

ALASKA LEGISLATURE SPECIAL COMMITTEE/SUBJECT FILE 8672
1871 SCOMM 75: MARICULTURE (FISH FARMING), 1987-1990

88

MEMORANDUM

State of Alaska

TO: Fisheries Mini-Cabinet

DATE: November 5, 1984

FILE NO:

TELEPHONE NO: 465-4160

FROM: S. A. Moberly
Director
FRED Division
Department of Fish and Game

SUBJECT: Mariculture

In response to Commissioner Collinsworth's memo of October 5, 1984, concerning mariculture, I would like to offer some pertinent observations; they are not intended to be comprehensive, and, accordingly, they should not be construed as anything other than the thoughts of one individual who has an interest in the subject matter. My definition of mariculture, as it is discussed here, includes the cultivation of all marine and freshwater plants and animals; ranching and farming are only terms to help describe the tactics of this cultivation.

First, I believe that our (Alaskan) freshwater and marine resources are the most valuable renewable resources in the state and that this asset should be managed to maximize the economic and social benefits to Alaskans. I believe that Alaska will eventually take action to maximize the positive aspects of this asset; i.e., a renewable resource industry that includes not only the harvesting of plants and animals that occur naturally but also the deliberate and aggressive cultivation of those plants and animals.

The world demand for good quality aquatic products is increasing; already, the world mariculture output is about 10% of the total harvest of fishery products. The time is right for some positive movement by government to assist in the initial planning phase for expansion of mariculture development. How fast we will proceed to commercial realization and eventual maturity, I could only guess. One thing I feel certain about, however, is that if the mariculture industry is to survive, it must have a solid, industrial base; moreover, it must be vertically integrated and have a well-developed infrastructure. In Alaska, we have the skeleton of all of this in place, and, if government and our existing industry recognize the great productive potential, we can initiate the policies and programs to stimulate, support, and guide this emerging industry. A climate of self-perpetuating confidence and security will be created for entrepreneurs and the industry. Mariculture will result in increased employment opportunities and better utilization of our current production and processing capability. The state and its citizens will benefit by exploiting this new valuable renewable asset, and, with proper management, the sea can be farmed forever.

Alaskans are already familiar with some aspects of mariculture; e.g., notably state and PNP hatcheries. Further development in this field, therefore, could be perceived as simply an extension of the current developmental status of the fishing industry as a whole. I do wish to clarify that there is a difference between mariculture and the salmon enhancement efforts that the state is now engaged in; a fully developed mariculture industry will be

decidedly different than our present hatchery program. The development of mariculture in Alaska should proceed solely as a private endeavor; the government's role would be confined to research and development; enforcement, land and water leasing, extension work, pathological and genetic services, etc.

Mariculture may be one of the few renewable natural resource activities that has potential for interior and western Alaska, as well as the Aleutian Chain. For example, Unalaska, with its large natural geothermal potential and the natural geography of that area; i.e., its protective bays and estuaries, it is not difficult to imagine farming the sea there.

While I certainly do not have a vision of a grand plan, I have identified potential constraints, and many of these can be removed by governmental action. Probably the largest constraint is the lack of clearly defined policies that accept mariculture as an independent and important food-producing sector of the economy. Along with these policies, enabling legislation should be passed, which will send clear signals to the private sector as to the government's intent. This legislation should clarify the many overlapping jurisdictions and help to eliminate jurisdictional confusion, as well as provide positive, effective coordination. There is and will be a lot of apprehension on the fisherman's part, because traditional fisheries are dominant, and the problems and preoccupation with these fisheries will make it difficult to devote much attention to mariculture possibilities, except, perhaps, to oppose them.

The "state-of-the-art" on mariculture is adequate for our present needs. What is being done in the rest of the world is a sufficient model for us. While we are adapting this knowledge to Alaska, we will need a mariculture research center and adequate pilot scale testing and demonstration facilities. Following research and pilot scale work, government needs to provide incentives to private entrepreneurs to implement mariculture on a larger scale. Government should also provide extension-type assistance. This extension work should include practical technical training and business management. Currently, we are teaching the "East Fish Cultural Practices Workshop," which alternates annually with a "Hatchery Managers' Workshop." This workshop type of approach could be expanded to teach and provide continuing education to private entrepreneurs in the mariculture business.

Mariculture activities will provide new products and new markets. Government, working through an organization like Alaska Seafood Marketing Institute (ASMI) and the industry, can continue to develop new markets and encourage new product form. The processing sector will benefit, because they will have products available for marketing and processing in other seasons. This will create extended employment opportunities and/or new opportunities in fisheries. These types of activities will encourage dollars to stay in Alaska. With the seasonality and short duration of the wild fisheries, there is a strong incentive to live elsewhere and, thus, the dollars leak from the state; a longer employment season will discourage this leakage.

November 5, 1984

Another function of government is the development and maintenance of a comprehensive data base. If we expect an orderly development of a mariculture industry, we need rigorous statistical analysis on performance, and this information must be available on a real-time basis to the industry and to those involved in planning.

I hope that these thoughts will aid in the discussion of the subject. The mini-cabinet can easily provide the nucleus of a mariculture policy group, and I would, of course, suggest Fish and Game, FRED Division as the lead agency, coordinating closely with the office of Commercial Fisheries Development and our counterparts in DEC, DNR, the university, and the federal agencies, like the National Marine Fisheries Service.

Fisheries Mini-Cabinet

R. Neve
D. Collinsworth
R. Lyon
W. Hudson
J. Katz
B. Twomley
L. Boston

Enclosure

cc: M. Hutton
G. Baker
C. Shelley

ECONOMIC IMPACT OF FARMED SALMON UPON THE
ALASKAN COMMERCIAL SALMON FISHING INDUSTRY

Principal Investigator: Bing-Hwan Lin

Units: Department of Economics
School of Management
University of Alaska, Fairbanks

Bing-Hwan Lin
Bing-Hwan Lin
Principal Investigator

Michael L. Rice
Michael L. Rice, Dean
School of Management

This study has only been partially funded. ~~but~~
AHL

Title: Economic Impact of Farmed Salmon Upon the Alaskan Commercial Fishing Industry

Principal Investigator: B.H. Lin

Units: Department of Economics
School of Management
University of Alaska, Fairbanks

BACKGROUND AND NEED

The domestication of wild sheep, boars and cattle was a very important step in making civilization, as we know it, possible. By genetically selecting prime stock over the years, the quality of beef and pork has continually improved into the products now seen marketed at the retail level. The ability of ranchers to control the breeding, rationing and harvesting of domesticated livestock has made all this progress possible. No one can argue with the success achieved in agriculture over the years, but what about the transfer of this technology to products from the sea?

Salmon aquaculture (farming) started in Norway as long ago as 1912. The early attempts failed because fish "farmers" were unable to keep their stocks in their pens. These failures resulted in a period of dormancy in the industry for about 40 years. In the late 1950s and early 1960s, this problem was resolved for large rainbow trout from L. R. Donaldson's genetic efforts at the University of Washington. However, protectionism in foreign countries and confusion among consumers about quality differences between these fish and the lower quality, freshwater-raised rainbows proved to be too large of marketing difficulties to overcome.

Norwegians then turned to the farming of Atlantic salmon in the late 1960s and in ten years the production of these farmed salmon had increased by tenfold... Norwegian-raised Atlantic salmon now are served in restaurants in most major metropolitan areas, including Seattle, traditionally the territory of the troll-caught Alaskan wild salmon. A primary reason for this rapid increase in production is the extremely high quality of the product. Twenty-four hours after the fish was alive it can be served in a restaurant in Europe or on the eastern seaboard of the United States. Its size range of 5-15 pounds makes it perfect for marketing as fresh baked or steaked salmon. As has been demonstrated for livestock, food ration programs and genetic engineering can be utilized to arrive at a high quality product. Norway's production has also been helped by the environmental conditions of their ocean currents. The temperature and oxygen contents of the water is considered ideal for farming salmon.

It should be noted, however, that there are large risks in fish farming. It is not an inexpensive method of food production and initial fixed investment is especially costly. Uncertain markets do not add to the peace of mind of fish farmers either. The Norwegians have enjoyed financing by their government which has resulted in a technological head start toward making their salmon farming ventures profitable. This success is shown by the tremendous increase in exports to the United States. The amount of Norwegian farmed salmon sent to the U.S. in the first quarter of 1984 equaled the amount sent in all of 1983.

The successful development of Norwegian salmon farming has received worldwide attention. Major salmon-producing countries such as Japan, Scotland, Russia, Canada and the United States have already attempted to duplicate the same practice. Therefore, it is expected that the world production of farmed salmon may increase at a phenomenal rate in the near future. This trend will likely have a tremendous impact upon the well being of commercial fishermen and processors in the U.S., especially in Alaska.

A key question is whether the farmed salmon are complements or substitutes with the wild salmon (see, e.g., Lent, Whittaker, Johnston, 1979). Because Norwegian salmon farming has not yet reached its capacity and the marketing of Norwegian salmon is directed by the Norwegian Fish Farmers' Sales Association, the Norwegian farmed salmon have been harvested deliberately in the winter and spring to avoid direct competition with fresh wild Pacific salmon. For this reason, some have believed that farmed salmon should be regarded as a complement of wild salmon. That is, the availability of farmed salmon in the spring and winter may help to develop consumers' preferences for fresh salmon in the summer. However, others argue that wild and farmed salmon are in direct competition, at least in the European markets. In any event, the predicted increases in the production of farmed salmon will likely intensify the substitution relationship between these two types of salmon. Therefore, it is important to investigate the likely impacts on the commercial salmon industry when world production of farmed salmon is increased. To do this, regression analysis can be employed to assess the effects of increased production on the prices of salmon at different market levels. Certainly, a demand-supply analysis can also provide useful information in addressing related issues such as the evaluation of public salmon enhancement programs.

If, in fact, there is a substitution between the two types of salmon, it may be possible to understand how Pacific farmed salmon will compete with wild Pacific salmon by an investigation into what has happened with the two types in the European market. This is important because Norwegian farmed salmon may compete directly with frozen and smoked salmon from the U.S. and Canada. It is realized here that Norwegian salmon may have a location advantage in the European market while the U.S. wild salmon may have the location advantage in the U.S. markets.

One of the major reasons for the importance of an investigation into the European market is the lack of information concerning the U.S. salmon farming industry. The reason for the lack of information is that the industry is in its initial stage of development. But because of the expected high growth rate, it is very important to monitor and document the industry as it develops. One only has to look at the breakthroughs

in the last few months in raising 7-10 pound chinook in pens to see the importance of this documentation. These chinooks are much more marketable than the 10-12 inch cohos raised previously and will compete with wild salmon in the restaurant markets.

The current status of the commercial fishing and salmon ranching industries may themselves promote interest in salmon farming. Since the salmon ranching industry has been successful in rearing smolts but has not been able to solve the problem of low return rates, it is very likely that salmon farming may become a superior method of producing salmon while ranching enterprises could supply the smolts which the farms will need. Furthermore, the ongoing debates on river and ocean carrying capacity, the allocation problems between commercial fishermen, sportfishermen, and native subsistence users, and the U.S. - Canada negotiations may further promote salmon farming. These are additional reasons why it is very important to do the monitoring and documenting mentioned previously. Another important factor is the institutional environment (e.g., the state and federal regulations dealing with salmon farming). For example, Washington allows farming and not ranching while Alaska allows ranching but not farming (P. Redmayne, Seafood Leader, Winter 1983). An understanding of the constraints imposed by institutional arrangements and others is important for predicting future growth of the industry.

A large increase in salmon farming, worldwide, appears to be imminent. However, current and proposed legislation may seek to restrict the growth of salmon farming in order to give the commercial fishing industry time to adjust to the new industry. If these regulations are continued, what will happen to the role of Alaskan salmon in domestic and international markets in the future? Obviously, this remains to be seen. If restrictions were lifted, as in Washington, what role should the state take in regulating salmon farming? We can expect several management issues will emerge. For example: what are the criteria that the state governments should employ in deciding how many farming rights should be issued? How should these rights be distributed? And, who should be granted these rights? It may not be too early to address these issues. Again, this shows the importance of documenting the regulations imposed by different states.

It is also very important to show which groups within Alaska will be affected by this proposed research. At this stage, the following affected groups have been identified, along with the reasons why:

1. Fishermen - Alaskan fishermen need to know whether or not their products will be affected by salmon farming. If so, they must understand the potential impact upon their incomes and, thus, their livelihood. The uncertainty over this impact has manifested itself in hostility toward the aquaculturists and inaction in investment decisions.
2. Processors - They perceive farmed salmon as both a threat to the status quo of their operations and as a potential investment for the future. Adjusting to the potential growth of the farmed salmon industry will be critical to them.
3. State of Alaska - Currently the State of Alaska is undergoing review of the return on investment it is receiving for its salmon

enhancement dollars. By providing a quantitative estimate of the impact of farmed salmon upon certain segments of its fishing industry, the State will have current information to incorporate into its ongoing evaluation of salmon enhancement programs. Also, given Alaska's current exploration into the feasibility of salmon farming in Alaska, research pertaining to farmed salmon markets will be valuable to any future decisions concerning further study of salmon farming in Alaska.

4. Federal Government - If substitutibility of farmed salmon for wild salmon is significant and the U.S. fisheries are drastically affected, the government needs up-to-date information to adjust policy making to take this new industry and its impact into consideration, especially where foreign competition is concerned.
5. Native Corporations - They need investments in renewable resources which will provide sustained income and employment for their shareholders. If the potential is great, salmon farming may warrant investigation as an investment alternative.

OBJECTIVES

The overall objective of this proposed study is to document the development of salmon farming in the U.S. and the rest of the world and investigate the impacts of increased farmed salmon on the well being of the Alaskan salmon industry. To be specific, the objectives of this project are fivefold.

Grant Year
1985

- (1) Summarize the impact that Norwegian farmed salmon has had on the European market.
- (2) Determine the substitutibility of farmed salmon for wild salmon.
- (3) Analyze the development of the U.S. salmon farming industry and the effects of current and potential state regulations on the industry.
- (4) By applying regression techniques, estimate the demand and supply relationship for wild and farmed salmon products in both domestic and international markets.
- (5) Relate the new market developments to specific populations within Alaska.

APPROACH

As an initial state of this research project, a comprehensive literature review will be performed. It will serve to acquaint the researcher with approaches utilized up to this point. A critique of other analyses (both descriptive and quantitative) will enable this research to identify accepted modeling techniques and improve upon them wherever possible. By performing this review, an economic profile of the newly formed Pacific northwest salmon farming industry will be obtained. This profile will

take note of recent accomplishments of this industry as well as limits to growth which still exist.

Once the literature review is completed, an analysis of the current conditions of the farmed salmon market and its potential growth will be done. It would be naive to assume that the farmed salmon will be in direct competition with all product forms that wild salmon presently take. The salmon farmers must, of course, utilize what comparative advantages they have by virtue of their methods of production. Because of both the high quality of, and high costs of production for farmed salmon, it is anticipated that the farmed product will not be in competition with the lower quality and lower priced canned salmon. One hypothesis is that the wild salmon most affected will be the high quality troll caught chinook and coho salmon. This hypothesis will be tested by examining the relationship between the price of troll caught salmon and the production and exports of Norwegian farmed salmon. In addition, the costs of producing Norwegian farmed salmon will be collected from published data and the costs of raising chinooks and cohos in the Pacific Northwest will be obtained through personal interviews. These data can then be used to shed light on how price competitive can Pacific salmon farming be.

The factors affecting the price and quantity sold of farmed salmon must also be studied. Consumers' income, their tastes and preferences, and the price of farmed (wild) salmon as well as the prices of closely related goods are hypothesized to have an impact upon consumer demand for farmed (wild) salmon. If it is found that farmed and wild salmon are perceived by consumers to be close substitutes. The effect of increases in the supply of farmed salmon would be similar to the effect of large catches of wild salmon. The increases in quantity supplied of wild or farmed salmon would depress the market price of wild salmon and hence reduce the income of salmon fishermen in Alaska and elsewhere. Quantitative estimates of this loss of income industry-wide would be of use to decision makers in both private and public sectors.

