases in sales.

One benefit of particular note will be the increased activity for fish processing plants when farmed salmon product moves to market in larger volume in 1987 and 1988.

Salmon farmers typically process and market their product in the period December 1 through May 31, a time when the commercial fishery is largely idle and processing plants have low or no volume.

Increasing volumes of farmed salmon will contribute strongly to higher activity levels in the processing sector.

ENVIRONMENTAL IMPACTS OF SALMON FARMING

The farming of salmon, like any other type of farming, unavoidably impacts to some degree on its immediate environment. However, if the pen sites are properly selected, and the farmer utilizes sound management and production techniques, negative environmental impacts will be minimal. This fact is not widely known in the public mind, which tends to view the concentration of fish in pens as a source of pollution and/or disease.

The primary responsibility of any farmer, whether land or water based, is to prevent and/or control so far as is possible any negative risk to his crop, and thus his livelihood, and to ensure that his activities pose minimal or no risk to the environment shared with others.

One of the principal thrusts of the B.C. Salmon Farmers Association is to increase public understanding and awareness of the real environmental facts of salmon farming.

All of the material in this Environmental Section has been developed in conjunction with members of the scientific community, who are credited for their work in each case.

Fish Disease Transference

Claims have been made that fish disease originating in salmon farm pens transfers to and infects wild salmon stock.

At the request of the Association, Dr. Stephen G. Newman, a microbiology consultant with Microtek Research and Development Limited, Sidney, B.C. examined the question of disease transference. Dr. Newman obtained his Ph.D. in Microbiology from the University of Miami, Miami, Florida; served for seven years as Director of Microbiology Research and Development for Biomed Research Laboratories in Seattle, Washington and has extensive industry experience in fish pathology, immunology, physiology and culture.

Dr. Newman has the following comments on disease transference:

> "The following excerpt was taken from Aquaculture Digest, a monthly report on Fish and Shellfish Farming, December 1986 issue.
>
> 'Some concern has been expressed that the culture environment may serve as a reservoir for those diseases which are present in the 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

re-infect 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.'

(Abstracted from a study entitled "The Environmental Effects of Floating Mariculture on Puget Sound" prepared for the Washington Department of Fisheries and the Washington Department of Ecology by the University of Washington.)

One of the conclusions reached by this study was that the capacity of a mariculture operation to serve as a disease reservoir for the infecton of wild organisms has never been demonstrated and that the existence of such an effect remains largely speculative. There are a number of very good reasons why the spread of disease from cultured fish to wild fish has not been observed and why it is unlikely to occur.

Infectious disease in all animals, including fish, is a result of an interaction between the host, the organism that has the ability to produce the disease and the environment that the animal (fish) is being reared in. How these factors interplay determines the type, severity and incidence of the disease.

For disease to occur, the disease producing organism must have a susceptible host. This susceptibility is determined by many factors and can vary considerably even within a single population of fish. There must also be some means for the pathogen to be transmitted from fish to fish either through intermediate vectors (parasites), the environment, feed, etc. Finally, assuming that the host is susceptible to the disease, then the environmental conditions must be such that a disease process can occur. Each component of this interactive process must be just right for the disease process to occur.

For fish, the single most important component in disease appears to be the environment. Fish can tolerate narrow ranges of environmental fluctuations (such as temperature variations, loading densities, handling, etc.) without becoming stressed. All net pen reared fish are stressed at various times during their growth cycles.

Continual stress is a normal part of the process in some net pen operations. The presence of stress and the subsequent physiological effects on the fish are directly responsible for most of the disease that occurs in net pen operations. Unlike wild fish populations, net pen reared fish don't have the option of thinning themselves out or avoiding excessively warm water temperatures or poor water quality. Since the stresses that correlate strongly with the onset of disease in commercially reared fish don't affect wild populations, wild populations are much less susceptible to disease.

Two of the organisms that can cause a problem to aquaculturists, the etiologic agents of Bacterial Kidney Disease and Infectious Hematopoietic Necrosis, are transmitted principally from adult carriers to fry through infected eggs. Thus transmission of the diseases via these routes of infection to wild stocks is not likely. Screening programs on brood fish, as currently practiced, can significantly minimize the impact of these organisms on commercial stocks.

These disease organisms can be transmitted by other routes though these are not usually significant sources of disease. Since neither organism survives very long in the environment outside of the host, the chances of them being transmitted to wild fish that come in proximity to net pens during disease outbreaks is minimal.

It is noteworthy that these organisms are endemic in wild stocks, though at very low levels. As both of these pathogens require the fish for survival in the environment, the wild stocks are likely the source of these diseases in commercial stocks. These organisms proliferated in wild fish long before the advent of aquaculture. Since wild stocks are often the source of eggs and milt for the initiation of commercial broodstock programs, commercially reared fish (using improperly screened eggs and milt from wild stocks) will continue to have problems with these disease organisms.

Two of the other diseases that cause problems in net pen reared fish are due to bacteria that cause disease primarily in stressed animals. These organisms, responsible for vibriosis and furunculosis, may be present in the fish without ever producing disease. They are not normally found in adult wild animals. It is only when the fish are stressed that the disease process occurs. Sick fish may shed organisms into their immediate environment from lesions and infected fecal material, increasing the chances that fish in close proximity to sick fish will contract a high enough level of pathogens to produce disease.

These pathogens must be present in net pens at very high levels to initiate disease. There is usually a threshold level of micro-organisms below which disease is unlikely to occur. As one moves away from the environment of the net pen, the level of potential pathogens present diminishes rapidly. In fact, it is not uncommon for disease outbreaks to occur in a single net pen and net pens that are right next to this net pen to have no disease outbreak. Thus the possiblity of the disease being transmitted to wild stocks in close proximity to the net pens during a disease outbreak is very small. Even if wild stocks were to encounter a sufficiently high enough level of organisms capable of producing disease in stressed commercial stocks, there are so many factors involved that affect susceptibility, including the presence of stress, that the chances of the disease occurring in the wild stocks is very small.

A final point to consider is the fact that wild fish stocks do not usually congregate around net pens. They may be in contact with waters that have net pens in them, but generally only for very short periods of time during migrations. This usually would occur only if the net pens are situated such that the fish must pass near to them to migrate to the open ocean or to return to spawn. These migrations do not occur at times of the year when environmental conditions are such that the fish in net pens are predisposed to becoming diseased.

To summarize, the transmission of disease from cultured to wild stocks in sufficient magnitude to adversely affect wild stocks is highly unlikely. The nature of the disease organisms, the role of stress in the increased susceptibility of commercial stocks to disease and the migration patterns of wild stocks all substantiate this. Furthermore, the lack of any direct evidence that disease transmission from commercial to wild stocks has ever occurred suggests that this is an issue of little or no concern when considering the potential impact of commercial aquaculture on 'natural' populations."

Stephen G. Newman, Ph.D.

Use of Pharmaceuticals in Salmon Farming

Some concern has been expressed about the environmental impacts of pharmaceutical products used in salmon farming.

Two factual statements address this concern:

1. No scientific evidence has yet been presented to indicate that pharmaceuticals used in salmon farming create risk or threat to human health, or diminish in any way the nutritional value, appearance or taste of the salmon product.

2. No scientific evidence has yet been presented to demonstrate that pharmaceuticals used in salmon farming are harmful to or pose any threat to proximate marine life or foreshore environments.

These and other environmental facts notwithstanding, the B.C. Salmon Farmers Association fully supports the principle of continuous, scientifically sound monitoring of, and action on, the environmental impacts of all ocean and foreshore based seeding, nurturing and harvesting of ocean resources.

Impact of Salmon Farming on Marine Water Quality

One of the most commonly expressed concerns about salmon farming is its potentially negative impact on water quality. Early in 1987, the Ministry of Agriculture and Fisheries released the results of a scientific study conducted in March 1986 in the Sechelt Inlet. The following abstract is reprinted from Fisheries Development Paper Number 11, by E.A. Black and B.L. Carswell.

> "Considerable development of mariculture in Sechelt Inlet is projected for the next few years. Salmon farms having a total capacity of at least 4,500 tonnes have been proposed for Sechelt Inlet.
>
> A study was conducted to determine if the present level of salmon farming activity was having any effect on water quality in the Inlet and to establish baseline levels for future water quality assessments. Samples were collected during March 1986 at salmon farm sites and compared with those taken from nearshore and mid-channel stations.
>
> Water quality parameters measured included ammonia, nitrite and nitrate nitrogen, orthophosphate, total phosphorus, oxygen, 5 day biochemical and chemical oxygen demands, total coliforms, temperature, salinity, pH and non-filterable residue. While most parameters were comparable to historical ranges for Sechelt Inlet or the Strait of Georgia, two parameters, ammonia and total coliforms, were significantly higher at farm sites than at other sample locations.
>
> Although salmonid excretion must contribute to the elevated ammonia levels, observations suggest that bivalve fouling may make a more significant contribution to the observed ammonia levels. The data also indicates that contaminated salmon feed may not be responsible for the elevated coliform levels near the pens. Proposed sources for the elevated coliforms

are marine birds or mammals. These findings are consistent with data available on other sites.

Water circulation patterns in Sechelt Inlet are inferred from available physical and chemical oceanographic data. They indicate longer retention times of water in certain areas, particularly the southernmost portion of Sechelt Inlet from Nine Mile Point to Porpoise Bay.

Available evidence thus suggests that at present production levels the existing salmon farms have little effect on surrounding water quality. The data collected may reasonably be used as a baseline for comparison for future studies."

Importation of Live Salmonids

Since 1919 the Department of Fisheries and Oceans has made several unsuccessful attempts to transplant Atlantic salmon into Pacific waters.

For the salmon farmer, Atlantic salmon may have advantages over Pacific species: there are indications that Atlantics have faster growth rates than Pacific Chinook and Coho and Atlantics are more docile and thus less subject to stress and related disease.

Atlantic salmon have been actively cultivated in Puget Sound, Washington state, for a number of years. The first successful transplantation into B.C. waters occurred in 1985 at D.F.O.'s Pacific Biological Station at Nanaimo and at one salmon farm. Three B.C. farms are now growing-out Atlantic salmon.

Concern has been expressed about possible negative environmental impacts resulting from the importation of Atlantic salmon. The Association shares some of those concerns and is monitoring closely the development and behavior of the Atlantic salmon that have been brought into Pacific waters.

The federal Department of Fisheries and Oceans has developed a set of stringent guidelines governing such importations. The guidelines will become formal policy and practice when signed by D.F.O. and by the B.C. Ministry of Environment.

It is worth noting that Atlantic salmonid imported to date have been governed by the guidelines established.

LICENCE APPLICATION PROCEDURES

The licence application process is long and cumbersome, requiring from nine to twelve months from site selection to issuance of the final permits.

A total of eight regulatory authorities from three governmental jurisdictions are involved in the process, as summarized below.

Licence/Permit	Jurisdiction
Section 10 Licence	Ministry of Agriculture & Fisheries (Prov)
Foreshore Lease or Licence of Occupation	Ministry of Forests & Lands (Prov)
Bona Fide Aquaculturist Certificate	Ministry of Agriculture & Fisheries (Prov)
Aquaculture Permit	Department of Fisheries and Oceans (Fed)
Navigation Compliance Permit	Transport Canada (Fed)
Fish Transfer Licence	Inter-Departmental Committee
Business Licence	Municipal or Regional District
Local Building, Sewage, etc. Permits	Municipal or Regional District

Applications for foreshore leases or licences of occupation are advertised to the public. Municipal or regional governments may also advertise applications for business licences, building permits, etc.

An applicant will pay some $2,000 in licence and permit fees to the various levels of government involved.