In analyzing the supply and demand effects we note research (e.g. Devoretz, 1982) previously conducted to investigate the demand for and supply of salmon products. Most of previous research employed single equation econometric frameworks which are limited in several respects when modeling salmon markets:

1. The allocation of salmon landings among different product forms has never been modeled. The lack of supply shifters in the estimation of demand for salmon may have caused bias in the empirical results.
2. Domestic and foreign demands have not been separated in previous studies. Because salmon products are traded heavily in the international market, the aggregation of two different types of demands may have also caused the empirical results to be biased.

In this study, we will develop a simultaneous equation model to quantify the important factors affecting the demand for and price of salmon products, especially fresh and frozen salmon. Since the wild salmon season peaks in the summer, we will try to use the data on a marketing year basis (June to June) to avoid the problem of lacking inventory data. Production data for fresh and frozen salmon in the U.S. are not available and have to be separated first. Nonetheless, the Canadian data are available for regression analysis. The empirical results may shed light on the U.S. market.

The investigation into the European market for the farmed-wild relationship will be accomplished by collecting and summarizing the trade statistics and regulations pertaining to fresh and frozen salmon products in Europe. The data collected by the Office of International Affairs/Fishery of NMFS will be obtained and analyzed. The Eurostat office in Washington, D.C. and researchers in Norway and Scotland will be contacted to obtain further information. The Institute of International Fisheries Economics and Trade (IIFET) network of salmon researchers will be utilized. Also, efforts will be made to extend the nearly completed research undertaken by the Office of Policy and Planning of NMFS.

In the documentation of the domestic industry, we will solicit information from the reporting done in fishing and trade magazines as well as from government agencies and industry members. This will take the form of a descriptive report with emphasis on the economic impact of recent developments. Dr James Anderson at URI is proposing a feasibility study of salmon farming in Maine. Interactions with Dr. Anderson have been established. A successful coordination of these projects will offer a comprehensive picture of the future of salmon farming in the U.S.

To study the potential issues in state management, we intend to work with the state Delphi research that is currently being conducted. This section will also be descriptive in nature with emphasis on application to current analysis dealing with the effects of fishery regulation.

PRODUCTS

There will be three basis products of this research, some of which will incorporate more than one of the needs mentioned. They are:

- (1) An economic analysis of the role of Norwegian farmed salmon in the European market. This will investigate a market where both farmed salmon and wild salmon products are present. This will allow the researchers to gain an understanding of the existing European market channels for farmed salmon and how they might develop in the U.S. market in the very near future. This will also assist in showing whether the consumption relationship between wild and farmed salmon is one of complement or competition.
- (2) A report on the development of U.S. salmon farming industry and regulations imposed by different states. This documentation will provide a comprehensive analysis of the current state of the domestic salmon farming industry. It will investigate the growth potential as seen by industry and government agencies. This will also relate salmon farming to current state and federal regulations and show how the growth of this new industry may be affected by some future regulations.
- (3) A report on the empirical demand-supply analysis. This will be a simultaneous equation model in showing the effects of increased production of farmed salmon on the prices of wild salmon at different market levels. The basic model will also assist in other areas such as government analysis of the future of enhancement programs in Alaska.

INTERACTIONS

State Agencies: Commercial Fisheries Entry Commission

Federal Agencies: National Marine Fisheries Service
Office of Policy and Planning
Office of International Affairs/Fishery
North Pacific Fishery Management Council

Researchers:

United States

Dick Johnston, Oregon State University
James Anderson, University of Rhode Island
Abby Gorham, University of Alaska, Sea Grant
Doug Larson, North Pacific Fishery Management Council,
University of Alaska, Sea Grant

Canada

Peter Leitz, Department of Oceans and Fisheries
Don Devoretz, Simon Frazer University

Scotland

Susan Shaw, Stirling University

France

Bernard Gilly, I.F.R.E. Mer, Centre de Nantes

MILESTONES

Grant Year
1985

1. March 1985 - Complete collection of data for objectives 1 and 2.
2. June 1985 - Complete investigation into Washington salmon farming operations (objective 3)
3. August 1985 - Specify model and complete data collection for objective 4.
4. October 1985 - Impacts specified from objective 5.
5. December 1985 - Final preparation of report for publication.

OVERALL PROJECT OBJECTIVES

1. Increase the awareness of policy makers and industry participants of the salmon farming industry in Norway and the U.S. by documentation of industry progress in recent years.
2. Through economic modeling, show current and potential economic impacts of increased salmon farming activity in Norway and the U.S. upon the Alaskan salmon fishing industry.

ANTICIPATED BENEFITS TO WHOM AND WHAT

1. Commercial Fishermen - This study will reduce the uncertainty that fishermen have concerning the potential impact that salmon farming may have on their incomes.
2. Processors - This research will provide the processing sector with an up-to-date analysis of the salmon farming industry so they may consider the impact of farmed salmon in their decision-making.
3. State of Alaska - A report on the potential impact of salmon farming upon the Alaskan salmon fishing industry will allow the state policy makers to incorporate this with their review of return on investment of salmon enhancement dollars. Also, this project's industry analysis of salmon farming will provide information for those in government researching the feasibility of salmon farming in Alaska.
4. Federal Government - This analysis will allow the government to consider the impact of Norwegian farmed salmon on U.S. salmon fisheries. This information may then be utilized in enacting legislation to allow the commercial fishing industry to adjust to the salmon farming industry.
5. Native Corporations - This research will provide valuable information to those corporations which perceive salmon farming as a potential investment.

Alaska Legislature Research Agency, Apr 84, Salmon Farming, E. Laschever
This Request from Rep. Ringstad for a description of salmon farming in other states and countries and to identify legal and biological impediments to such operations in Alaska.

Memo on Research Request number 84-74 did cover certain areas and provided pertinent reference material on the subject.

Fish Farming International, Sep 77, Ocean Ranching, C.E. Nash
This paper (notice the date) describes the already successful Japanese methods of sea-ranching and some of the more far reaching ramifications of it. In the previous year (1976) the Japanese had a return of 15 million fish...!!!!!!!

AK Dept of Commerce, Office of Comm. Fish. Development, Jul 1984,
Aquaculture Overview, by Patrick Stenkamp
Contains headings on aquaculture trends and production figures in various countries worldwide.

US Dept of Commerce, Foreign Fisheries Analysis Branch, Norwegian Salmon and Trout farming

20 to 30 percent of Norwegian aquaculture license holders are former fishermen who inhabit the isolated communities along the fjords of the western coast. The Norwegian Government encourages fish farming for both strategic and social reasons. They regard salmon farming as one of the most lucrative commercial activities available to the local residents and actively assist small operators by guaranteeing loans through two Development Funds.

The Norwegian Government have restricted investment in salmon farms by large companies and have imposed size restrictions on salmon farms in an effort to limit the industry primarily to small, owner operated farms (startup size is a net cage capacity of 5000 cubic meters). Farms that have operated continuously for three years may apply for permission to increase their size to a maximum of 8000 cubic meters. An 8000 cubic meter farm can produce about 60 tons of salmon annually.

Two species are extensively cultured; rainbow trout and atlantic salmon with the salmon coming to dominance in recent years. The weight of pen reared salmon is a fairly uniform 4 kg, whereas the weight of wild stock fluctuates from 1 to 9 kg. The high quality, uniform size and weight, and year-round availability of cultured salmon accounts for much of its marketing appeal.

The success of their salmon exports is due to a number of factors. The salmon is of very high quality and is shipped fresh on SAS Airline. Because the fish are farmed and not caught wild, fresh shipments are guaranteed at any time of the year, and are especially valuable when the catch of wild salmon is down (winter, etc). The high quality and year round availability makes it particularly valuable to such specialized customers as restaurants, hotels, gourmet stores, etc.

The Norwegian salmon is of the Atlantic variety, *Salmo Salar*, which is more highly valued by many consumers than the US-landed Pacific salmon species. Thus, they are able to compete very effectively with the USA for the "top-of-the-line" salmon. This species export potential is best evidenced by the fact that it has recently been sold in Seattle, one of the centers of the US salmon industry.

The Norwegian Government is also attempting to encourage fish farmers to begin working with other, equally cost-beneficial species such as cod. The decline of the cod fishery in recent years has led many scientists to experiment with cod farming in the hope that a new industry can be developed to supplement the existing farmed species.

PERIODICALS

Fishing News International, Aug 84

The Japanese report that for the preceeding year, marine aquaculture produced 1,052,000 tons and freshwater aquaculture produced 94,000. This was in addition to their high seas catch of 11,988,000 tons.

The Faroe Islands will export over 400 tons of soaked and frozen salmon in 1985. The fish (average weight 4.5 kg) will be supplied by the Islands new aquaculture industry.

An article mentions the sale of thousands of fish feeders to the USSR.

The Daily Sentinel, Sitka, AK, 19Jul84 ----Fish Farms: Time Ripe? -Greg Baker, Fisherman and Director of Alaska Office of Commercial Fisheries, gave a spiel to Sitka Chamber of Commerce on the pros and cons of fish farming. In general, his info was correct and he drew a few obvious conclusions from his text. He says the Governor asked state officials(?) to study fish farming to determine whether the state should continue to invest in hatchery programs.

Aquaculture Magazine, May/Jun 84

Jon Lindbergh, Six ways to lose money in Aquaculture

1. Pinning hopes on not-yet-developed technology.

Research is costly and the time it may take is open ended. It is advisable to select only those species that have already been raised in captivity and for which management techniques are established.

2. Failure to realize that aquaculture is a farming business.

Scientists are often inexperienced managers. The technical skills to maintain a hatchery can be acquired in far less time than can the managerial skills which often take many years for research oriented staff to acquire.

3. Undercapitalization.

It often takes twice as long to get the first cash crop than the scientists may have optimistically projected.

4. Aiming at the wrong market.

There is generally two major types of farming: A) to produce large volumes of low priced food for large masses of people, B) to produce relatively high priced food items for the luxury market. Almost all successful aquaculture projects are of the second type, raising high quality table items.

5. Failure to realize the product is a live animal.

Livestock farmers must keep their chickens/pigs/cows comfortable and protected or they will lose money, but even the best of aquaculture farms often provide spectacles of overcrowding, rough and unnecessary handling, unsuitable water temperature, lack of shelter, all of which can result in poor growth rates and other undesirable damages.

6. Lack of business experience.

Owners and managers, even the most idealistic and hardworking, simply may not be competent to meet the normal day to day problems encountered in the management of a business.

Pacific Fishing

--- Sep 84

---Strike shuts B.C. Salmon Industry.. strike on Jul 11 over fish prices and technological change. Fishermen wanted C\$1.03/lb up from C\$.89/lb last year. Shoreworkers protest the use of new fish washing machines the processors hope to install which would cost the the shoreworkers jobs.

Washington will vote on Initiative 456 which will block State enforcement of the Boldt Decision. Backers argue that treaties between USA and Indians are void since Indians became citizens in 1924. Washington Politicos denounce the Initiative, etc.

The new head of PWSAC, Brian Allee, was former head of aquaculture research for Meyerhaeuser. PWSAC is building a new hatchery on Ester Island at

a cost of \$9 million. Construction starts May 85.

----Foreign Salmon Market, an Update - Processors expect a larger percentage of Bristol Bay run to be frozen since canned demand is weak; Japanese demand for frozen salmon is reportedly good, if the price is "reasonable"; Japanese will continue trend of making smaller, more frequent purchases, forcing producers to carry more inventory.

Hatcheries on Hokkaido and the Japanese mainland produced 33.3 million chum in 1983 and are expected to top that this year. Royal Alaska Seafoods spokesman does not expect these large runs to "reduce sales volume" but they could "hold prices down".

[Note] There is increasing evidence that the Japanese are selling off their Alaskan processing properties and are beginning to pull out of the state.

The US dollars strengthening will hurt European sales; Troll caught Chinook are probably already too high priced for Europe says one processor.

Norwegian fish farms are a potent force in the world salmon market. While Alaska trollers are limited in time of production, a fish farm can supply fish year round. The Norwegian fish is more expensive than the Alaskan Troll Kings at first glance: in 1984 they were priced 10% higher but the higher wholesale price was more than offset by reduced handling costs. For example, a French smoker can buy a weeks supply of fish on 60-90 days' credit instead of paying cash for a container load from Alaska and incurring storage, interest and shipping cost. There is also beginning to be great concern that increased production will lead to increased efficiency and lower prices for the Norwegian product. This will eventually force US prices down if they are to compete.

!!! Alaska Fishermans Journal

--- Nov 83

----Norwegian imports spur salmon farming experiment - Against a background of European pen farmed salmon imports into the USA, FRED Division (Moberly) of ADF&G feels Alaska needs to take some steps to make sure it is not completely left out. FRED interest is strictly on the technical aspects of pen reared fish. NMFS (Bill Heard) is also interested in the subject and plan to study the subject of pen-rearing with FRED. Heard doubted that the political climate would allow the importing of Atlantic salmon for the project to raise.

Kellus Sewell, a former Juneau seafood supplier, said one German seafood broker in Hamburg told him to forget about quoting Alaska prices because he (the broker) could now pick up his phone and get salmon delivered fresh within four days.

Both Heard and Moberly stress they are not advocates of farm raised salmon; but because of the impact fish-farming has had, they just want to do a modest amount of research on the subject. In the meantime, the Alaska state and US governments have salmon farming locked up: no pens can be put in salt water without a Corps of Engineers permit, and no fish can be put into the pens without a FRED permit. Moberly is quoted as saying "if someone were to ask for a permit to pen rear fish they would be told that it is not allowed in Alaska". He also says this situation will not change until the legislature develops an official policy for farmed fish.

The Alaska Trollers Assoc Executive Director, Ed Wojcek, is interested in getting fishermen into this business, a la Norway and Sweden. Some members of the organization say they would like to get into the business right now, others see it as just a first step for Meyerhauser to move in.

---- Threats of war: analysis of a treaty dispute - article discusses the problems inherent in the current USA / Canada salmon treaty which has still to be ratified.

---Dec 83

Salmon farming on the fjords of Norway: describes a former fishermen

salmon farm as well as a general description of a Norwegian fish farm and its operation. Also discusses the interaction of Norse Fisheries Research and the fishing industry, i.e., Research is supposed to be as near to self supporting as possible with Industry paying for research projects applicable to fishing. For instance, feeding experiments show salmon fed a straight diet of squid grow almost one-third faster but that capelin is almost as good and is more readily available to the farmers. Some fishermen turned farmer also use their seiners to provide feed for their co-ops as an extra income side line.

Contains a description of the process from harvest to consumer in 72 hours via SAS. SAS has worked out the shipping problems and has developed a fool proof container for shipping the fresh salmon product.

European salmon markets report light demand for USA frozen. Fresh Norway salmon is selling in France at \$3/lb. USA imports of Norway salmon thru Apr 84 have already exceeded 1983 total import of 3 million lbs. Sockeye price drops in Seattle due to huge run forecast in Bristol Bay and Chignik.

---Jul 84

European salmon markets (May 30) found light demand for USA frozen. Prices for chum ranged from \$1.15-1.50; pinks \$1.15-1.20.

Norwegian fresh salmon were selling in France for \$3.00/lb depending on size. Norway Trade Commission reports that thru April 1984 they had exported more fish to USA than they did in all of 1983... over 3 million lbs.

---Sep 84

Salmon Deficit - Salmon import/export statistics for the first five months of 1984: USA paid more for Norwegian salmon imports than they received for salmon sold to Japan. Net deficit was \$912,285.

Fire Destroys Hydaburg Cannery - this leaves the local fishermen with no place to sell their catch for at least a year. The cannery was built in 1948 after a fire destroyed the previous cannery.

---Jan 85

Norway is the world's most important salmon farming nation. They are expected to produce 80,000 tons by 1990 and 100,000 tons by year 2000.

!!! Fish Farming International

--- May 84

Norwegian fish farms for trout/salmon to increase from 474 to 562 (83 new locations). Farmed salmon production figures are: 1983; 17,000 tons, 1984; 24,000 tons, projected for 1985; 45/50,000 tons.

Canadian east coast fishermen are beginning to get into aquaculture in a small way (almost as a hobby) according to Canadian officials.

--- Jun 84

---Salmon Farms take off in Faroe Islands - Farmers are on schedule to produce 600 tons this year with 3000 tons forecast for 1986 and could be harvesting 15,000 tons by 1990. The 1985 harvest forecast is for 1400 tons. Current restraints consist of inadequate smolt supplies.