MARKETS FOR FARMED SALMON AND WILD SALMON

Some segments of the commercial fishing industry have expressed fears that salmon farming threatens the future viability of commercial salmon fishing. The following excerpts from the independent study commissioned by B.C.S.F.A. addresses these fears.

"The traditional Pacific salmon industry has been increasingly concerned about potential competition from pen-reared salmon in British Columbia and other parts of the world. Industry members are concerned with, among other things, how imports will affect existing markets for wild Pacific salmon.
A considerable body of evidence supports two important conclusions:

1. B.C. pen-reared salmon will compete only minimally with B.C. wild salmon production;

2. increasing consumption of fresh (and frozen) seafood generally means that increased consumption of farmed salmon will not be at the expense of wild-caught salmon.

The supporting evidence for these conclusions is provided in the paragraphs that follow.

Total production of salmon in British Columbia for 1984 and 1985 is shown in the following table.

Production of Wild Salmon in British Columbia
(tonnes)

	1985	1984
Chinook	5,469	6,254
Coho	8,977	10,089
Sockeye	31,569	12,877
Pink	37,700	12,059
Chum	23,646	9,003
Steelhead	202	150
Total	107,563	50,432

Source: B.C. Ministry of Environment

As the table above illustrates, the majority of production in B.C. is sockeye, pink and chum. Combined chinook and coho production was 13% in 1985 and 32% in 1984. These two species are the predominant farmed varieties.

Salmon markets can be distinguished on the basis of product form, season and, to some extent, species. There is considerable evidence that the various product forms of salmon do not compete with each other.

Canned salmon competes with other canned products like tuna. Similarly, fresh B.C. salmon competes with fresh salmon from other sources and other forms of fresh seafood. Fresh and frozen salmon do not generally compete with each other in most markets. A restaurant that cannot purchase fresh salmon will seek other forms of fresh seafood, not frozen salmon, as a substitute.

Product form is important for an understanding of salmon markets. The following table provides a breakdown of production by product form for 1984 and 1985.

Production of Salmon by Product Form in British Columbia
(round weight equivalents in tonnes)

	1985	1984
Canned*	60,344	21,168
Fresh†	3,078	2,975
Frozen†	38,312	24,824
Other Forms	5,829	1,465
Total	107,563	50,432

* Canned salmon is converted to round weights @ 70 lbs/case.

† Fresh and frozen dressed salmon is converted to round weight assuming a 90% yield.

Source: B.C. Ministry of Environment

As shown in the table above, a significant proportion of salmon is canned. Canned salmon typically utilizes lower grades of pink and sockeye salmon and sells for considerably less than fresh and frozen salmon. In contrast, the majority of chinook, coho and chum is sold in fresh or frozen form. Farmed chinook and coho compete in the fresh/frozen salmon market. The markets for fresh/frozen salmon in B.C. in 1985 are shown in the following table.

Markets for B.C. Fresh/Frozen Salmon Production in 1985
(tonnes)

		Fresh	Frozen	Total
Domestic[1]		1,180	9,191	10,371
Exports[2]	U.S.A.	1,675	3,530	5,205
	Europe	-	14,059	14,059
	Japan	-	11,365	11,365
	Other	223	167	390
Subtotal		1,898	29,121	31,019
Total		3,078	38,312	41,390
		7%	93%	100%

Source: [1] B.C. Ministry of Environment; [2] Statistics Canada

The table above highlights the following factors important to an understanding of the markets for fresh and frozen salmon:

- frozen salmon comprises 93% of total fresh/frozen production, the majority of which is exported to Europe and Japan;

- fresh salmon production comprises 7% of total fresh/frozen production, the majority of which is exported to the U.S.A.

The table illustrates that fresh sales of B.C. wild salmon constitute a very small proportion of total salmon production. Moreover, there is considerable evidence that this fresh production alone is, by and large, the only portion of B.C. catch that will compete with B.C. farmed salmon.

The conclusions of a major study conducted by the University of Alaska and completed in September, 1986 reinforces this finding. The study, which included a survey of 127 wholesalers in the major salmon markets of Los Angeles, San Francisco, Seattle, Chicago, New York and Boston, was commissioned because of concern about the impacts of U.S. imports of fresh Atlantic salmon from Norway on markets for wild-caught Pacific salmon. One of the important findings of the survey was that the majority of wholesalers and distributors who handle pen-raised salmon feel their product competes only with fresh wild Pacifics.[1]

Seventy-five percent of respondents contended that pen-raised salmon were not a legitimate substitute for frozen wild Pacific salmon, (i.e., did not compete with) while 80% felt that fresh wild Pacific salmon and pen-raised salmon were substitutes.

Given the fact that only 3% of Alaskan catch is marketed fresh, the authors concluded, on the basis of the survey evidence, that "some of the concern about pen-raised salmon imports shown by Alaskan commercial salmon fishermen may be somewhat unwarranted".

This viewpoint is further reinforced in a recent article contained in a leading seafood industry journal.[2] Based on interviews with brokers and producers, the authors concluded that competition at current price levels was minimal. It was contended that most restaurants that handled a fresh cultured product would be unlikely to offer salmon if they had to resort to frozen fish. Some industry observers quoted in the article conceded that farmed fish expanded the market "by keeping fresh salmon on consumers' minds during the off-season".

Other factors, listed as follows, lead to the same conclusion.

- fresh wild caught exports to the U.S.A. have not decreased since the introduction of farmed salmon into British Columbia (see below);

- the vast majority of British Columbia farmed salmon is and will be sold in the months when fresh wild-caught salmon is not available;

- most farmed salmon is priced above fresh and frozen wild-caught salmon, suggesting that there is minimal price competition.

Furthermore, with respect to prices, there is no indication that the introduction of farmed salmon has had an impact on prices for wild-caught salmon. Average wholesale prices for fresh and frozen chinook and coho for the period 1981-1985 are shown in the following table.