From four trout/salmon farms a few years ago the industry has grown to six smolt rearing stations and 30 cage-rearing sites. The country's fjords are well suited to cage-rearing salmon. They are deep, well sheltered, winter water temperature stays above freezing, summer temperature is cool, and there is very little tide. Other advantages are that surface runoff reduces the salinity enough that it inhibits sea-lice infestation, water quality is good, and the cages do not foul as quickly.

Ocean ranching is also being developed and there are many good sites for release and reception construction. Released smolt are able to take advantage of rich feeding grounds nearby which considerably reduces mortality. Returns have already been achieved.

----Company to sell Island salmon - A new company has been formed to market

salmon raised on the Islands of Harris and Lewis. These islands are located off the west coast of Scotland. The company is 51% Norwegian owned.

----Computer controls automatic feeders - One of the advantages of the new system is that the farmer can start with one control unit and expand gradually to fully computerized feeding. The pause, feed, pause cycle can be set for each feeder or for all feeders. Each night, just before midnight, the computer adds up the total amount of feed dispensed by each unit over the preceding 24 hours. This is then added to the total feed released by each unit since startup. These figures are available for printout.

----Where to study aquaculture in Britain - Contains a list of schools and their addresses.

--- Aug 84

----Island Smolt Shuttle - Small-scale salmon farming in the Western Isles of Scotland (Lewis and Harris) has taken another step forward with the successful transfer of 10,000 smolts from the big McConnell hatchery on South Uist to the cages of a small operator recently established on the same island.

The encouragement of local independent salmon farmers is an important part of the Integrated Development Programme (IDP) backing fish farming in the Western Isles. The IDP now helps the independents get started with both training and finance.

----Canadians welcome new Salmon Hatchery - A Norwegian Corp has decided to become a major participant in the new aquaculture industry of Atlantic Canada. The company plans to construct a salmon smolt hatchery near St George on the Bay of Fundy coastline.

Due to a shortage of smolt from the federal hatcheries, news of the hatchery was welcomed by industry spokesmen. Fishermen groups were also pleased that the company plans to encourage 40-50 commercial fishermen into the sea cage rearing business. The general view is that anything that will improve the fishermen's income has got to be good.

----Fish Farming takes off in the Faroe Islands - article describes salmon rearing and some other species as money crops. They have also recently completed a salmon smolt raising facility to supply raw materials to the sea pen operation. A leading grower has recently added shellfish to his successful salmon operation.

----Cage projects develop in warmer water - One company started off in 1982 with 13,000 fish and is now rearing 41,000 Atlantic salmon and trout in their cages. They plan to increase from 9 cages to 20 cages by 1986 and produce about 150 tonnes/year. This will be aided by the recent startup of a fish feed and oil business in the islands. These fish have already found good markets in Europe.

----Russians buy 5000 feeders - This leads to the conclusion that they are going to increase salmon production thru aquaculture. This is further suggested by their recent order from Vladivostok to a Swedish firm for thirty 2400-liter tanks for transporting live fish over long distances. They are also showing strong interest in an integrated floating installation for raising fish on an industrial scale... similar to the installation which has been operating in Finland for some time.

---Sep84

---Money for farms - Projects under the Integrated Development Programme for the Western Isles of Scotland multiplied so rapidly in the first two years that discretionary aid may have to be applied more selectively over the three years remaining. Spending on fish farming was allocated 1.2 million pounds for the five years of the programme actually reached 2.3 million in its first 18 months.

---Hatcheries in Scotland ship Smolts - The Norwegian firm Sea Farm A/S, which is developing the farming of Atlantic Salmon in Canada has asked to be shipped half a million eggs.

---Norway's salmon forecast - Fish farming is increasing by 4 %/year and

represents a doubling in 17-18 years. The Norwegians have also reportedly mastered the technique of cloning female fish from roe with a 70% yield. This means that from a female fish 7000 identical copies can be produced by spawning. As to the value of salmon farming; first hand sales of cod in 1983 realized US\$134 million, while farmers earned US\$95 million for salmon and trout. In 1986 fish farming should top the sales figures with a turnover of US\$ 150 million. Existing capacity is 50,000/60,000 tons/year but projects already in the works will increase this to 80,000 tons/year by 1990.

!!! Aquaculture Digest ---Jan 84

9.1.2 An Oregon commercial salmon troller, Lee Myers, says poor catch can be tied to a government/aquaculture plot to drive independent fishermen out of business. He sees the Indians rights as next to go and then the sportsmen's shortly thereafter. He states that biologists don't know what they are talking about when they refer to salmon feeding in cold water ... he claims warm water feeding makes salmon bigger, not smaller, as the biologists claim.

Salmon Trout Steelheader magazine says anyone with an IQ over 50 knows the best economic return on State/Federal salmon dollars comes from ocean sport caught salmon. Therefore, it is not only dumb but outright negligent to allow commercial trollers to take 80% of the fish while forcing recreational fishermen to stay away. They say Sport fishermen will spend \$100 to catch one fish whereas some troll caught coho sold for less than \$1/each last year.

OreAqua spokesman says salmon ranching probably contributes 25% of the world's total harvest.

9.1.4 A group of Portland investors paid \$150,000 for bankrupt Burnt Hill Salmon Ranch. The Operation cost about \$5,000,000 to build.

9.1.21 New England Fish Farming Enterprises, Inc operates a hatchery for Atlantic Salmon in Bristol NH where it raises smolts. It's growing facility is on Plum Island, Mass, where salmon are raised in rubber lined ponds.

Mary Lawson

10 Indian Rock Road

Nashua NH 03063

1-603-889-0837

9.1.22 Ocean Products Inc has 20 net-pens holding 20,000 salmon that will be ready for harvest in the fall of 83. They will weigh about 9 lbs/each.

Art MacKay

Estes Head

Eastport ME 04831

1-207-853-6081

!!!!!!Note!!!! The Canadian operation has since gone bankrupt !!!!!

9.1.24 Some of the OreAqua coho releases went upstream instead of down. Ed Cummings (ODFW) says studies show 90% of the smolt wrong-ways were released after Aug 20 which will not be done this year.

9.1.27 SSRAA Inc Article... contains production statistics.

9.1.64 Aquaculture statistics for USA. Total production estimated to be 400 million lbs/year or about 11% of total edible production. The industry includes about: 1100 catfish; 400 crawfish; 25 salmon; 500 oyster; 30 clam, mussel, abalone; 15 shrimp; and 20 freshwater prawn farms.

9.1.65 Description and objectives of:

National Wildlife Federation

Rudolph Rosen

1412 16th St, NW

Washington DC 20036

1-202-797-6800

9.1.68 A study on USA seafood consumption with the following results:

39% ; buy better fish at specialty markets

44% ; buy fish because it is nutritious

20% ; frozen tastes as good as fresh

47% ; easy to prepare good tasting fish dishes

42% ; buy fish with no small bones

41% ; fish is more economical than beef

78% ; don't like seafood with a strong odor

9.1.74 Oregon Dept of Fish & Wildlife reconsidered its position and reserved 500,000 salmon eggs from OreAqua.. just in case. Eggs are to be used in the Yaquina River project above OreAqua hatchery at Newport OR, and in some inland lakes.

--- Mar 84

9.3.1 OreAqua has its own mail-order business as well as supplying stock for the Walter Cribbens Co. specialty advertising catalog.

9.3.4 Net-pen farming creates serious pollution problems after a few years operation. The accumulation of organic matter under the pens is the cause of the problem. Fish behavior changes and growth rates slow. A majority of farmers who have been in business for several years know the problem.

9.3.13 Anadromous, Inc plans to build a \$3 million facility near Stayton OR for rearing Coho and Chinook smolts. They plan to release 10 million/year from the facility.

9.3.14 OreAqua sold its Coos Bay facility to Anadromous Inc for \$2 million. Sale was prompted by each companies fish continually mixing with the other. OreAqua retains its other sites.

9.3.15 Anadromous Inc had disastrous results with Coos Bay operation in which only 1500 adults AND jacks returned on a release of 1.5 million smolt (0.1%).

9.3.27 Lopez Sound Salmon received permits from Skagit County for a net pen salmon farm south of Anacortes. The product will be Atlantic Salmon from smolt to market size. The pen unit cost \$125,000 and employs 4 people. However, four influential people got a vocal group together and scuttled the project... unsightly, lowering land values, etc. Lopez Sound has since relocated the operation "north" of Anacortes and away from expensive homes.

Alexander Bill

Lopez Sound Salmon

Route 1, Box 1426

Lopez WA 98261

9.3.33 Up to 25% of Oregon Coho caught by ocean fishermen come from hatchery fish releases.

9.3.38 Swecker's Salmon farm raises about 100,000 lbs/yr of coho salmon. Boned and gutted, with heads and tails on, his fish weigh 7-11 oz. Restaurants serve the smaller size with steak or other seafood, while the larger is served as the main course. He can deliver to San Francisco for \$1.60/1.80 per portion, compared to \$2.40/2.50 for ocean caught salmon. He is experimenting with Atlantic Salmon which he believes can be grown to 5/8 lbs in fresh water.

Swecker's Salmon Farms

Route 2, Box 12AA

Rochester WA 98579

9.3.58 Jon Lindbergh, VP of Dowsea Farms Inc from 1970 to 1983 when he resigned to become an independent consultant. He looks to future of brood stock development of different species despite opposition of commercial fishermen and food processors who don't want any kind of change. He pushes hardest the breeding of fish in their proper environment. He draws corollary to domesticating animals which subsequently caused the human race to move out of caves.

9.3.62 A coalition of disgruntled sports fishermen and charter boat operators will try to put a measure on Nov 84, Oregon ballot to revamp salmon and steelhead production. One purpose of the measure will be to restrict salmon ranching.

9.3.63 On Dec 12, 1983, a petition prohibiting off-season releases of Coho and chinook salmon from private ranches was filed with the Oregon Secretary of State. This would prevent ranchers from releasing fish in the off season and from genetically altering the salmon's life cycle in such a manner as to bring

them back at a different time than natural runs.

--- Apr 84

9.4.2 A complete status report on Silverking Oceanic Farms (California) for the period 1980 thru mid-1983 is contained in this issue.

9.4.12 Oregon Fish and Wildlife Commission has decided NOT to buy salmon eggs from OreAqua based upon ODFW report. Dave Schlip, salmon fisherman and member of the governors task force on salmon, said the report was "an indictment against using their eggs. They are hybrids. The things don't survive very well and they don't grow". [Note] ODFW has since reserved 500,000 OreAqua eggs.

9.4.24 North American Salmon Research Center in New Brunswick, Canada have been studying Atlantic Salmon since 1974 as a sea-ranched pen-reared species.

9.4.26 Fears are growing in the Canadian maritime provinces that the rich Scandinavians are getting ready to buy out the region's dozen fish-farms.

9.4.27 Reports on induced spawning in Atlantic Salmon.

9.4.32 A paper on changing a trout hatchery into an Atlantic salmon hatchery. Notes on stress, self-feeding equipment and its effect on the critters.

V.J. Segarich

US Fish and Wildlife Service

Nashua National Fish Hatchery

Nashua NH 03063

9.4.34 Oregon Dept of Fish/Wildlife report on the effects of two types of food on chinook salmon production.

9.4.54 Jim Youngren spent appx \$250,000 setting up a salmon hatchery in Washington state which can produce 1 million smolts and 3-4 million eggs/yr. He is also working on legislation to legalize "non-profit" salmon ranching in the state.

9.4.55 The collapse of Oregon salmon stocks has led officials to consider looking to private ranches for help. Lee Woodward, a charter fishing operator who has long opposed salmon ranching, is in favor of this.

9.4.57 An Oregon Fish/wildlife report on the straying of ranch bred salmon.

9.4.59 An Oregon Troll fisherman cooperative has initiated a proposal to turn private ocean ranching over to the state. OreAqua says that if this law were to pass it would put them out of business; Anadromous Inc says the concept is "outlandish" and neither they nor the public/legislature will go for it.

9.4.60 State of Washington (Dept Natl Res) wants input from the aquaculture industry on whether they would be interested in reserved areas where they could be guaranteed access to water and/or space.

--- Jun 84

9.6.8 The Norwegian salmon farming industry expanded because of cheap food and little labor. Atlantic salmon in Norway grow to 10-12 lbs in 18 months without early maturation problems.

9.6.9 The Norwegians are selling farmed Atlantic salmon in the USA.

9.6.10 Farmed Atlantic salmon imports to the USA have increased 28 fold thru Sep 82. Fresh fish accounted for most of the 611,000 lbs worth \$2.2 million.

9.6.12 Notes on how Norwegians produce big fish in a hurry.

9.6.24 Notes on Ocean Products Inc operation in Maine and New Brunswick.

9.6.25 Scan-Am Fish farms is starting a salmon fish-farm in Port Townsend WA.

Alf Saetra

Scan-Am Fish Farms

1511 Irondale Road

Hadlock WA 98339

1-206-385-3803

9.6.26 Sea Farm of Norway has received a permit to operate an Atlantic salmon net-pen farm near Port Angeles WA. Jon Lindbergh is consultant. Article has costs on net-pen rearing as well as general info.

9.6.29 SSRAA Inc has money problems. Management tried to increase fisherman assessment from 3% to 6% but the fishermen voted it down.

9.6.51 Salmon ranchers in Oregon may be able to sell smolt to State gov't and

commercial fishermen seem to be in favor of it. Article contains statements on the subject from several influential people, pro and con.

--- Sep 84

9.9.3 Salmon Ranching--Alaska Style Ladd Macaulay(9.4.31), manager of DIPAC gives a slide presentation and spiel on his two operations.

9.9.4 Kraft Inc--getting out of Aquaculture The Sea Farm Group(Norwegian) has bought Shearwater Fish Farming from Kraft. Sea Farm has investments in Scotland, Canada (N. Brunswick), and in the Seattle area (9.6.26). Sea Farm plans to market commercially farmed Atlantic Salmon on the USA west coast in late 1985. Shearwater will act as marketing arm. Sea Farm (France) SNC, a new company, will handle sales of fish farm equipment and know-how.

9.9.12 Doosea Farms Inc, produces more pen reared salmon than any other company in the USA. They expect to harvest 2 million lbs in 1984 and will increase production by another 50% in 1986. They sell to restaurants, markets and supermarkets on the west coast and Atlantic states.

9.9.15 Lopez Sound Salmon has a new site for its net pen farm; Deepwater Bay off Cypress Is., Washington. The farm is capable of 500,000 lbs/yr of salmon.

9.9.20 Oregon-Pacific Salmon Ranch Inc is the new name of the Burnt Hill Salmon Ranch (9.1.14) which went out of business in the summer of 1983. The new operation will release 215,000 smolts in 1984.

9.9.22 Scan-A Fish Farms (9.6.25) plans to raise Atlantic Salmon in Puget Sound. They figure each pen will produce 50 tons/yr for an annual gross of roughly \$1Mil/yr. Alf Saetre, principal, will eventually produce his own feed. He says Puget Sound could produce as much salmon as Norway or about 25,000 metric tons.

9.9.25 Swecker Salmon Farm Inc (9.3.38) is for sale-- or will take partners and either expand or become a fingerling production unit. Historically, it has produced and marketed pan size coho, smoked salmon and salmon smolts. In the northwest, large contracts are being let for Atlantic salmon fingerlings of which nearly 50% will go to this company in 1984.

+++Dan or Debby Swecker, 10420 173rd Ave SW, Rochester, WA 98579
(1-206-273-5890)

9.9.54 NMFS in Manchester, WA, has been culturing Atlantic salmon for six years. They are going to produce 5 Mil eggs/yr for restocking northeast USA rivers.

9.9.55 Article gives some wholesale import prices(includes cost of insurance & freight) for farmed Atlantic salmon in France, Germany, and the U.K.

9.12.4 72 Japanese hatcheries are putting out 1.5 billion salmon fry into the ocean each year with an economic return estimated to be \$400 million. The Russians release 2 billion fry/year now and plan 5 billion by year 2000. The whole west coast of USA and Canada put out 350 million.

9.12.5 Fundacion Chile purchased Doosea Farms salmon operation in that country. They ranch Chinook and Coho and are going into net-pen farming.

9.12.10 Anadromous Inc had bad returns in 1984 and won't get enough fish to replace brood stock this year.

9.12.25 Ore-aqua will take over the Doosea Farms operation at Florence, OR.

9.12.27 Puget Sound Aquaculture has applied for Corps of Engineers permit for fish pens off Vashon Island.

9.12.65 In Oregon, a proposal has been introduced to allow commercial salmon fishermen to target catches of hatchery reared fish, including those from private ranches.

9.12.66 The beauty of raising Atlantic Salmon to maturity in pens is that it might take pressure off the high seas netting of salmon, thus eventually allowing more salmon to return to streams for spawning and providing a better sport fishery.

9.12.67 *Offshore commercially caught salmon landed in Oregon totaled \$2.3 million for 390,000 fish. Each fish caught by a sportsman yielded approx 20 times its commercial market value to the economy of the state. This puts down the Commercial fisherman fallacy that his type of fishing means jobs, and that sport fishing does not. Commercial fishing is not an economic factor in the

state of Oregon." A letter to the Sunday Oregonian.

AQSTATES

***State of California

(916) 355-7095: Steve Taylor; contacted Fish & Game 6/22/84

Per Steve Taylor - There is only one private salmon hatchery authorized by law within the state:

Silver King Oceanic Farms
(408) 438-7721; Roger Haas

This operation is considered experimental by the legislature and will remain so until 1986 at which time the whole subject will come up for re-evaluation. This is a Ranching operation. It handles smolt to mature critters and can sell excess production for profit. The whole concept of sea-ranching is violently opposed by most of the industry, the Trollers in particular. They see it as a very thinly disguised way of eliminating them entirely from their traditional occupations; as another instance of direct competition from State Agencies; or as the state taking unfair advantage of private industry. There is now a move afoot to declare a moratorium on State run hatchery construction because of this competitive edge.

Industry might have a different view of the ranching concept if someone was making money at it. So far, no one is making a profit. (It is not clear how anyone else could make a profit when only one hatchery can legally operate in the state. It is also unclear why the Trollers should object to ranching when they have access to the fish before the hatchery does).

The commercial salmon fishery (trolling) is primarily for Coho with a few Chinook. The industry is currently in bad shape due to El Nino as well as a general decline of the native wild stocks. Aquaculture in California consists mainly in raising fish other than salmon for the market; Oysters, trout, catfish are the big items.

He is sending regulations/statutes and his annual report to us. The Report is made up by the state from info supplied by the private hatchery.

*** Per Curt Kerns; This operation has been moved about over the state from creek to creek at least four times and whoever is bankrolling it must have... This has never been an effective operation during all the years in existence. The operators have spent a lot of money and a lot of motion and have produced almost nothing.

*** ...are Digest, Apr 84, 9.4.2 Contains the complete status report for Silver King Oceanic Farms for the period of 1980 thru mid-83. Report consists of Introduction, History, Operations, Planting, Returns, Tagging, Conc. Lions and Recommendations.

###State of Maine

Fish and Game (207) 289-3651; Dave Lock; State Hatcheries, Contact 6/18/84
There are two operations in the state at present:

Sea Run, Inc

RFD 2, Box 1052

Kennebunkport ME 04046

(207) 967-4026; Dr Evelyn Sawyer and Phillip Sawyer, owners

Per Dave Lock; She is doing a pilot study on introduction of Pacific stocks into eastern waters (setting up brood stocks from eggs obtained from Pacific sources). Brood stocks are Pink & Chum; less competitive with Atlantic salmon etc, which are almost extinct in Maine waters.

Per Ladd McCauley; she bought eggs from Sheldon Jackson college in Sitka two years in a row and could not buy from him because of objections of FRED Div of ADF&G. She had a Pink return but fish returned to the wrong place.

~~Note~~ this not unusual for Pinks... they stray all over when they return.

Per Aquaculture Digest, Jun 84, 9.6.27 Sea Run Inc received a National Science foundation award of \$28,647 for experimental Pink & Chum ranch in the state. This operation will transplant stocks from Hokkaido, Japan, and USSR areas which are similar to the Maine coast, as well as eastern Pacific stocks (Alaska, Washington, Oregon, etc). The overall objective is to compare returns of western Pacific and eastern Pacific (control) salmon stocks in the western Atlantic. Comparison is based upon western Pacific stocks which move eastward into the Pacific before maturing and eastern Pacific stocks which move westward into the Pacific before maturing. Phase I objectives are to locate, evaluate, and obtain eggs from eastern Pacific sources.

Ocean Products

(207) 853-6081; Peter Pierce

Per Dave Lock; this is the same company as the New Brunswick, Canada company; they raise Atlantic salmon using pen-rearing operation.

~~Note~~ as of Aug 84, the Canadian side of this operation is bankrupt and all assets have been turned over to Dept of Fisheries. Problem was caused by seals getting into the fish cages for a huge loss. Don MacKay is out and Pierce is the CEO and Chmn/Board. MacKay is trying to buy up assets from Gov't for reasons of his own. He used to own the whole company when it was Research.

###State of Oregon

(503) 229-5551; Ed Cummings, Fish Biologist, contact 6/21/84

He will send Rules/Regs.. they have been changed but will send us old and new when available.

Oregon patterned its operation after Calif, then Calif re-did its program after Oregon got its program going. Oregon still considers Aquaculture as an experimental program which has a long way to go before it is proven.

Aquaculture, in general, is not very well received by those involved in the industry. That is, the fishermen view it two ways: as an answer to low stocks and short seasons, or as replacing them altogether. They see the advent of big corporations as another step in the elimination of the small operator from the fishing industry. This emotional reaction coincides with the bad conditions in the commercial fishing industry as a whole.

The present conditions (El Nino, etc) and its effect on the salmon fishing industry are disastrous. sub-tropical fish are showing up off the coasts of Oregon, Calif and Wash. Feed fish have virtually disappeared from offshore and consequently all salmon stocks are at disaster levels.

The conditions, combined with Alaska and BC interception of Oregon Coho and Chinook stocks, have almost wiped out the fishing industry in the state. These are the only two species in their salmon fishery.

Note a small, tagged Chinook caught locally by G. Doss was brood stock of 1980, 27 inches, 12 lbs, from Bonneville, Oregon, hatchery.

Per Fishing News International, Jun 84

the 1983 session. Its activities will be funded by a percentage of every pound of salmon sold.

Per Aquaculture Digest, Jan 84

A list of private salmon ranches, their locations, and species raised are shown in 9.1.60.

State of Washington

(206) 753-1873; Bill James; Aquaculture, contact 6/19/84

He is sending info on the states position and regulation of the industry as well as literature from some of the companies engaged in the business. He is the only person in the state government concerned with aquaculture. He keeps in touch with the industry more so than he regulates it.

His comments: The USA is currently importing fish from Chile, Japan, Scotland, Norway to name a few countries. These countries, Norway in particular, are producing a very high quality product, year round, and in large quantities. Norway has the winter and gourmet market completely to itself on the east coast.

They ship large quantities of salmon by air freight to the eastern USA year round. The companies get their order and ship within 24 hours. They do not pre-package the fish and wait for the order; they receive the order before the fish is removed from the water. Their Atlantic salmon sells in New York for \$00/lb during the winter months.

Salmon hatcheries and fish farming has really taken hold in the state the last five years. There will not be much of a fly-by-night operation in the industry due to the long lead time and the large investment required to produce anything of consequence in this type of industry. The state does not have a great deal of policing to do with the farmers themselves because of their own independent associations. The Associations police themselves and are very quick to call attention to anything that is not exactly right. They are very sensitive to public opinion and product confidence and do not want any problems such as happened in Alaska with the canned Pinks.

The Boldt Decision essentially killed the commercial salmon fishing industry in the state. Current investment in commercial fishing gear by residents is nonexistent. Fishery stocks are not very high right now and not likely to get better in the near future. This is partly due to lack of public interest, i.e., since the Indians are entitled to take half of everything, and since their attempts at their half has in effect eliminated those who would normally take the other half, there is little public interest in building hatcheries solely for the Indians with public money.

The demise of the commercial fishing industry paved the way for fish farming to come into being. This has in turn generated a great deal of outside investment in this particular industry within the state. The Norwegians have a new operation starting up at Port Angeles, for example.

Quality of product is the single greatest selling point used by the foreigners in their USA marketing efforts. They are dealing only with a fresh ocean product at point of sale.

Certain Indian tribes have started their own hatcheries and are moving into the business on their own whether in fish-farming or sea-ranching remains to be seen. The Indians are not bound by the same laws as the public where sea ranching is concerned and they may eventually move into this area as well. **Note** in the State of Washington it is against the law to profit from sea ranching... etc

Per Seafood Leader Magazine, Spring 84, Atlantic Salmon in the Pacific
Scan-Am Fish Farms has an operation in Hadlock WA and are now setting up another operation in Port Angeles. They are Norwegian company who pen-rear Atlantic Salmon.

Dorsea Farms, a subsidiary of Campbell Soups, has been pen-rearing pan size coho for the last ten years in Puget Sound. In the winter of 83/84, they announced the introduction of pan-size coho in four supermarket chains across New York state. While the small salmon have always had a strong following in gourmet restaurants, supermarket chains are a new and promising market for the company. Brisk sales were reported at \$5.69/lb compared to Norwegian salmon steaks just down the aisle at \$8.99/lb.

There are currently six independent fish-farm operations in the State of Washington primarily located in the Chehalis/Rochester area. Each of these is typically a one family farm on 20 acres, with a total of 10 ponds with a containment of about 500,000 gallons. The water flow year round is about 2000 gal/min of 50 degree clear spring water in which Coho are raised. The advantage of raising Coho in fresh water is they are less susceptible to disease; the disadvantage is the water has to be at just the right temperature to do it. This reduces the possibility of developing a very large industry. The main reason the farms are located in this area is the water table and temperature are perfect.

These companies harvest fish only when there is an order. Orders come mostly from upscale restaurants all over the country via Dory Seafoods, which acts as their marketing organization. From order to product delivery requires 24 hours.

***Salmon/Trout Advisory Service, Jan 85

Richard E. Noble, President

PO Box 6232

Olympia WA 98502

(206) 943-4676

Has been successfully associated with aquaculture since 1952. Has very impressive credentials in the field; introduced Pacific Salmon into Chile; introduced Coho and Chinook into Michigan; Consultant to Washington Indian tribes and developed their hatchery programs; Consultant to Canadian Gov't and is developing two major hatcheries/enhancement programs; Authored / initiated Washington State Admin Code(Regulatory Law) for Fisheries; Faculty member of Univ of Washington for Fisheries and Salmon culture curriculum.

Europe & Japan

AQEURJAP.TXT -- PRINTED ON 01-01-1980 AT 00:05:10 -- PAGE 1

***NORWAY

The Norwegians got into commercial salmon farming when they found they had a very large, over capitalized, fishing fleet at the same time they had a great number of fishermen out of work. Fish farming was started as a local measure to alleviate economic hardship and unemployment in the fishing towns along the coast. The success of this programme is the most significant event in the history of European aquaculture and has been the industry's most visible commercial success.

The success of saltwater salmon aquaculture has attracted many former fishermen who are disillusioned with declining fishery catches to apply for licenses for salmon or trout farms. It is estimated that 20 to 30 percent of the current license holders are former fishermen, many of whom live in isolated communities along the western coast of Norway. The Norwegian Government encourages aquaculture in these sparsely populated regions for both social and economic reasons and view salmon farming as one of the best commercial activities available to the residents of these coastal communities.

Their fish farming programme began in the mid to late 1960's and applied technology developed for raising trout to the raising of Atlantic Salmon. These modern methods have enabled the aquaculturists to get into the business with relatively small investments and then to gradually expand their operation as they become more experienced. The Government assists the small operators with guaranteed loans and training in the operation of their fish-farms. In fact, the Government has restricted salmon investments by large companies and has also imposed a size restriction on the individual farms themselves. This was done to limit the industry primarily to small, owner operated farms. As of 1984, there are 562 of these small farms along the coast with the northernmost being above the Arctic Circle at Finnmark.

Since 1973, Norwegian law restricts the maximum size of a salmon farm to a floating net pen capacity of 8000 cubic meters. It is estimated that a farm of this size will produce about 60 metric tonnes (approximately 133,000 pounds) of salmon annually. However, beginning farmers are not allowed this large an operation, instead they must start with a size of 5000 cubic meters and operate these successfully for at least three years before they will be allowed to apply for permission to increase their capacity to 8000 cubic meters.

Pen rearing or fish farming is the undoubted way of the future. It is cost effective, the problems are recognizable and already defined, a vast body of information has been gathered by both scientists and growers, and there is already a brisk demand for the product. It is the accepted method of rearing salmon in Norway and from it is produced some of the highest quality fish available anywhere. Due to it's high quality and year round availability, the Norwegians have the gourmet and off season salmon market almost completely to themselves in the east coast cities of the United States.

Norway ships large quantities of fresh salmon by Scandinavian Airlines System air freight to the eastern United States year round and are targeting the existing market with a much larger export volume in the future. The success of these exports is due to a number of factors. The salmon is of very high quality; because the fish are farmed and not caught in the wild, fresh shipments can be guaranteed at any time of the year; and they are especially valued at those times when the catch of wild salmon is down. The high quality and year round availability of the product makes it especially valuable to such specialized customers as upscale restaurants, hotels, and gourmet stores.

The United States exports much more salmon than Norway and supplies most of the salmon for the it's domestic market but it faces strong competition

from the Norwegians for the "top-of-the-line" salmon. Since the USA produced Pacific salmon is caught only in the summer, it is available fresh for only a short time, and therefore most USA salmon is sold in frozen or canned form. The Norwegian product can be shipped fresh year-round and is exported to the USA primarily in the winter and spring. The Norwegian product is also the Atlantic variety which many consumers prefer to the stronger flavored Pacific variety. The export potential of this product is evidenced by the fact that it is currently being sold in Seattle, Washington, one of the centers of the USA salmon industry.

###Scotland

More than one third of the Atlantic Salmon marketed in the world comes from pen-farm operations. Most of this comes from Norway but Scottish production has increased to significant proportions over the past few years. There are now a number of small farms and one large operation located on the west coast of Scotland. McConnell Salmon is a large salmon farming operation which also supplies smolts to other fish-farmers in the Western Islands and the mainland.

Recently a company was formed to market salmon raised on the Islands of Lewis and Harris. These islands are located off the west coast of Scotland and are part of a previously large fishing community. The new company is 51% Norwegian owned and will specifically deal in locally pen-raised Atlantic Salmon. The company's encouragement of local farmers is an important part of their Integrated Development Programme (IDP) backing fish farming in the Western Isles. The IDP helps the small independent salmon farmer get started with training and finance.

Since 1980 salmon farming in Scotland has increased significantly. In 1983 there were 41 freshwater and 62 seawater salmon growing sites in Scotland. These sites produced yearly Atlantic salmon totals of 598 tonnes in 1980, 1133 tonnes in 1981, 2152 tonnes in 1982, and 2536 tonnes in 1983. Their projection is for 4000 tonnes in 1984 and 7000 tonnes in 1985. These farms will market their fish thru the existing Norwegian network of dealers in Europe and the USA.

###Iceland

During the eleven centuries that people have lived in Iceland, fish have been the basis of their survival and of their economy. This has led them to the development of a farsighted, successful system for the management of the islands stocks of salmon and trout. During the past century, while catches of Atlantic salmon were steadily declining in western Europe and North America, they have been increasing in Iceland.

The Atlantic salmon is particularly suited to ocean ranching due to its precise homing to its place of release and for its growth statistics: from 1 to 6 lbs in one year and to 13 lbs in two. Where return rates of smolt are high, salmon can be ranched profitably. The first smolts from a government owned hatchery were released in 1963 into marginal streams where the return of two year smolts had exceeded 8% by 1966. This was the foundation of salmon ranching in Iceland.

Over the years, it has become increasingly clear that Icelandic salmon stocks enjoy a much higher rate of return than in any other Atlantic country. Oceanic survival to one year has been determined as 20% in a salmon stream and 10-15% in those that were hatchery reared. The three factors responsible for this are: 1) prohibition on commercial fishing for salmon at sea, 2) high proportion of one winter fish (grilse), and 3) a great abundance of food organisms in the waters around Iceland.

little success in Iceland. This is in a large part due to the absence of sheltered sites for the cages. Attempts at cage rearing were made in what appeared to be good sites but severe wind and wave action and near freezing sea temperatures resulted in damage to the cages and death of the fish.