Average Wholesale Prices
of Fresh and Frozen Chinook and Coho
1981 - 1985
($/kg)

	Fresh		Frozen	
	Chinook	Coho	Chinook	Coho
1981	6.46	5.68	8.30	6.41
1982	6.92	4.78	8.33	6.17
1983	6.29	4.49	7.51	4.91
1984	8.03	6.24	9.31	7.12
1985	7.89	5.79	9.78	6.84

Source: B.C. Ministry of the Environment

The prices indicated in the table above suggest that demand for fresh and frozen wild-caught salmon remains strong. Some industry observers suggest that the introduction of farmed salmon has had a positive impact on prices for wild-caught salmon.

The vagaries of the export market, in particular exchange rates, present a much greater challenge to traditional salmon producers in B.C. than incursions on their markets by B.C. farmed salmon. Where wild B.C. Pacific salmon stands to lose a substantial market share is in the smoking markets in Europe where farmed Atlantic salmon production from Norway and Scotland has recently eroded market shares held by Canadian and American frozen Pacific salmon.

It is unlikely that B.C. farmed salmon will be exported to Europe because of the transportation disadvantages. Rather, B.C. farmed salmon sales will likely be mostly in the U.S.A.

The U.S.A., in spite of having large domestic supplies and being the dominant exporter, is also the world's largest importer of fresh salmon. A comparison of American imports of fresh and frozen wild and farmed salmon in 1981 and 1984 is shown in the following table.

U.S.A. Imports of Fresh Wild and Farmed Salmon *
(tonnes)

	Fresh		Frozen	
	1981	1984	1981	1984
Canada	591	2,522	1,946	2,542
Norway	5	3,888	8	80
U.K.	-	104	-	-
Chile	-	32	-	-
Others	2	279	44	122
Total	598	6,825	1,998	2,744

* excludes fresh fillets

Source: U.S. Department of Commerce

As indicated in the table above, both fresh and frozen imports have increased. As well, Norway has replaced Canada as the leading exporter of fresh salmon to the U.S.A. With the exception of Canada, imports were mostly farmed salmon.

So, while the size of the fresh salmon market has grown dramatically since 1981, it has not been at the expense of fresh or frozen wild-caught production from British Columbia whose exports also increased. Demand for fresh salmon has increased in the U.S.A. because: more outlets have increased availability; demand has been stimulated by greater consumer awareness; and real incomes have been rising.

Most industry observers expect American demand to continue to grow. Suppliers of pen-reared salmon from countries like Canada, Norway, Chile and New Zealand are also rising dramatically.

As a result, the real marketing battle in the future will be fought between various suppliers of farmed salmon, not between farmed and wild sources. And that international competition will exist whether or not B.C. develops a strong salmon farming industry."

FOOTNOTES

1 Ronald V. Rogress and Biing-Hwan Lin, The Marketing Relationship Between Pacific and Pen-Raised Salmon: A Survey of U.S. Seafood WHolesalers, University of Alaska, Alaska Sea Grant Report 86-3, September, 1986.

2 Richard Bard, Salmon: An Ever-Changing Supply, in Seafood Business Report, March/April, 1985.

PROVINCIAL GOVERNMENT SUPPORT OF SALMON FARMING

The Government of the Province of British Columbia has been an active and high-profile proponent of the desirability of developing a vibrant salmon farming/aquaculture industry in this province.

Creation and staffing of aquaculture administrative divisions in appropriate Ministries, supportive advertising programs and other activities all attest to the Provincial Government's positive view of and support for this industry.

Of particular note are the foreign trade missions sponsored and organized by government Ministries in each of the past three years. These missions, composed of industry and government representatives, were designed specifically to obtain first-hand information about salmon farming/aquaculture in other countries and to encourage investment in the developing industry in British Columbia.

In response to some stated concerns about the rapid development of salmon farming in B.C., the provincial government imposed in late 1986 a moratorium on the issuance of salmon farm licences and appointed Mr. David Gillespie to head a 30-day public inquiry into finfish aquaculture in the province.

The B.C. Salmon Farmers Association supported the Inquiry and prepared a major submission to Mr. Gillespie. His report and recommendations were released on December 16, 1986 and the licence moratorium was lifted three days later.

The Association supports the major recommendations of the Gillespie Report and looks forward to assisting government in implementing those recommendations and associated programs.

January 1987

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§ 6072. Research and aquaculture leases

1. Authority. The commissioner may lease areas in, on and under the coastal waters including the public lands beneath those waters and portions of the intertidal zone for scientific research or for aquaculture of marine organisms. The commissioner may grant a lease to any person. Except as provided in this Part, the commissioner's power to lease lands under this section shall be exclusive. For the purposes of this section, the deputy commissioner may serve in the place of the commissioner.

2. Limitations of lease. The commissioner shall determine the provisions of each lease, provided:

A. A lease shall not exceed a term of 10 years;

B. A lease may be granted for tracts not to exceed 5 acres in area. The commissioner may grant contiguous lease tracts to a single applicant; and

C. No applicant shall be permitted to lease more than 200 acres; and

D. A lease shall not be transferable to any other person.

3. Municipal approval. In any municipality with a shellfish conservation program under section 6671, the commissioner may not lease more than 2 acres of the intertidal zone within the municipality without the consent of the municipal officers.

4. Applications. The application shall:

A. Be written on forms supplied by the commissioner;

B. Describe the location of the proposed lease tract by coordinates or metes and bounds;

C. Identify the species to be cultivated;

D. Describe the impact of the project on existing or potential uses of the area;

E. Describe the degree of exclusive use required by the project;

F. Include written permission of every riparian owner whose land to the low water mark will be actually used; and

G. Include a map of the lease area and its adjoining waters and shorelands, with the names and addresses of the known riparian owners.

5. Application review. The commissioner shall review the application and set a hearing date if he is satisfied that the written application is complete and the application indicates that the lease could be granted.

6. Hearing procedure. Prior to granting a lease, the commissioner shall hold a hearing. The hearing shall be an adjudicatory proceeding and shall be held in the manner provided under the Maine Administrative Procedure Act, Title 5, chapter 375, subchapter IV and the specific procedures of this section.