At present, a satisfactory policy of foreign investment with two large firms, Norlce and Meyerhauser in particular, show promise in joint venture fish farming operations. These operations and other such arrangements are always on a shareholder basis with Iceland having majority ownership. There is great promise in these ventures; the water quality and quantity is excellent and cheap, electricity is cheap and there is very good fish disease service available.

There is probably no other salmon producing country with such good promise of success as can be found in Iceland. Its thermal springs and reliable supply of uncontaminated ground water may well be unique and the absence of commercial netting in the adjacent seas guarantees the maximum return of ocean ranched salmon. These are strong reasons to view this industry as having a good future in this country.

###Faroe Islands

Fish farmers of the Faroe Islands are on schedule to produce 600 tons of salmon in 1984, 1400 tons in 1985 with 3000 tons forecast for 1986. Their long range plan calls for the harvesting of 15,000 tons by 1990. These fish will weigh approximately 10 pounds each and are the product of the Islands new aquaculture industry. Current production restraints are due to inadequate supplies of smolt to stock the pens.

From four salmon cage-farms a few years ago the industry has grown to six smolt rearing stations and 30 cage rearing sites. The islands fjords are well suited to cage rearing salmon; they are deep, well sheltered, winter water temperature is above freezing, fresh water quality is good, and there is very little tide. Other advantages are that the natural environment inhibits certain types of diseases and parasitic infestation.

One island company started fish farming in 1982 with 13,000 fish and are now rearing 41,000 Atlantic salmon and trout in their cages. They plan to increase from their present 9 cages to 20 cages by 1986 and produce about 150 tons per year. This increase in production will be aided by the recent startup of a fish feed business in the islands. Their fish have already found good market acceptance in Europe.

Ocean ranching is also being developed and there are many good sites for the construction of release and reception sites. Released smolts are able to take advantage of the rich feeding grounds nearby which will promote rapid growth and will considerably reduce mortality. Returns have already been achieved. A smolt rearing facility which will supply raw materials to the sea pen operation has recently been completed but is not yet in full production.

###Japan

Japan obtains salmon from four sources: a coastal trap-net fishery based on returns of hatchery releases, a highseas catch, imports, and cage culture. Salmon usage has more than doubled within the years 1974 to 1983. An increased demand for salmon, a decreased highseas catch, and the desire to reduce imports has caused the Japanese Government to expand their salmon hatchery program. Hatchery produced returns have grown steadily and are now Japan's most important source of salmon. The Japanese Fisheries Agency estimates that hatchery produced salmon accounted for 45% of Japan's salmon supply in 1983.

greatly during the last ten years because of growing demand and a decreasing highseas catch. Before the establishment of the 200 mile fishing zones, Japan averaged 10,000 metric tons annually of imported salmon. Since then Japan has increasingly relied on U.S. imports to fill domestic demand. Their imports were over 96,000 metric tons in 1983, but are expected to be lower in 1984 because of an over-supply of salmon in Japan. Japan's hatchery programs, however, cannot completely replace imports at this time. Chum is the main species in their hatchery program while most of their imported salmon is sockeye.

Japan has a long history of raising salmon fry in hatcheries. Their coastal catch of hatchery produced salmon returning from the high seas increased over 200% during the years 1974 to 1983. The increased returns were especially pronounced during the early 1980s and were the result of a five year salmon culture program sponsored by the Japanese government. This program was carried out by over 250 Government and private hatcheries located on Hokkaido and Honshu and has been exceptionally successful in it's returns.

Japan released approximately 2 billion salmon fry in 1983 most of which were chum fry. There were also released small amounts of pink, cherry, and sockeye during the same year. From this the coastal fishermen expect to harvest over 38 million fish when the mature salmon return in 1987. If these projected hatchery returns are accurate and salmon imports continue to increase, Japan Fishery officials believe that salmon supplies may exceed demand resulting in lower prices. They are therefore considering a hatchery enhancement program for fry of commercially more high value species such as cherry and sockeye salmon.

Financial problems are affecting plans for a new five year plan for salmon hatcheries. The Finance Ministry does not wish to continue assuming the cost of financing the hatchery program and wants the coastal trap-net fishermen to contribute more to the program since they benefit most from the salmon returns. In 1983 the fishermen contributed approximately 20% of the cost of the hatchery enhancement program with the Government supplying the remainder.

Japanese fish farmers (cage-culture) raise only coho (silver) salmon in ocean cages. Sea farming of salmon began in 1973 with the importation of one million coho salmon eggs from the USA for experimental purposes. These pen-farming operations were switched from fresh to salt water in 1975 because the salmon showed too slow a growth rate in fresh water.

The Japanese production of cage cultured coho salmon increased from 72 to 2,900 metric tons during the years 1978 to 1983. As in previous years, the entire production was consumed domestically; none was exported. Japan cage farms expect to harvest 4,500 metric tons of salmon in 1984 and 8,000 metric tons by 1990. This is noteworthy due to the Japanese Government policy on cage farms; they do not offer financial incentives to salmon farmers, as they do to private hatchery operators, and seem to prefer to let the marketplace decide the success or failure of this type of aquaculture.

IN THE

BY

_____ BILL NO. _____

IN THE LEGISLATURE OF THE STATE OF ALASKA
FIFTEENTH LEGISLATURE - FIRST SESSION

A BILL

For an Act entitled: "An Act authorizing and encouraging
aquatic farming and providing an
effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* Section 1. FINDINGS AND PURPOSES. The legislature
finds and declares that

(1) Aquatic farming in Alaska would provide a consistent
source of quality food, provide new jobs, increase Alaska
exports, create new commercial fishing and other business
opportunities, and increase the stability and diversity of
Alaska's economy;

(2) Many areas of the state are ecologically suited for
aquatic farming development;

(3) Aquatic farming would complement and enhance the
variety and quality of Alaska seafood and aquatic products, and
would thus benefit Alaska's economy as a whole;

(4) The principal responsibility for development of
aquatic farming in the state rests with the private sector.
Existing constraints on the private sector tend to be
administrative rather than scientific or technological. The
proper role of government is to ease those constraints and to
provide encouragement and support through programs and services
that cannot reasonably be expected from private sources; and

(5) It is the policy of this state to encourage the
establishment and growth of an aquatic farming industry.

* Section 2. AS 08 is amended by adding a new chapter to read:

CHAPTER 94. AQUATIC FARMING

Sec. 08.94.010. AQUATIC FARM AND HATCHERY PERMITS; LIMITATION ON RELEASE. (a) No person may conduct either of the following activities without a permit from the commissioner:

(1) the construction or operation of an aquatic farm;
or

(2) the construction and operation of a hatchery for the purpose of supplying aquatic plants and animals to an aquatic farm.

(b) A permit issued under this section authorizes the permittee, subject to the conditions of this chapter, to acquire, purchase, offer to purchase, transport, possess, sell and offer to sell stock and aquatic farm products that are used or reared at the hatchery or aquatic farm.

(c) No salmon, steelhead or other trout may be released from a hatchery or aquatic farm permitted under this section into the public waters of the state without authorization from the Department of Fish and Game.

(d) An application fee of \$100 must accompany the application for a permit under this section.

Sec. 08.94.020. REGULATIONS; OTHER AUTHORITY. (a) The commissioner may adopt regulations necessary to implement this chapter. The commissioner shall compile and annually report aquatic farm and hatchery production statistics.

(b) Except as expressly provided in AS 16.05.822, the Board of Fisheries may not adopt any regulations, or take any action regarding either the issuance, denial or conditioning of any permit under AS 08.94.010 or AS 16.05.821; the construction or operation of any farm or hatchery permitted under

AS 08.94.010; or a permitted harvest under AS 16.05.821. Regulations or orders adopted by the Board of Fisheries under AS 16.05.251 do not apply to a permitted harvest under AS 16.05.821.

Sec. 08.94.030. DISEASE CONTROL AND INSPECTION. (a) The Department of Fish and Game may order the destruction and disposal of any diseased stock or aquatic farm products when that department finds it necessary to protect natural stocks. A permit holder under AS 08.94.010 or AS 16.05.821 shall immediately report any outbreak or incidence of disease to the Department of Fish and Game.

(b) A permittee under AS 08.94.010 shall permit the Department of Fish and Game to inspect the farm or hatchery during operating hours and upon reasonable notice. The cost of inspection will be borne by that department.

(c) The Department of Fish and Game shall develop a disease management and control program for aquatic farms and hatcheries.

(d) The Department of Fish and Game shall, to the extent feasible, provide permittees with disease diagnostic and management services, and may enter into agreements with other state or federal agencies, or the private sector, to provide those services.

Sec. 08.94.040. PERMIT CONDITIONS; RESTRICTION ON TRANSFER; ANNUAL RENEWAL. (a) The Commissioner, after consulting with the commissioners of fish and game, and environmental conservation may attach conditions to a permit under AS 08.94.010 that are necessary to protect the public health or natural stocks.

(b) A private hatchery permitted under AS 08.94.010 may sell or transfer stock from the hatchery only to an aquatic farm or other hatchery permitted under AS 08.94.010.

(c) No stock may be transported to or from an aquatic farm or hatchery permitted under AS 08.94.010 without first submitting a notice of transfer to the Commissioner. The notice must be accompanied by a health inspection report from the Department of Fish and Game, or from a disease diagnostician approved by that department. The notice of transfer must be submitted no later than 30 days before the proposed date of transfer. The Department of Fish and Game may restrict or disapprove the transfer if it finds that the transfer would either present a substantial risk of spreading disease or, in the case of a transfer from a hatchery, would significantly impair the production needs of that hatchery.

(d) A permit issued under AS 08.94.010 must be renewed annually. The renewal application must be submitted to the Commissioner no later than 30 days prior to the expiration of the permit. Each renewal application must be accompanied by a health inspection report from the Department of Fish and Game, or from a fish disease diagnostician approved by that department. In the renewal, the commissioner may impose additional conditions necessary to control and manage disease.

Sec. 08.94.070. LIMITATIONS ON SALE. (a) No person may sell, transfer or offer to sell any aquatic farm product unless that product was grown or propagated on a farm permitted under AS 08.94.010, and that permit was in effect at the time of the sale, transfer or offer.

(b) No person may knowingly purchase, receive or offer to purchase or receive any aquatic farm product that was not grown

or propagated from a farm having a valid permit under AS 08.94.010 at the time of the purchase, receipt or offer.

(c) The sale of any aquatic farm product must be evidenced by a bill of sale. A summary of all bills of sale specifying quantities, products and sales prices must be submitted to the commissioner on a quarterly basis. Quarterly summaries submitted under this subsection, and information contained in the summary when presented in a manner so as to enable identification of the seller, are confidential and may not be released by the commissioner. This subsection does not prevent the commissioner from releasing:

(1) aggregated sales information that does not enable identification of a particular seller or the substance of that seller's transactions; or

(2) the quarterly summary:

(A) to the Department of Revenue to assist that department in carrying out its statutory responsibilities on the condition that the confidentiality required by this subsection will be accorded by that department;

(B) the municipality with jurisdiction over the sale for the purpose of verifying applicable taxes due on the sale, on the condition that the confidentiality required by this subsection will be accorded by that municipality;

(C) pursuant to court order; or

(D) to the seller upon the seller's written request.

Sec. 08.94.060. PENALTY FOR VIOLATION. A person who violates a provision of this chapter, a regulation adopted under this chapter, or a term or condition of a permit issued under AS 08.94.010, is guilty of a class B misdemeanor.

Sec. 08.94.100. DEFINITIONS. In this chapter,

(1) "Aquatic farm" means a facility which grows, farms, or cultivates aquatic farm products within either artificially enclosed marine or fresh waters, or within controlled waters for immobile species. The term does not include releasing fish or shellfish into the waters of the state and their subsequent recapture in the practice known as ocean ranching;

(2) "Aquatic farm products" include any form of aquatic plants and animals, and fish parts that are propagated, farmed, or cultivated in an aquatic farm and that are sold or offered for consumption;

(3) "Commissioner" means the commissioner of the Alaska Department of Commerce and Economic Development;

(4) "Hatchery" means a facility for the artificial incubation of stock, including rearing of juvenile aquatic plant or animals;

(5) "Stock" includes any form of live aquatic plants and animals that are acquired, collected, possessed or intended for use by a hatchery or aquatic farm permitted under AS 16.12.010 for the purpose of further growth or propagation.

* Section 3. AS 03.05.020(a) is amended by adding a new paragraph to read:

(6) monitor aquatic farms and hatcheries permitted under AS 08.94.010 for the possible presence of paralytic shellfish poisoning.

* Section 4. AS 03.05.026(d) is amended to read:

(d) The commissioner of environmental conservation, after consultation with the Alaska Seafood Marketing Institute and representatives of the aquatic farming industry, shall develop product specifications and standards for the use of the "premium

quality" seal on Alaska seafood products. The commissioner shall authorize a seafood processor to display a "premium quality" seal on products that quality for the seal if the processor meets the requirements of regulations adopted under this section and AS 03.05.025, and has been issued a permit to operate under AS 03.05.025. The commissioner shall authorize an aquatic farm permitted under AS 08.94.010 to display a "premium quality" seal on aquatic farm products if the aquatic farm meets the requirements of regulations developed under this section in consultation with the aquatic farming industry and the requirements of AS 08.94.

* Section 5. AS 16.05.251 is amended by adding a new subsection to read:

(f) The authority of the Board of Fisheries under this section is subject to the limitations of AS 08.94.020.

* Section 6. AS 16.05.330(a) is amended to read:

(a) Except as otherwise permitted in this chapter, a person may not engage in sport fishing, including the taking of razor clams; in hunting, trapping, or fur dealing; in the farming of [FISH,] fur[,] or game; or in taxidermy, without having the appropriate license or tag in actual possession.

* Section 7. AS 16.05.340(a)(14) is amended to read:

(14) [FISH OR] game farming biennial licenses 100

* Section ⁸~~7~~. AS 16.05 is amended by adding new sections to read:

Sec. 16.05.821. AQUATIC FARM STOCK ACQUISITION PERMITS.

(a) No person may acquire aquatic plants or animals from wild stock in the state for the purpose of supplying stock to an

aquatic farm or hatchery permitted under AS 08.94.010 without a permit from the commissioner. An application fee of \$100 must accompany the permit application.

(b) A permit issued under this section authorizes the permittee, subject to the conditions of AS 08.94, to harvest those species and quantities of wild stock in the state specified in the permit for the purpose of supplying stock to an aquatic farm or hatchery permitted under AS 08.94.010.

(c) The commissioner, in consultation with the commissioner of commerce and economic development, may attach conditions to a permit issued under this section, including conditions relating to the time, place, and manner of harvest. Size, gear, place, time, licensing and other limitations applicable to sport, commercial or subsistence harvest of aquatic plants and animals do not apply to a permitted harvest under this section.

(d) The commissioner shall forward a copy of any permit application under this section to the commissioner of commerce and economic development. The commissioner's decision must be made within 30 days of receipt of the application.

(e) The commissioner may deny or restrict a permit under this section upon finding that the proposed harvest will substantially impair sustained yield of the species. The commissioner's decision must contain the factual basis for that finding and must also explain why the substantial impairment could not have been reasonably foreseen and avoided through available management options. If the commissioner is unable to find substantial impairment, the permit application must be granted if any of the following circumstances exist:

(1) wild stock is needed for initial farms or hatchery stock;

(2) there are technological limitations on the propagation of cultured stock for the species sought;

(3) wild stock is needed to maintain the gene pool of a hatchery or farm; or

(4) commercial harvest of the species sought is neither limited under AS 16.43 nor fully developed.

(f) When aquatic plants or animals are acquired under a permit issued under this section, they become the property of the permittee and are no longer a public or common resource.

(g) The commissioner shall make stock available for aquatic farming purposes.

Sec. 16.05.822. IMPORTATION OF AQUATIC PLANTS OR ANIMALS FOR STOCK. No person may import an aquatic plant or animal into the state for the purpose of supplying stock to an aquatic farm or hatchery unless authorized by a permit or regulation of the Board of Fisheries.

Section 16.05.823. PENALTIES FOR VIOLATION. A person who violates a provision of AS 16.05.821 - 16.05.822, a regulation adopted under AS 16.05.821 - 16.05.822, or a term or condition of a permit issued under AS 16.05.821, is guilty of a Class B misdemeanor.

* Section 9. AS 16.05.920(a) is amended to read:

(a) Unless permitted by this chapter or AS 08.94, or by regulation adopted under this chapter or AS 08.94, a person may not take, possess, transport, sell, offer to sell, purchase, or offer to purchase fish, game or marine aquatic plants, or any part of fish, game or aquatic plants, or a nest or egg of fish or game.

* Section 10. AS 16.05.930 is amended by adding a new subsection to read:

(g) AS 16.05.330 - 16.05.720 do not apply to any activity authorized by a permit issued under AS 08.94.010 or AS 16.05.821, or to any person or vessel employed in pursuit of an activity permitted under AS 08.94.010 or AS 16.05.821.

* Section 11. AS 16.10 is amended by adding a new section to read:

Sec. 16.10.269. LIMITATIONS. AS 16.10.265 - 16.10.267 do not apply to the purchase or sale of aquatic farm products from a permittee under AS 08.94.010 or stock from a permittee under AS 16.05.821.

* Section 12. AS 16.10.380(b) is amended to read:

(b) In this section "user group" includes, but is not limited to, sport fishermen, processors, commercial fishermen, aquatic farmers, subsistence fishermen, and representatives of local communities.

* Section 13. AS 16.10.400 is amended by adding a new subsection to read:

(h) AS 16.10.400 - 16.10.475 do not apply to the construction or operation of a private hatchery permitted under AS 08.94.010.

* Section 14. AS 16.10.420(3) is amended to read:

(3) no salmon eggs or resulting fry, sold to a permit holder by the state or by another party approved by the department, may be resold or otherwise transferred to another person, unless that person holds a permit under AS 08.94.010;

* Section 15. AS 16.10.420(7) is amended to read:

(7) surplus eggs from salmon returning to the hatchery be made available for sale first to the department and then, after inspection and approval by the department, to operators of other hatcheries authorized by permit to operate under AS 16.10.400 - 16.10.470, or AS 08.94.010;

* Section 16. AS 16.10.450 is amended to read:

Sec. 16.10.450. SALE OF SALMON AND SALMON EGGS BY HATCHERY. A hatchery operator who sells salmon returning from the natural waters of the state, or sells salmon eggs to another hatchery operating under AS 16.10.400 - 16.10.470 or AS 08.94.010, after utilizing the funds for reasonable operating costs, including debt retirement, expanding its facilities, salmon rehabilitation projects, fisheries research, or for costs of operating the qualified regional association for the area in which the hatchery is located, shall expend the remaining funds on other fisheries activities of the qualified regional association. Fish returning to hatcheries and sold for human consumption shall be of comparable quality to fish harvested by commercial fisheries in the area, and shall be sold at prices commensurate with the current market.

* Section 17. AS 16.43.140 is amended by adding a new subsection to read:

(d) This chapter does not apply to activities authorized by permit under AS 08.94.010 or AS 16.05.821.

* Section 18. AS 16.51.180(5) is amended to read:

(5) "seafood" means finfish, shellfish, and by-products, including but not limited to salmon, halibut, herring, flounder, crab, clam, cod, shrimp, and pollock. The terms does not

include aquatic farm products as that term is defined in
AS 08.94.100(2);

* Sec. 19. AS 16.05.940(12) is repealed.

* Sec. 20. This Act takes effect immediately in accordance
with AS 01.10.070(c).

THE FOLLOWING DOCUMENT HAS
NOT BEEN FILMED BUT IS
AVAILABLE IN THE ORIGINAL
FILE

**STANDING SENATE COMMITTEE ON
FISHERIES**

THE MARKETING OF FISH IN CANADA

FACT-FINDING MISSION TO ALASKA (U.S.A.)



PROGRAM

JUNEAU (ALASKA, U.S.A.)

7 TO 11 FEBRUARY 1987

SCOMM

75:10

Salmon Farming in Alaska
Economic Feasibility and Socioeconomic Impacts

Robert R. Logan .

John Weddleton

University of Alaska - Fairbanks

April, 1987 .

Introduction

1) Overview

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

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

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

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

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

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

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

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

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

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

2) Putting Things Into Perspective

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

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

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

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

Relative Size of Salmon Farming

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

Table 1

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

Conclusion

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

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

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

If this state does allow salmon farming, it appears that even a very modest development will result in thousands of jobs (part time plus full time), and over one hundred

million in sales dollars when both direct and indirect effects are considered. The 20,000 metric ton scenario resulted in well over \$300 million in final sales, around \$90 million in final payroll, and over 4,000 in final employment.

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

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

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

Note that these figures are the result of some very pessimistic assumptions - that demand for salmon fails to

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

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

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

Alaska Mariculture Association

TO: All Legislators

FROM: Rodger Painter
Executive Director

DATE: March 17, 1989

RE: Finfish Farming Impacts on Wild Salmon

As hearings open on legislation to authorize finfish farming when the moratorium expires in 1990 (Senate Bill 195), it might be useful to review some recent information examining the impacts of the pen-rearing of salmon on wild stocks and the environment.

Attached you will find a news release describing the findings of a comprehensive draft environmental impact statement on the effects of pen rearing on wild stocks and the environment. The Washington State study was more than a year in the making and represents the most thorough examination of its kind.

Significantly, this study supports the earlier conclusions of the Alaska Departments of Fish and Game and Environmental Conservation that the problems associated with salmon farming are manageable with proper controls, siting guidelines and funding.

Sen. Bettye Fahrenkamp's office has made some copies of the EIS and accompanying technical appendices for distribution to interested legislators.

I also have attached an article I prepared recently addressing disease and genetics concerns. I would be pleased to furnish copies of the Norwegian studies referenced in the articles at your request. I have additional information and am available to discuss these issues with you or your staffs.

The current debate over disease and genetics is very reminiscent of the opposition raised to our currently hatchery program when it was first proposed. Many of the same kind of concerns now raised about salmon farming were voiced then by fishermen opposed to hatchery release programs.

The very conservative management and resulting success of these programs have convinced most fishermen that aquaculture is an extremely valuable biological tool offering great economic benefits. The Alaska Mariculture Association agrees and merely wants to take our existing program to its logical next step, slowly and carefully.

Thank you for your attention to this important issue.

Alaska Mariculture Association

F O R I M M E D I A T E R E L E A S E

Major Study Shows Minimal Impact from Fish Farming

A draft environmental impact statement prepared by the State of Washington provides Alaska with the information necessary to solve the long-standing issue of salmon farming, according to the Alaska Mariculture Association (AMA).

The document has been in the works for well over a year and represents the most comprehensive work ever performed regarding the impacts of salmon farming. Rodger Painter, executive director of AMA, said the EIS clearly provides net-pen rearing of salmon with a clean bill of health.

Washington has been undergoing a debate over the net-pen rearing of salmon similar to the one occurring in Alaska over the past several years. The draft EIS published in late January was ordered by the Washington legislature to evaluate the environmental impacts of net pens on the biological and human environments.

According to the document summary, these are the major conclusions of the draft EIS:

1. The major impacts of net-pen culture can be prevented by proper farm siting to assure dispersion of wastes, flushing of the site, and protection of sensitive areas.
2. The impacts of net pens are reversible, and after pen removal any affected areas will revert to their undisturbed state.
3. The accidental introduction of an exotic disease into state waters remains a risk. While existing import rules minimize this risk, it cannot be eliminated if animals are to be introduced from other areas.
4. Four levels of development were analyzed. Proper siting of 100 farms would not have a significant impact on the aquatic environment; however, small bays may be adversely affected by over-development.

"The EIS suggests that the net-pen rearing of salmon would pose no significant threat to Alaska's natural salmon runs or to the

- more -

environment," Painter said. "It is our hope that legislators, state agencies and critics of salmon farming closely study this document to determine what additional questions must be answered before Alaska can proceed forward with the most significant economic development opportunity available for the asking.

"There have been several questions being raised consistently during the debate over salmon farming in Alaska regarding impacts on wild stocks and the environment," Painter said. "These include the risk of spreading disease from farmed fish to wild stocks, genetic dilution of wild stocks from escaped pen-reared salmon, degradation of the environment, and impacts from the use of antibiotics.

"These issues are discussed in detail in the draft EIS, and salmon farming passes all four tests with flying colors." Painter provided these excerpts from the EIS as examples:

Disease--"Review of the technical literature indicates the risk of transmission of disease from net pens to wild fish is possible but is not likely a significant problem. Fish disease control regulations...are in place in Washington to prevent the importation of exotic infectious diseases. It is such diseases which could pose a significant risk to native fish."

Painter said it is significant to note that Washington allows the importation of Atlantic salmon and other non-indigenous stocks for use in salmon farms, while AMA supports the state's current ban on Atlantic salmon and prohibitions against the use of non-Alaska salmon stocks.

Escaped Salmon--"Assessing the potential impact of farmed Pacific salmon or steelhead on wild populations is difficult given the speculative nature of the issue. Local experts agree that significant genetic impacts of wild populations due to widespread net-pen farming in Puget Sound is unlikely. The most likely scenario for an impact would be where large numbers of genetically different escapees ascended a stream with a relatively small wild population. The impacts to the wild population, if any, would be reduced fitness of the interbred progeny. Without constant infusion by escaped fish, these maladaptive genes would disappear gradually due to selective pressure, making any impacts temporary. Compared with the large numbers of hatchery releases, the genetic impact of escaped farmed fish on wild stocks would be negligible."

Water Quality/Antibiotics--"Net-pen aquaculture can potentially have a wide range of impacts on water quality. Some water quality determinants such as temperature, pH, fecal coliforms and toxicity are virtually unaffected by net pens. Other determinants are affected only during some periodic activities in the operation of net pens. This is the case of turbidity which may be impaired during net cleaning.

"The primary water quality indicators of concern are dissolved

oxygen, nutrients, and antibiotics. Nutrients are a concern in certain nutrient sensitive embayments where they potentially cause large increases in phytoplankton populations and possibly causing nuisance algal species. Dissolved oxygen and nutrient impacts are usually very localized in the immediate vicinity of a net pen and decrease rapidly with distance away from the pens due to diffusion and biological activity. Antibiotics have not been shown to cause the development of antibiotic resistant bacteria except in highly controlled laboratory experiments. The development of antibiotic resistant bacteria in Puget Sound is virtually impossible at the low temperature and low concentrations of antibiotics around net pens in the Sound."

"Mitigation measures are capable of reducing or eliminating all adverse water quality impacts from net pens."

The study provides the information necessary for Alaska to make informed decisions regarding salmon farming, Painter said. "This EIS confirms the position taken by our state agencies in the past that the impacts of salmon farming are manageable. It is our hope that we can now proceed forward with an informed debate about what Alaska's policies should be regarding a significant opportunity for economic diversification.

"AMA has been advocating a careful approach to development of salmon farming in Alaska. This study says it is very possible to proceed forward with a minimal adverse impact. It is time for state policymakers to stop ducking the issue, and go about setting a careful, intelligent state policy on fish farming."

Alaska imposed a one-year moratorium on commercial finfish farming in 1987. That moratorium was extended for two years in 1988, and is scheduled to lapse on July 1, 1990. A task force to study the issue was not funded, and virtually no progress has been made to resolve the issue over the past several years.

A small commercial freshwater salmon farm was established in Fairbanks under a narrow exception to the moratorium. A joint federal-state salmon farming research project in Southeast has demonstrated the biological viability of net pen rearing of salmon in Alaska.

Two independent studies for the state released in 1988 showed that Alaska salmon farms could be competitive in world markets and would have a minor impact on world salmon markets.

A major private study in 1985 concluded that a modest salmon farming industry in Alaska could produce 2,640 direct and indirect jobs and a payroll of \$67.8 million on total sales of \$132 million. A subsequent legislative study calculated a more modest impact of 1,920 new jobs (direct and indirect) and a payroll of \$48.8 million.

Alaska Mariculture Association

F O R I M M E D I A T E R E L E A S E

Finfish Farming Does Not Threaten Wild Salmon

by Rodger Painter, Executive Director
Alaska Mariculture Association

In the heated debate over finfish farming, it often is difficult to have a calm, factual discussion of complex technical issues like disease and genetics. In the midst of charges and countercharges, attention tends to get focused on the most sensational aspects of the debate, and analytical reports of scientists and researchers don't make for very interesting copy.

In light of continued efforts of critics to describe salmon farming as something akin to introducing AIDS into our marine environment, it is important to review what more dispassionate voices, such as the scientific community, have to say.

The reaction of salmon farming critics to the recent discovery of a dangerous, exotic fish disease in Washington State was swift and predictable--it must have been caused by fish farming. However, that allegation is disputed by federal and state officials investigating the outbreak of VHS (viral hemorrhagic septicemia). Officials have stressed there is no evidence linking farmed salmon with the disease outbreak.

The disease was isolated in adult Pacific salmon returning to two Washington hatcheries located some 75 miles apart. Alaska's chief fisheries pathologist told the legislature recently that scientists are baffled by the appearance of VHS in North America, and that there are three suspected sources: (1) ballast water discharged from foreign ships; (2) infection from marine fish (cod, halibut, etc.); and (3) imported fish stocks. A Washington disease expert also said VHS may have been present in the environment for years without detection.

Lost in the media coverage and absent in statements by those attempting to link VHS to Washington Atlantic salmon farms were the following facts: (1) Atlantic salmon eggs imported into Washington were certified as VHS-free after intense scrutiny; (2) the European hatcheries supplying the eggs to Washington have never been infected with VHS; (3) fisheries scientists say VHS is not transmitted through eggs; and (4) VHS has never been detected in Atlantic salmon stocks in the wild, hatcheries or farms.

One of the most sensational recent allegations leveled against salmon farming is that the industry has destroyed 30 wild salmon

-- more --

rivers in Norway. The claim, made recently by the United Fishermen of Alaska's Mariculture Committee, conflicts with the research state and university officials have gathered on the Norwegian experience. UFA charged that a "fish farm disease" that "has destroyed 30 wild salmon rivers in Norway is Gryodctylus salarius, a parasite that entered Norway via infected smolts from Sweden."

While two studies by the Norwegian Directorate for Nature Management obtained by the University of Alaska Marine Advisory Program trace the introduction of this parasite to Atlantic salmon stocks imported from Sweden, researchers say the disease was spread by "river stocking programs." The studies say other rivers were infected by fish traveling from one stream to another through brackish waters. The situation is exacerbated by the fact that Norwegian hatcheries freely exchange eggs, fry and smolts.

The shortcomings of Norwegian control of river stocking and farm hatchery systems are underscored by the documentation of unauthorized river stocking by infected private hatcheries and sales of diseased fish for illegal releases. The parasite "is easily spread to new areas in this manner," according to one study.

The G. Salarius parasite is deadly and spreads easily. The studies say it has been found in "28 different watercourses and about 11 hatcheries in Norway." Wiping out all fish--and consequently the parasite--in some river systems with a natural compound known as Rotenone has been shown to be effective, but the studies indicate the parasite is far from under control.

The danger of this introduced parasite should not be underplayed. A third study by the Directorate for Nature Management blamed current concern over the health of Atlantic salmon runs in Norway on a combination of acid rain and spread of G. salarius. These factors, combined with rising concern over the infusion of renegade farm salmon escaping into river systems, has led to the establishment of a salmon sperm bank, the study said.

These more recent threats add to the long-standing depletion of wild salmon in Norway that can be linked to familiar problems--over-fishing, pollution and the damming of major spawning systems to produce hydroelectric power.

Information obtained by Dr. William Smoker, a geneticist with the University of Alaska Southeast, sheds some light on what Norwegian scientists have found about the effects of renegade farmed salmon. In 1988 correspondence with Smoker, Dr. Trygve Gjerdem, a leading geneticist with the Agricultural University of Norway and president of the International Association for Genetics in Aquaculture, summarized the conclusions of initial research:

So far no positive or negative effect has been found to be caused by renegade fish in wild populations.

[No research] has shown that renegade fish spawn in rivers.

No information is available whether or not renegade fish and their progeny can compete with wild fish in a river system.

Nothing in any of the scientific information collected to date suggests that fish farm-related diseases or escaped salmon have destroyed 30 Norwegian salmon streams. Norway's salmon runs have been seriously threatened for decades by a variety of factors unrelated to salmon farming.