A. Notwithstanding the provisions of Title 5, section 9052, subsection 1, paragraph A, personal notice of the hearing shall be rquired to be given only to the lessee and the known riparian owners.

B. Under the provisions of Title 5, section 9052, the leasing procedure shall require notice to the general public.

7. Decision. The commissioner may grant the lease, if he is satisfied that the proposed project will not unreasonably interfere with the ingress and egress of riparian owners, navigation, fishing or other uses of the area and is not in conflict with applicable coastal zoning statutes or ordinances. The commissioner may establish conditions that govern the use of the leased area and the limitations on the aquaculture activities. These conditions shall encourage the greatest multiple, compatible uses of the leased area, but shall also preserve the exclusive rights of the lessee to the extent necessary to carry out the lease purpose.

8. Preference. If more than one person applies to lease an area, preference shall be given as follows:

A. First, to the department;

B. Second, to the riparian owner of the intertidal zone within the leased area;

C. Third, to fishermen who have traditionally fished in or near the proposed lease area; and

D. Fourth, to the riparian owner within 100 feet of leased coastal waters.

9. Rents. After consulting with the Director of the Bureau of Public Lands, the commissioner shall determine the rent which shall be paid under each lease. The rent shall represent a fair value based upon the use of the leased area.

10. Lessee's actions. After being granted a lease, each lessee shall:

A. Record the lease in the registry of deeds of each county in which the leased area is located;

B. Publish a notice in the newspaper in which the commissioner published notice or would have published notice of any public hearing. The notice shall describe the area leased and enumerate any restrictions in the leased area; and

C. Mark the leased area in a manner prescribed by the commissioner.

11. Revocation. If substantially no research or aquaculture has been conducted within the preceding year, or if it has been conducted in a manner substantially injurious to marine organisms, or if any other condition of the lease has been violated, the commissioner may revoke the lease. A lease revocation shall be an adjudicatory proceeding under the Maine Administrative Procedure Act, Title 5, chapter 375, subchapter IV. A hearing with public notice shall be held prior to revoking any lease.

12. Renewal. The commissioner shall grant a lease renewal unless the prior lessee has not complied with the lease agreement during its term, substantially no research or aquaculture has been conducted, or the commissioner finds that it is not in the best interest of the State to renew the lease. Renewals may be granted if applied for no later than 30 days after the lapse of the prior lease. A lease renewal shall be an adjudicatory proceeding under the Maine Administrative Procedure Act, Title 5, chapter 375, subchapter IV. Public notice shall be given as required under subsection 6 of this section and a hearing shall be held if it is requested by an interested person.

12-A. Transferability. A lease may be transferred to another person for the remaining portion of its term subject to the following conditions.

A. Lease transfers shall be subject to the same procedural requirements as initial applications, except that a public hearing is not mandatory unless requested by an interested person.

B. The commissioner may grant lease transfers if he determines that:

(1) The change in lessee does not violate any of the standards in subsection 7;

(2) The transfer is not intended to circumvent the intent of subsection 8; and

(3) The transfer is not for speculative purposes.

13. Regulations. The commissioner may adopt or amend regulations:

A. Establishing minimum standards for maintaining leases;

B. For procedures to issue, transfer, review or revoke leases; and

C. For notices and hearings to the extent that those procedures are not established by this section or the Maine Administrative Procedure Act, Title 5, chapter 375.

14. Conflicts. Whenever a project described in a pending aquaculture lease conflicts or could conflict with a project described in a pending submerged lands ac' lease, the commissioner and the Commissioner of Conservation shall determine which project is in the best interests of the State.

1982, c. 609, §§§§1, 2, 3, & 4; 1983, c. 301, §§§§1, 2, 3, & 4.

§ 6073. Exclusivity; prohibition or interference

1. Exclusivity. Each lease for aquaculture shall be exclusive for the species and to the extent provided by the commissioner in the lease.

2. Prohibition on interference. It shall be unlawful to interfere with the rights provided in a lease.

DEPARTMENT OF MARINE RESOURCES REGULATIONS

CHAPTER 2
Aquaculture Lease Regulations

Summary:

These regulations prescribe the procedures and substantive criteria governing consideration of aquaculture lease applications submitted to the Commissioner of Marine Resources pursuant to 12 M.R.S.A. § 6072 and Department administration of leases. The regulations set forth procedural requirements for all aspects of the adjudicatory aquaculture lease application and administration process, consistent with the requirements of 12 M.R.S.A. § 6072 and the Maine Administrative Procedures Act, 5 M.R.S.A. § 9051 et seq.

2.01 Purpose

This chapter establishes procedures and explains criteria governing consideration of aquaculture lease applications submitted to the Commissioner pursuant to 12 M.R.S.A. § 6072 and prescribes procedures and criteria for subsequent annual lease review, lease renewal, lease revocation and lease transfer.

2.05 Definitions

A. The definitions set forth in section 6001 of Title 12, Maine Revised Statutes, shall apply to the terms used in this chapter.

B. Aquaculture. "Aquaculture" means the culture or husbandry of marine organisms by any person. Storage or any other form of impounding or holding wild marine organisms, without more, shall not qualify as aquaculture. In order to qualify as aquaculture, a project must involve affirmative action by the lessee to improve the growth rate or quality of the marine organism.

C. Commissioner. "Commissioner" means the Commissioner or Deputy Commissioner of Marine Resources.

D. Culture or Husbandry. "Culture or husbandry" means the production, development or improvement of a marine organism.

E. Riparian owner. "Riparian owner" means a shorefront property owner whose property boundaries are within 1000 feet of the proposed lease boundaries.

2.10 Application requirements

A. Form.

Aquaculture lease applications shall be submitted on forms prescribed by the Commissioner and shall contain all information required by the Commissioner in order to obtain information relevant to the aquaculture project. Applications should be submitted at least 80 days in advance of any desired hearing date.