More information on the potential effects of salmon farming can be found in a draft environmental impact statement recently released by the State of Washington. After more than a year of intensive study, the EIS came to some interesting conclusions on disease and genetics:

"Review of the technical literature indicates the risk of transmission of disease from net pens to wild fish is possible but is not likely a significant problem."

"Local experts agree that significant genetic impacts of wild populations due to widespread net-pen farming in Puget Sound is unlikely. The impacts to the wild population, if any, would be reduced fitness of the interbred progeny. Without constant infusion by escaped fish, these maladaptive genes would disappear gradually due to selective pressure, making any effects temporary. Compared with the large numbers of hatchery releases, the genetic impact of escaped farmed fish on wild stocks would be negligible."

This information does not mean that the concern expressed by commercial fishermen over the disease and genetic issues related to salmon farming are unfounded. These are issues which should be of primary concern to fishermen, and other dependent upon the seafood industry.

The Alaska Mariculture Association believes in a conservative approach to development of fish farming, and we have consistently supported bans on importation of non-indigenous species and strong statutory controls by the Alaska Department of Fish and Game over private farms and hatcheries.

We believe that salmon farming can be every bit as safe as Alaska's highly successful ocean ranching program if it is approached in this conservative fashion. Disease and genetics are important issues that must be thoroughly investigated and debated, and we welcome the opening of an improved dialogue.

-- end --

Rodger Painter is a sixth generation Alaskan who grew up on the fishing grounds and currently is executive director of the Alaska Mariculture Association.

MY TURN

By Sen. ARLISS STURGULEWSKI

The development of Alaska's natural resources traditionally sparks spirited discussions. This can be a healthy process where issues such as costs and benefits, protection of the environment and resource values, public health and safety, and other important public policy issues are thoroughly explored.

Sometimes these debates reach the point of impasse and the public policy issues tend to become obscured in the overheated rhetoric of proponents and opponents moving further apart. Hopefully, we have not yet reached that point in discussions over mariculture development.

The recent introduction of legislation by the Senate Resources Committee authorizing finfish farming in Alaska has reopened debate over an important policy left hanging far too long. Committee hearings on finfish farming are scheduled to begin soon, and it is hoped that some constructive dialogue will take place.

This is a complicated, controversial issue that has split the legislature, and resulted in the unusual imposition of a moratorium on a promising economic opportunity. The farming of salmon and other finfish is a major growth industry throughout the world, and Alaska's potential is great.

A recent report by the American

Embassy in Chile provided a dramatic picture of how a struggling rural economy has benefitted from the growth of salmon farming:

"Experts foresee that salmon aquaculture could grow to 25,000 tons by 1990, equating at current prices to more than \$100 million (U.S.) Two thousand workers and professionals are currently involved in aquaculture activities. Unemployment declines where salmon producing activity starts."

Salmon farming in Alaska may never grow this quickly or even reach the 1990 projection for Chile, but it's clear that even a modest, carefully developed industry could provide a significant boost to our struggling private sector. Beyond replicating what other countries have done with the farming of chinook and coho salmon, Alaska has the opportunity to stake out unique niches by farming sockeye salmon, arctic char, sheefish, black cod and other promising aquaculture candidates.

Alaska's important fisheries resources and healthy aquatic environment must be protected under whatever development scenario we finally elect. After closely studying this issue for the past three years and personally investigating fish farms in Canada and Puget Sound, I really believe that it is possible to develop a viable finfish farming in Alaska

without damaging our fisheries resources or environment.

This view is supported by a recent comprehensive environmental impact statement on salmon farming conducted by the state of Washington. Among the conclusions of this in-depth study were several of great importance to Alaska:

- "...The risk of transmission of disease is possible but not likely a significant problem."

- "Local experts agree that significant genetic impacts of wild populations due to widespread net-pen farming is unlikely."

- "The major impacts of net-pen culture can be prevented by proper farm siting to assure dispersion of wastes, flushing of the site, and protection of sensitive areas."

- "Proper siting of 100 farms would not have a significant impact on the aquatic environment; however, small bays may be adversely affected by over-development."

An attached cost-benefit analysis of salmon farming by the Washington Department of Fisheries concluded: "...Washington's economy would, in any event, benefit from further growth in fish farming, and that it may benefit substantially."

This EIS and a growing collection of additional data provides the legislature with the information necessary to set an informed public policy

regarding fish farming. In the coming weeks the Senate Resources Committee will be going over this information, listening to the public and other experts, and reviewing agency testimony regarding finfish farming.

The committee may indeed find it necessary to work throughout the interim on the issue to produce a carefully crafted piece of legislation. We must meet a self-imposed deadline of July 1, 1990, when a three-year moratorium on finfish farming expires.

Our challenge over the next few months will be to pull all Alaskans together in a constructive dialogue. We must focus on the ultimate goal of enhancing Alaska's competitive position in world seafood markets and not get sidetracked by short-term political considerations. This requires a rational, dispassionate analysis of the public policy issues.

Finfish farming represents one of the few opportunities for private sector-driven economic development available to Alaska for the asking. Let's not end up squabbling among ourselves while the rest of the world leaves us behind.

Sen. Arliss Sturgulewski, R-Anchorage, is chairman of the Senate Rules Committee and a member of the Senate Resources Committee and the Senate Special Committee on High Seas Salmon Interception.

STATE OF ALASKA

DEPARTMENT OF COMMERCE & ECONOMIC DEVELOPMENT

DIVISION OF BUSINESS DEVELOPMENT

STEVE COWPER, GOVERNOR

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

DATE: March 4, 1988

TO: Distribution

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

SUBJECT: Preliminary Findings of Socioeconomic Studies

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

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

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

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

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

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

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

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

1. Evaluate in general terms the extent to which potential Alaskan farmed salmon would compete with Alaskan wild production in likely markets for Alaskan farmed salmon -- Japan and the west coast of the U.S.
2. Gauge the relative impact of Alaska's increment of potential production on wholesale salmon prices. As the funds are not adequate to build a worldwide supply and demand model, it is not possible to predict with certainty the overall effect of world production on markets for Alaskan wild salmon.
3. In the near term, predict what will be the actual market prices for farmed salmon potentially produced in Alaska. A point estimate for 1995 will be produced and, if possible, high and low bounds will also be determined.

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

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

SUMMARY OF SIGNIFICANT FINDINGS TO DATE

WILD PRODUCTION OF KINGS AND COHOS

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

Source: Compilation of NMFS and ADF&G data.

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

WORLD SUPPLY AND DEMAND FOR ALL FROZEN AND FRESH SALMON

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

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

Total world production of salmon by species in 1983.

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

Note: Figures are from UN Food and Agriculture Organization.

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

PROJECTED WORLD PRODUCTION OF FARMED SALMON BY 1990

Atlantic	150,000 mt
Pacific	35,000 mt
Projected Increase in Supply to U.S.	49,400 mt

Projected Increase in U.S. Demand 47,000 mt
at current prices

Conclusion - "This result suggests that the forecasted supply of salmon to the U.S. market until 1990 could be absorbed by the market at current prices, provided no supply and distribution constraints exist In reality, average real prices for farmed salmon likely will continue to decline until 1990 but not greater than 25-30% below current prices Production efficiencies in regions like Norway and Chile are improving, and increasing competition is forcing producers to reduce the fairly healthy profit margins they have enjoyed to date."

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

FARMED SALMON PRICES IN U.S. (AVERAGE)

Atlantics 4-6 lb.	1986 \$3.85	1987 4.60	Jan 5.50	Feb _____
Pacific Salmon 4-6 lb.				
Coho, Chile		\$3.83	4.20	3.65*
Canada		\$3.59		
King		\$4.04		

Source: Seafare Group, Preliminary findings

* Seattle price during large scale promotion at \$4.99/lb. retail. Fish did not sell well and price dropped from \$4.20 to \$3.65 as distributors dumped their inventories.

OBSERVATIONS CONCERNING 1987 PRICE MOVEMENTS

A disease (hitra) outbreak in Norway in late 1986 led to a surplus of farmed salmon early in 1987 as vulnerable fish were harvested early, and to a shortage later. This shortage was compounded by a poor harvest of wild cohos, resulting in unusually high prices for farmed and wild salmon in 1987 (and high prices for Alaskan fishermen). The prices of both Norwegian and Alaskan salmon can be expected to come down again as production picks up.

Source: Barry Lester, SPC Sales Manager

NOTES ON THE EUROPEAN MARKETS

It should be noted that the European market for Alaskan salmon seems to be holding up in terms of volume due to the decades old relationship between Alaskan suppliers and their markets, primarily smokers, and the price and product attributes of wild Pacific salmon - lower price, firmer flesh, redder color, larger sizes. Market share is declining, however, as the market expands, and the overall supply of

both wild and farmed fish determines the price. The long-term trend is probably for continued sales volume, but lower price and eroding market share.

The European market is very important for troll and high quality net kings and cohos. The Norwegians and Scots are also starting to smoke fish for export to these markets in direct competition with the buyers of Alaskan salmon. Major efforts are underway by ASMI to promote Alaskan salmon there using Federal monies.

Source: Combination of Market Access and Penetration Strategy by DPA Group, Inc., and data in ASMI TEA application concerning sales volumes, corroborated in discussions with several major brokers.

FRESH MARKETS FOR WILD PACIFIC SALMON

Currently, much of the Washington, Oregon, and California king and coho production is marketed fresh in the restaurant, fish shop and retail trades. The large majority of fresh kings and cohos marketed in the U.S. come from these sources. Only 10% or less of Alaskan king and coho production is sold fresh due to higher margins available in the frozen markets and the difficulties of getting fresh product out of Alaska in volume.

Source: Seafare Group, personal communication, corroborated by various Alaska producers.

COSTS OF PRODUCTION FOR FARMED SALMON

Estimated total costs of production		FOB Farm	FOB U.S. LA	Port NY
B.C. 1987	\$5 Cdn/kg =	\$1.70 U.S./lb.	\$1.95	\$2.75
Norway 1984	\$31 Kr/kg =	\$1.56 U.S./lb.		
at current exch rate		\$2.22 U.S./lb.	3.37	3.02
Washington 1987		\$2.05 U.S./lb.	2.10	2.75
Scotland 1985	3.20UKL/kg =	\$1.94 U.S./lb.		
at 1987 exch rate		\$2.66 U.S./lb.	?	?

Sources: B.C. - DPA Group, Inc. Overview of the B.C. Salmon Farming Industry
 Norway - Norwegian Directorate of Fisheries, Study of Profitability of Fish Farms
 Washington - Seafood Leader, Winter 1987 "Farming Washington's Inland Sea"
 Scotland - Highlands and Islands Development Board From "Atlantic Salmon Farming Industry: Past Performance and Future Potential" by Irish Sea Fisheries Board Oct. 1985

NOTES ON LIKELY EFFECT OF INCREASED PRODUCTION AND PRICE DECLINES ON
MARKETING STRATEGY OF FARMING INDUSTRY

"There appear to be few feasible market opportunities for B.C. farmed salmon other than in fresh form. At current costs of production, expected prices for farmed product as a frozen, canned, smoked, or further processed product would not yield sufficient net returns to be a viable option over the long run

Much of the value inherent in farmed fish is lost if it is sold in any product form other than fresh. As a frozen or canned product, it is unlikely to receive prices better than those prevailing for wild product

Less than top quality farmed product can be sold as fresh, frozen, or higher value-added processed form (e.g., smoked, pate product) A scarred fish exterior or extensive scale loss may be acceptable if the fish is going to be steaked or filleted."

Source: Market Access and Penetration Strategy, DPA Group, Inc.,
pg. 6-7.

PRODUCERS CAN BE EXPECTED TO DEVELOP VALUE ADDED LINES

Some Norwegian and Scottish salmon farming companies are building smokers in European countries and marketing their fish as finished product -- Barry Lester, Troll Producers Association

"Norwegian producers are finally offering their farmed salmon in forms other than the traditional whole, dressed, head-on. U.S. buyers have been clamoring for more frozen salmon and more convenient forms for years. This summer Frionor complied, bringing out a new line of frozen sides and loins The move to portions will allow Norwegian producers to increase exports without straining an already overburdened airline system that hauls thousands of tons of fresh salmon to the U.S. each year

Meanwhile, Alaskan salmon producers (who introduced frozen steaks and loins several years ago) are readjusting market strategies in the face of an unexpectedly low harvest." Seafood Business, November/December 1987, pg. 66.

Norwegian and Chilean salmon farmers can be expected to produce fillets and steaks from lower quality or small fish in particular as competition heats up and freight costs become more important in determining profitability. Both producers are far from the North American market and shipping heads and backbones that far is expensive. Overall, the price of head-on fresh Norwegian fish may drop about a dollar by the early 1990's. The price difference between Norwegian and B.C. fish will not hold up. Arnie Einmo, Dory Seafoods personal communication.

ALASKA'S COMPETITIVE POSITION

Water temperatures affect fish growth rates quite markedly. The optimum temperature range for salmon growout is 10-15° C. Water temperatures in areas of Alaska with large amounts of glacial runoff have colder summer water temperatures compared to areas with a more oceanic character, such as the outer coast of Southeast Alaska, outer Prince William Sound, Kodiak, and the Alaska Peninsula. Areas such as inner Prince William Sound, northern and eastern Southeast Alaska, and to some extent central Southeast Alaska, are at the lower end of the range.

Winter temperatures of colder than 4° C are considered poor for growing conditions, while 5-7° is medium, and greater than 7° is best. Areas close to the mainland such as inner Prince William Sound, upper Cook Inlet, and eastern and northern Southeast Alaska have winter water temperatures in the 2-4° range. More oceanic areas have temperatures in the 4-5° range. While techniques such as upwelling can be used to raise the temperature, this would also increase the costs.

Areas that have significant ice accumulation in the winter are not likely to be either warm enough or suitable from an engineering standpoint.

There are many other factors that affect the suitability of a site. While temperature is the most important factor in determining growth rates, other factors affecting mortality, such as algal blooms, are less common in colder waters. Evaluating the suitability of a site requires looking at quite a few factors. These have been surveyed in B.C. and that information is available. However, how the various factors affect economic viability has not been fully analyzed.

Source: Biophysical Criteria for Siting Salmon Farms in British Columbia, B.C. Ministry of Agriculture and Fisheries.

EXCHANGE RATES

Perhaps the most important factor affecting prices for both farmed and wild salmon is the strength of the dollar. With the dollar weak, export prices for salmon from the U.S. are more favorable, but the profit margin for imported salmon is less favorable. Salmon produced and consumed in the U.S. is not directly affected except to the extent that U.S. consumers must compete with foreign consumers.

The recent decline in the dollar has cut into the profit margins of foreign farmers, and they have raised their prices as much as possible. In addition, there is currently a shortage of salmon available which has also pushed the price up. Prices to fishermen and farmer alike are quite good. A turnaround in the dollar would put U.S. farmers and fishermen at a disadvantage, and make domestic markets relatively more desirable than in the weak dollar situation.

Another complicating factor is the movement of various foreign currencies relative to the dollar. For instance, the yen has appreciated considerably more than the kroner. A table follows that lays out the recent changes in exchange rates.

BACKGROUND ON CONTRACTORS

Three contractors were selected, DPA Group, Inc. to do the cost of production model, and Seafare Group working with Dr. James Anderson of the University of Rhode Island to do the market study.

DPA Group, Inc. is a medium sized Canadian consulting firm with extensive experience in farmed salmon economics in B.C. They have done market studies, industry financing studies, feed studies, and world supply estimates for the B.C. government and industry. They have much more extensive data on the actual costs in B.C. than anyone else we could find, and B.C. is obviously more similar to Alaska in terms of environment and species than other farming regions.

Seafare Group is a Seattle consulting company that edits Seafood Leader magazine and organizes seafood expositions. They will be working with Dr. James Anderson, a recognized authority on salmon markets who has also worked with DPA Group, Inc. Dr. Anderson's work is the most definitive available on market sizes and competitive interactions between competing products. He will be building on work already done and trying to answer some of the competition and market size and price questions.

There is also a considerable body of work that has been done by the B.C. and federal governments in Canada. This includes long-term modeling work that projects the impacts of increases in wild, ranched, and farmed salmon production on prices. Through cooperating with the Canadians on studies of this type the state will gain access to some of this information, which will be of use in planning for hatcheries and salmon marketing.