B.

1. Within 15 working days of receipt of a written application, the Commissioner shall

   a. determine whether the application is complete, containing sufficient information on which a decision regarding the granting of the application may be taken; and

   b. notify the applicant of his determination.

2. If the application is complete, the Commissioner shall schedule a hearing on the application, if he determines that the application could be granted.

3. If the application is incomplete, it shall be returned to the applicant with a written explanation of the additional information required in order to be complete.

C. Within 60 days after hearing on an application, the Commissioner shall render a final decision, unless the applicant agrees to a longer time.

2.12 Multiple ownership

A. Corporate applicants. Corporate applicants for aquaculture leases shall include information in their application concerning:

1. Date and state in which incorporated;

2. Names, addresses and titles of all officers;

3. Names and addresses of all directors;

4. Names and addresses of stockholders, directors or officers owning an interest, either directly or beneficially, in any other Maine aquaculture leases, as well as the quantity of acreage attributed to each such person under paragraph C below.

5. Whether the corporation, any stockholder, director or officer has applied for an aquaculture lease for Maine lands in the past;

6. Whether any officer or director has ever been arrested, indicted or convicted of any violation of any marine resources law, whether State of federal.

B. Partnership applicant. Partnership applicants for aquaculture lease shall include information concerning:

1. The names, addresses and ownership shares of all partners;

2. Whether the partnership or any partner has applied for an aquaculture lease for Maine lands in the past;

3. Whether the partnerhip or any partner owns an interest, either directly or beneficially, in any Maine aquaculture leases as well as the quantity of acreage attributed to the partnership or partner under paragraph C below.

4. Whether any partner has been arrested, indicted or convicted of any violation of marine resources law, whether State or federal.

C. Aquaculture lease acreage.

Any person, whether an individual, partnership or corporation, will be credited as owning the number of aquaculture lease acres held either directly or beneficially by that person. Thus, the shareholders in a corporation or partners in a partnership will be credited with a number of acres equal to their proportional ownership share in the corporation or partnership. Therefore if a person owns a 50% stock interest in a corporation which holds an aquaculture lease of 100 acres, that person shall be credited as holding 50 aquaculture lease acres.

2.15. Notice of Lease Application and Hearing.

A. Personal notice.

At least 30 days prior to the dates of the hearing, the Department shall mail a copy of the notice of hearing, lease application and chart describing the lease area to the following persons:

1. riparian owners;

2. officers of the town(s) in which the lease area is located;

3. the applicant, except that the applicant shall receive only a notice of hearing; and

4. any public agency the Department determines should be notified, including but not limited to, State Planning Office, Department of Environmental Protection, Department of Conservation, Regional Planning Office, Municipal Officials, United States Coast Guard and United States Army Corps of Engineers.

B. Public notice.

The Department shall publish notice of the lease hearings at least twice in a newspaper of general circulation in the area affected unless otherwise prescribed by the Maine Administrative Procedure Act. Notice of the hearing shall be published once at least 20 days prior to the hearing and a second time at least 10 days prior to the hearing. Notice shall also be published in a trade, industry or interest group publication which the Department deems effective in reaching persons who would be entitled to intervene. Public notice shall include the following information:

1. A statement of the legal authority under which the proceedings are being conducted, including references to the adjudicatory proceedings procedures of the Administrative Procedures Act, 5 M.R.S.A. § 9051 et seq. and the aquaculture lease provisions of 12 M.R.S.A. § 6072;

2. a short, plain statement of the nature and purpose of the proceeding and the nature of the aquaculture lease application;

3. a statement of the time and place of the hearing; and

4. a statement of the manner and time within which applications for intervention may be filed.

2.20 Intervention

A. Forms.

The Commissioner shall supply application forms for intervenor status and require the submission of the following information:

1. identity of intervenor applicant;

2. specific description of the manner in which the intervenor applicant may be substantially and directly affected by the granting of an application. This description shall include information describing the intervenor applicant's existing use of the proposed lease area, (whether recreational or commercial.) In the event that the applicant is not a member of the class which may be substantially and directly affected by the proceeding, the applicant shall describe any other interest he may have in the lease proceeding which merits Department approval of his intervenor status; and

3. a specific description of intervenor applicant's objections, if any, to the proposed aquaculture lease.

B. Filing of applications.

Any application for intervenor status must be filed in writing and received by the Department at least 15 days prior to the hearing. The Commissioner may waive the 15 day deadline for good cause shown.

C. Participation limited or denied.

At least 5 days prior to the hearing, the Commissioner shall decide whether to allow or refuse intervenor applications. The Commissioner shall provide written or oral notice of his decision to the intervenor applicants. When participation of any intervenor is limited or denied the Commissioner shall include in the hearing record an entry noting his decision and the reasons therefore.

1. Full participation. The Commissioner shall approve intervenor status for any person who is substantially and directly affected by the granting of an aquacultural lease application, and for any other agency of federal, state, or local government.

2. Limited participation. The Commissioner may grant limited intervenor status to an intervenor applicant where the Commissioner determines that the applicant has an interest in the proceeding and that the applicant's testimony or interest are repetitive or cumulative when viewed in the context of the interest represented or evidence to be offered by other intervenors.

D. Correspondence of parties.

Once admitted as an intervenor, whether full or limited, the intervenor applicant shall be considered a party to the proceeding. Each party shall provide copies of all correspondence with the Department to all other parties and will be notified of all communications between the Department and other parties to the aquaculture lease proceedings.

2.25. Agency file

A. Upon receipt of an aquaculture lease application, the Commissioner shall open an agency file, which file shall include all written correspondence from parties and non-parties concerning the application and memoranda of oral communications between the department and parties and non-parties concerning the lease application.

B. Public inspection.

The agency file shall be open for public inspection by prior appointment during normal business hours. The Department will supply copies of the file contents to any person for a charge according to the Department schedule.

2.29. Prehearing Conference.

The Commissioner may require parties to attend a prehearing conference if the complexity of the issues or volume of evidence indicate a prehearing conference would aid in the determination of issues raised by the application.

2.30. Aquaculture Lease Hearing Procedures.

A. Presiding Officer

1. The presiding officer at any aquaculture lease hearing shall be either the Commissioner or a Department employee or representative designated by the Commissioner to act as hearing officer.

2. The presiding officer shall have the authority to:

a. rule upon issues of evidence and procedure;

b. regulate the course of the hearing;

c. certify questions to the Commissioner for his determination;

d. administer oaths;

e. take such other action as may be necessary for the efficient and orderly conduct of the hearing, consistent with these regulations and applicable statutes.

3. The presiding officer may permit deviation from these procedural regulations for good cause shown, in so far as compliance is found to be impracticable or unnecessary.

B. General Conduct.

1. Opening statement. The presiding officer shall open the hearing by describing in general terms the purpose of the hearing and the general procedure governing its conduct.

2. Record of testimony. All testimony at aquaculture lease hearings shall be recorded and, if necessary for judicial review, transcribed.

3. Witnesses. All witnesses must be sworn and will be required to state their names, residence, and whom they represent, if anyone, for the purpose of the hearing.

4. Testimony in written form. At any time prior to or during the course of the hearing, the presiding officer may require that all or part of

the testimony to be offered at such a hearing be filed with the Department in a prescribed form. All persons offering testimony in written form must be present at the hearing and subject to examination. This subsection shall not be construed to prevent oral testimony at a scheduled hearing by any member of the public.

C. Continuance.

All hearings conducted pursuant to these regulations may be continued for reasonable cause and reconvened from time to time and place to place by the presiding officer. All orders for continuance shall specify the time and place at which such hearing shall be reconvened. The presiding officer shall provide reasonable notice to interested persons and the public of the time and place of such reconvened hearing.

D. Regulations of cameras and microphones.

The placement and use of television cameras, still cameras, motion picture cameras, microphones and other recording devices may be regulated by the presiding officer to ensure the orderly conduct of the hearings.

2.31 Evidence.

A. Evidence which is relevant and material to the subject matter of the hearing, and is of the type commonly relied upon by reasonably prudent persons in the conduct of their affairs shall be admissable. Evidence which is irrelevant, immaterial or unduly repetitious shall be excluded. The Department's experience, technical competence and specialized knowledge may be utilized in the evaluation of all evidence submitted.

B. The presiding officer may take official notice of any facts of which judicial notice could be taken, and in addition may take official notice of general, technical, or scientific matters within its specialized knowledge as well as statutes, regulations and non-confidential agency records. When facts are noticed officially, the presiding officer shall notify all parties and they shall be afforded an opportunity to contest the substance or materiality of the facts noticed. Facts officially noticed shall be included and indicated as such in the hearing record.

C. Documentary and real evidence.

1. All documents, materials and objects offered and accepted as evidence shall be numbered or otherwise identified and included in the record. Documentary evidence may be received in the form of copies or excerpts if the original is not readily available. The presiding officer may require any person offering documents or photographs as exhibits to submit a specified number of copies, unless the document or photograph is determined to be unsuitable for reproduction.

2. All written testimony and documents, materials and objects submitted into evidence shall be made available during the course of the hearing for public examination. All hearing evidence shall also be available for public examination upon prior appointment at the Department of Marine Resources in Hallowell during normal business hours.

3. The agency file containing the application and agency correspondence shall be submitted as documentary evidence in the hearing record.

D. Objections.

All objections to rulings of the presiding officer concerning evidence or procedure and the grounds therefore shall be timely stated during the course of the hearing. During the course of the hearing or after the close of the hearing, the Commissioner may determine that the ruling of the presiding officer was in error and order the hearing reopened or take any other action he deems appropriate to correct the error.

E. Offer of proof.

An offer of proof may be made in connection with an objection to a ruling of the presiding officer excluding or objecting any testimony or question on cross-examination. Such offer of proof shall consist of a statement of the substance of the proffered evidence.

F. Public participation.

Any person may participate in a hearing by making oral or written statements explaining his position on the issues, and may submit written or oral questions to the parties through the presiding officer, within such limits and upon such terms and conditions as may be fixed by the presiding officer.

G. Testimony at hearings.

1. Order of presentation. Unless varied by the presiding officer, hearing testimony shall be offered in the following order:

   a. Direct evidence by applicant and applicant's witnesses in support of the application.

   b. Testimony by department, staff and consultants.

   c. Testimony by members of federal, state and local agencies.

   d. Direct evidence by intervenors supporting the application.

   e. Direct evidence by intervenors opposing the application.

   f. Testimony by members of the public.

2. Questions. At the conclusion of their testimony each witness may be questioned in the order described below.. The presiding officer may require that questioning of witnesses be conducted only after the conclusion of testimony by an entire category of witnesses, for the purposes of efficiency or clarity of record.

   a. The presiding officer, legal counsel and department staff may question witnesses at any time.

   b. The applicant.

   c. Intervenor parties.

d. Federal, state and local agency representatives.

e. All other members of the public may have the opportunity to question witnesses by oral or written questions through the presiding officer.

H. Conclusion of hearing.

Subsequent to the conclusion of the hearing, no other evidence or testimony will be allowed into the record, except by stipulation of the parties or as specified by the presiding officer.

I. Record.

A full and complete record shall be kept for each aquaculture lease application proceeding. The record shall include, but shall not be limited to, the application, supporting documents, all exhibits, proposed findings of facts and conclusions of the presiding officer, if any, staff documents, the Commissioner's findings of facts and conclusions, and a recording or transcript of the hearing.

2.35. Hearing Officer Report.

A. In the event that an aquaculture lease hearing is conducted by a hearing officer other than the Commissioner, the hearing officer may prepare a report, including proposed findings of fact, conclusions of law and, at the Commissioner's request, a recommended decision. A copy of the hearing officer's report shall be provided to each party and each party shall have an opportunity to file responses or exceptions to the report within 10 days following receipt of the report.

1. In submitting responses and exceptions, parties may submit a petition to the hearing officer to correct mis-statements of fact in the report. The hearing officer may correct any mis-statements of fact in his report prior to submission of the report to the Commissioner.

a. The report shall be submitted to the commissioner with the parties' responses and exceptions.

B. Nothing in this section shall prevent the Commissioner from reaching his decision based solely on the record, after review of the hearing, tape or transcript and after review of the hearing record.

C. Whenever a presiding officer other than the Commissioner conducts an aquaculture lease hearing, the Commissioner shall not confer with the presiding officer concerning the aquaculture lease application at issue outside the presence of the parties, whether or not a hearing officer report has been prepared.

2.37 Decision.

A. After review of the agency record, the Commissioner shall issue a written decision, complete with findings of fact and conclusions of law.

1. The Commissioner may grant an aquaculture lease, if he is satisfied that the proposed project will not unreasonably interfere with the ingress and egress of riparian owners, navigation, fishing or other uses of the area and is not in conflict with applicable coastal zoning statutes or ordinances. The commissioner may establish conditions that govern the use of the leased area and the limitations on the aquaculture activities. These conditions shall encourage the greatest multiple, compatible uses of the leased area, but shall also preserve the exclusive rights of the lessee to the extent necessary to carry out the lease purpose.

2. If the Commissioner denies a lease application, his denial shall be considered "final agency action" for purposes of judicial review.

B. The final decision of the Commissioner shall be mailed within 10 days to all parties.

2.40 Lease issuance.

A. Prior to issuing a lease, the Department shall send a draft lease for review to the applicant.

B. Applicant responsibilities. Within 30 days of the Commissionser's decision and prior to issuance of the lease the applicant must complete the following requirements:

1. establish an escrow account or secure a performance bond in the amount required by the Department in the draft lease; and

2. pay the rental fee due for the first year of the lease term.

C. Immediately following, but not before, signing of the lease by the Department and the applicant, the lessee must complete the following requirements:

1. file the lease or a memorandum of lease in the Registry of Deeds of the County in which the lease tracts are located, and

2. publish notice of the lease issuance in the newspapers in which the aquaculture lease hearing notices originally appeared following Department approval of the notice.

D. Compliance. Failure to maintain an escrow account or performance bond, to pay rental fees in a timely manner, to file the lease in the Registry of Deeds or to publish notice of the lease shall be grounds for lease revocation under 2.42.

E. Lease term and validity. The term of the lease shall run from the date of the Commissioner's decision, but no aquaculture rights shall accrue in the lease area until the lease is signed.

2.41 Competing aquaculture lease applications.

A. In the event the Department receives more than one application for a lease site, the Department shall give preference in granting a lease as follows:

1. first to the Department;

2. second to the riparian owner of the intertidal zone within the leased area;

3. third, to fishermen who have traditionally fished in or near the proposed lease area; and

4. fourth, to the riparian owner within 100 feet of leased coastal waters.

B. To qualify for preference under Section A. an application must be accepted by to the Department prior to the publication of the first public notice of hearing to consider a previously filed lease application for identical or overlapping lease areas.

C. When the Department receives competing applications, it shall schedule one hearing to consider the applications concurrently.

2.42 Annual lease review and revocation.

The Commissioner may conduct an annual review of each aquaculture lease.

A. If the Commissioner determines following an annual review or at any other time that the applicant has conducted substantially no research or aquaculture within the preceding year, that the aquaculture or research within the aquaculture lease area has been conducted in a manner substantially injurious to marine organisms, or that any other lease condition has been violated, he may revoke the lease.

B. The Commissioner shall hold an adjudicatory hearing to consider revocation of a lease, subject to the notice and hearing procedures set forth in these regulations.

2.45 Lease renewal.

A. A lessee must file with the Department an application to renew a lease no later than 30 days following the lapse of the prior lease.

B. Renewal of a lease shall be an adjudicatory proceeding with notice as provided by these regulations, except that no hearing is required unless it is requested by an interested person.

C. The Commissioner shall grant a lease renewal unless:

1. the prior lessee has not complied with the lease agreement during its term;

2. the prior lessee has conducted substantially no research or aquaculture in the lease areas during the lease term; or

3. The Commissioner finds that it is not in the best interest of the state to renew the lease. Considerations of the best interest of the state may include, but shall not be limited to, conflict with other new or existing uses of the area.

2.60 Lease transfer.

A. Application. A lessee may apply for Department approval of the transfer of his aquaculture lease to another person for the remaining portion of the lease term on a form supplied by the Commissioner.

B. Procedure. A lease transfer shall be an adjudicatory proceeding subject to the notice, hearing and decision requirements, as set forth for initial lease application in these regulations, except that no hearing is required unless requested by an interested person.

C. Decision. The Commissioner may grant the lease transfer if he determines that:

1. the change in lessee's identity does not violate any of the lease issuance criteria set forth in 12 M.R.S.A. § 6072(7);

2. the lease transfer is not intended to circumvent the preference guidelines for treatment of competing applications as set forth in 12 M.R.S.A. § 6072(8); and

3. the lease transfer is not for speculative purposes. "Speculative purposes" shall be found to exist whenever the owner of the lease to be transferred has not conducted any substantial aquaculture on the lease sites, including but not limited to seeding, cultivation or harvest of organisms.

2.75 Minimum lease maintenance standards.

A. Each lessee shall mark the lease tracts in a manner prescribed by the Commissioner in the lease.

B. Each lessee shall maintain his aquaculture lease tracts in such a manner as to avoid the creation of a public or private nuisance and to avoid substantial injury to marine organisms.

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.

W. Michael Kaill

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

W. G. Paulick

William G. Paulick
Alaska Department of Commerce
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Co-Chair, Development and
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Enclosure

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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

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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.

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THE ENVIRONMENTAL EFFECTS OF FLOATING MARICULTURE IN PUGET SOUND

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