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Attachment
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DISTRIBUTION:

Senate Resources Committee
House Resources Committee
Governor Cowper
Fisheries Cabinet members
United Fishermen of Alaska
Alaska Mariculture Association
Barry Lester, Alaska Troll Producers Association
Arnie Einmo, Dory Seafoods
Peter Redmayne, Seafood Leader Magazine
David Egan, DPA Group, Inc.
Dr. James Anderson, University of Rhode Island

This is a brief summary of the final report on the Costs of Production Model for Pen Rearing and World Markets for Salmon: Pen Reared Salmon Impacts.

(*Things not taken into consideration in this study are general taxes and land costs. Quote, "the economics of salmon farming in most supply regions is not well understood.")

Comparisons:

Norway

Projected to continue as world's largest producer of farmed salmon to end of century. Production of Atlantic salmon in the year 2000 is forecasted at 200,000 metric tonnes.

In 1985, there were 559 grow-out farms and by 1987 were 611 smolt producers.

There is a large number of small farms because both pen volume and ownership of multiple site farms are restricted. (Norwegian govt. is considering a 50% increase in maximum size of each farm.)

Scotland

Projected to remain second at 50,000 metric tonnes of farmed salmon in the year 2000. Plans to continue to produce Atlantic salmon.

In 1987, 126 companies operated 196 cage sites and 11 tank sites. Also 72 smolt production companies with 80 tank and 51 cage sites. Not restrictions on size or ownership exist.

In contrast to Norway, more concentration of production and more vertical integration. In 1987, 45% of production was from the largest 20 farms.

British Columbia

Projected to be third largest producer with 33,000 metric tonnes in the year 2000, 75% of which is projected to be comprised of Chinook salmon.

In 1987, 85 farms operated 115 sites. Eight smolt producers produced about 90% of production in 1987. No restrictions on size or ownership exist.

A levy was previously charged on wild salmon eggs distributed to producers. In 1988, the levy is being shifted to smolt sales, since increasingly the industry is becoming self sufficient in egg supplies.

Chile

Projected to be fourth largest at 23,000 metric tonnes. 60% is expected to be coho salmon with the balance being mostly Atlantic salmon, with only limited production of chinook salmon.

In 1986, 22 farms producing salmon and/or trout were in operation. No restrictions on size or ownership exist.

Industry is characterized by sizeable companies rather than small family operations.

Japan

Projected to be fifth with 15,000 tonnes, comprised almost entirely of coho salmon.

Production is largely at small scales and organized through cooperatives. In 1986, a total of 19 organizations operated 264 sites.

Alaska:

- Considered to be competitive from a cost stand point in all markets.
- Would be selling farmed salmon in smaller sizes than Norway, Scotland and B.C. and would compete more directly with Chile.
- Would likely be supplied by fish feed manufacturers in Wa. State or B.C. since Ak.'s reduction industry is not well developed.
- E.C. and Chile have cost advantages over Ak. in both Los Angeles and New York.
- Ak. would likely have a short window period in which to sell which would result in more direct competition with Chileans.
- U.S. and Canadian currencies are closely linked and generally shift from each other only slowly. As a result, B.C. would likely have cost advantages over Ak. in all major markets.

Study findings:

Many areas in Southcentral and Southeast are not suitable for fish farming due to large river systems, (i.e. the Stikine, Taku, Unuk, Chilkat, and Speel), ice, and icebergs.

Areas which would be favoured for development in terms of their proximity to population centers, airports and processing plants are:

- along the eastern half of S.E. Ak. near Taneau, Ketchikan and Petersburg/Wrangell;
 - along the western side of Baranof Isl. near Sitka;
 - in southcentral Ak. near Kodiak, Homer, Seward, Cordova, Valdez and Whittier. - The area around Ketchikan is probably the best area for development because of warmer summer and winter temps.
- *However, the Ketchikan area would have lower growth rates and higher conversion rates than in most areas of B.C. where salmon farming occurs because of seasonally lower water temps.

Smolt Production Capabilities

Four state hatcheries in S.E. produce chinook and three hatcheries produce coho salmon. (Chinook would likely be preferable for net pen rearing in Ak. since they have shown greater survival rates than coho during the longer growout periods in B.C.) In addition, 10 private non-profit hatcheries operated by aquaculture assoc. and other non-profit groups raise chinook or coho or are permitted to raise these species.

In '86, nearly 5 million chinook eggs were collected from these facilities and more than 2.7 million juvenile chinook were released. More than 4 million coho eggs were collected and 1.5 juvenile coho were released.

Five state hatcheries in southcentral produce chinook and five produce coho salmon.

In '86 1.5 million chinook eggs were collected and 1.5 million juvenile chinook were released. More than 6.5 million coho eggs were collected and 7 million coho juveniles were released.

Clearly, a large smolt production capability exists in both southcentral and S.E.

MEMORANDUM

State of Alaska

TO: Distribution

DATE: March 16, 1988

Sen Eliason

FILE NO:

TELEPHONE NO:

THRU:

SUBJECT: Cost of Production Model
for Pen Rearing and World
Markets for Salmon: Pen
Reared Salmon Impacts

FROM: Paul Peyton, Program Manager *Paul*
Division of Business Development
Department of Commerce & Economic
Development

Attached is the final report on Costs of Production. The World Market report is still being worked on due to difficulties in identifying existing domestic markets for Alaska's salmon. This information is not compiled anywhere and must be derived indirectly. The task has proved more difficult than anticipated and the completion date has been moved to March 23.

Please call if you have any questions or suggestions concerning these findings. I have asked the contractors to be available for hearings next week and they will be available the 22nd and later.

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COST OF PRODUCTION MODEL
FOR PEN-REARING OF SALMON IN ALASKA
AND CURRENTLY PRODUCING REGIONS

FINAL REPORT

Prepared for:
State of Alaska Department
Department of Commerce
and Economic Development
Juneau, Alaska

Prepared by:
The DPA Group Inc.
In association with
Hatfield Consultants Ltd.
and Dr. Trond Bjorndal
Vancouver, B.C.

March, 1988

EXECUTIVE SUMMARY

A. PURPOSE OF STUDY

The purpose of this study is to determine costs of production for net-pen rearing of salmon in Alaska. The State Department of Commerce and Economic Development commissioned the study in December, 1987 in conjunction with a second study to assess the impacts of projected farmed salmon supplies on markets for Alaska's wild salmon. Together, these studies can be used to determine the potential economic viability of production in Alaska.

The study first analyzes costs of production in the regions projected to be the largest suppliers. It then develops costs of production for Alaska from an analysis of biological, environmental and logistic conditions in the state.

B. SCOPE OF STUDY

Costs of production (COP) for Norway and Scotland were developed largely from recent studies. Costs of production for Chile were developed from recent studies and from COP models developed by Hatfield Consultants Ltd. for the Chilean industry. Costs of production for British Columbia were developed from a unit cost model recently developed by the DPA Group Inc. for the industry.

Costs of production for Japan were not developed because no cost of production data is available in the public domain or from the firsthand experience of study team members. However, sufficient data was obtained from previous studies and a recent visit by a study team member to draw some important conclusions about its cost structures and its development potential. These are presented in a narrative form.

In order to assess conditions for pen rearing salmon in Alaska we conducted reviews of previous environmental studies in Alaska. We also held telephone interviews with several fisheries officials in the state of Alaska Department of Fish and Game and the National Marine Fisheries Service.

In order to develop growth data and feed conversion ratios we compared published results of the National Marine Fisheries Service salmon farming research projects at Little Port Walter and Auke Bay to those of a recent broodstock management program in British Columbia.

C. COSTS OF PRODUCTION IN CURRENTLY PRODUCING REGIONS

A summary of unit costs for farmed salmon in each major supply region is shown in Exhibit 3.13. In all cases, product is assumed to be sold in a head-on, dressed form. In

the exhibit, a yield factor is applied to the unit costs previously calculated on a round weight basis. Yield factors range between 85% and 90%. Yields are highest with larger fish.

EXHIBIT A: COMPARATIVE DRESSED-WEIGHT UNIT COSTS IN US DOLLARS

	Norway	Scotland	B.C.	Chile	Japan
Unit Costs Per kg Round Wt. Basis	\$5.05	\$5.46	\$3.32	\$3.20	\$5.67
Average Size	4 kg	2.5 kg	3.4 kg	2.5 kg	2.0 kg
Processing Yield	.90	.87	.89	.87	.85
Unit Costs Per kg Dressed Wt. Basis	\$5.61	\$6.28	\$3.73	\$3.68	\$6.67
Unit Costs Per lb	\$2.55	\$2.85	\$1.70	\$1.67	\$3.03

Exchange rates to US dollars are 1987 year-end rates:

NOK: 6.2325; UK pound: 1.8715; CDN\$: 0.7693; Yen: 0.0081.

Source: As in Exhibit 3.12.

Chile and British Columbia have the lowest unit costs. Japan has the highest. However, the lower unit costs of the Chilean and British Columbian industries do not necessarily mean that higher returns are being earned in these regions. Freight costs to major markets are a significant factor. Pricing is based on numerous factors including size, species, and grade. Generally larger sizes and high quality are preferred attributes. Preferences for particular species will generally vary by area. Time of harvests and level of marketing effort will also influence net returns.

Large areas of southcentral and southeast Alaska are not suitable for salmon culture due to the presence of ice, icebergs and large river systems. Salinities are generally more consistent throughout the year in areas away from mainland waters, where blooms are also less likely to occur.

Smolt production capacity in both southcentral and southeast Alaska is likely adequate to meet potential demand from a salmon farming industry. Some fish feed production capability exists in southcentral, however fish feed would most likely be imported from Washington State or British Columbia because of more specialized production in these regions.

The following areas would be favoured for development in terms of their proximity to population centers, airports and processing plants:

- . along the eastern half of southeast Alaska near Juneau, Ketchikan and Petersburg/Wrangell;
- . along the western side of Baranof Island near Sitka;
- . in southcentral Alaska near Kodiak, Homer, Seward, Cordova, Valdez and Whittier.

Netpen operations in these areas would also be less likely to be affected by phytoplankton blooms. However, all areas are likely to be affected by predators.

D. COSTS OF PRODUCTION IN ALASKA

The area around Ketchikan is probably the best area for development of pen rearing of salmon in Alaska because of warmer summer and winter temperatures. This area also has more constant salinities throughout the year. Chinook could be expected to reach a harvestable size of two kilograms during the second winter in saltwater. However, the Ketchikan area would have lower growth rates and higher conversion rates than in most areas of British Columbia where salmon farming occurs because of seasonally lower water temperatures.

The cost profile of a farm assumed to be located in the Ketchikan area is summarized below.

Capital Investment

Capital investment is assumed to be similar to that of British Columbia. However, cage systems and equipment are assumed to be imported and slightly more expensive. The estimated total capital investment for the farm is shown below.

	U.S. \$
Sea cage system and equipment	\$380,000
Facility on floating barge with equipment	<u>250,000</u>
	\$630,000

The total capital investment is \$2,520 per tonne. Like British Columbia accommodation and other facilities are assumed to be on a floating barge due to the lack of extensive road systems in the south central portion of southeast Alaska.

Unit Costs

Unit costs are shown in Exhibit B. Unit costs are \$4.49 per kilogram.

EXHIBIT B: ESTIMATED UNIT COSTS PER KG FOR CHINOOK SALMON IN ALASKA

	Unit Costs (US Dollars)	%
Variable Costs		
Smolts	0.40	9
Feed	2.00	45
Stock Insurance	0.07	2
Processing	0.52	11
Interest on Working Capital	<u>0.27</u>	<u>6</u>
Total Variable Costs	3.26	73
Fixed Production Costs		
Wages	0.32	7
Overhead	0.24	5
Depreciation	0.49	11
Interest	<u>0.18</u>	<u>4</u>
Total Fixed Costs	1.23	27
Unit Costs per Kilogram	4.49	100%

Source: The DPA Group Inc.

Assuming a yield factor of about 85%, unit costs on a dressed weight basis would be \$5.28/kg or \$2.40/lb.

E. SUMMARY

The landed costs of farmed salmon from each major supply region and from Alaska in three major markets are shown in Exhibit C.

EXHIBIT C: COMPARISON OF LANDED COSTS PER LB IN MAJOR MARKETS
(U.S. DOLLARS)

Market	Supply Region					
	Norway	Scotland	B.C.	Chile	Japan	Alaska
Los Angeles	3.80	4.17	2.06	2.63	N/A	2.77
New York	3.46	3.83	2.44	2.63	N/A	3.18
Tokyo	4.25	4.62	2.89	3.85	3.21	3.36

As indicated in the exhibit, Alaska is competitive from a cost standpoint in all markets.

However, costs at an industry level are only well known for Norway. As a result, the cost comparison should be viewed with caution. Alaska would be selling farmed salmon in smaller sizes than Norway, Scotland and British Columbia and would compete more directly with Chile. British Columbia and Chile have cost advantages over Alaska in both Los Angeles and New York.

Alaska would also likely have a short window period in which to sell. This would also likely result in more direct competition with the Chileans.

Landed costs in major markets are sensitive to exchange rates. Fluctuating exchange rates could make Alaskan farmed salmon more or less competitive in all markets. However, the U.S. and Canadian currencies are closely linked and generally shift from each other only slowly. As a result, British Columbia would likely have cost advantages over Alaska in all major markets.

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APPENDIX B:	Profitability Study of Fish Farms in Norway, 1984
APPENDIX C:	Potential Development Areas for Salmon Farming in Alaska: Technical Summary

1.0 PURPOSE AND SCOPE OF STUDY

Purpose of Study

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The study first analyzes costs of production in the regions projected to be the largest suppliers. It then develops costs of production for Alaska from an analysis of biological, environmental and logistic conditions in the state.

Scope of Study

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Costs of production for Japan were not developed because no cost of production data is available in the public domain or from the firsthand experience of study team members. However, sufficient data was obtained from previous studies and a recent visit by a study team member to draw some important conclusions about its cost structures and its development potential. These are presented in a narrative form.

In order to assess conditions for pen rearing salmon in Alaska we conducted reviews of previous environmental studies in Alaska. We also held telephone interviews with several fisheries officials in the state of Alaska Department of Fish and Game and the National Marine Fisheries Service.

In order to develop growth data and feed conversion ratios we compared published results of the National Marine Fisheries Service salmon farming research projects at Little Port Walter and Auke Bay to those of a recent broodstock management program in British Columbia.

In the following section of the report we present an overview of worldwide farmed salmon production. In Section 3.0 we analyze and compare costs of production in each major supply region. In Section 4.0 we estimate costs of production in areas suitable for pen-rearing salmon in Alaska. In Section

5.0 we summarize Alaska's potential cost advantages and disadvantages.

2.0 OVERVIEW OF WORLDWIDE FARMED SALMON PRODUCTION

2.1 Introduction

Aquaculture is defined as the culturing of finfish, shellfish and aquatic plants. Species currently being cultured commercially include shrimp, oysters, carp, tilapia, catfish and salmon. Worldwide production from aquaculture has grown rapidly from about 2.6 million tonnes in 1970 to about 10 million tonnes in 1986, accounting for 10-12% of total fisheries output worldwide. China and Japan account for 35 percent of world aquaculture production. The United States produces two percent of the world total. Production is mostly catfish.

Aquaculture production can be classified as either extensive, semi-intensive or intensive. The extensive method is the simplest. Aquatic environments such as oceans and lakes are stocked at low densities with little management of the species and little or no supplemental feeding. The semi-intensive method involves higher stocking densities in smaller culture units, more intensive management and some supplemental feeding. The intensive method employs still higher stocking densities in a controlled environment.

Salmon ranching, roe on kelp and scallop spat collection in Alaska can be classified as extensive forms of aquaculture. Pond rearing of catfish and trout in several other states and seapen rearing of salmon in Washington and Maine are classified as semi-intensive production.

Intensive forms of aquaculture for the most part have only been successful with some tropical species although rearing of trout in Idaho could possibly be classified as such. Intensive rearing of Atlantic salmon in land-based tank farms has been attempted but has generally not been successful. Much greater success with rearing salmon has been achieved with netpen rearing of Atlantic salmon in Norway. Production has increased from 1,500 tonnes in 1975 to over 45,000 tonnes in 1986. Along with growing demand for fresh seafood in major markets, this industry has spurred the development of netpen rearing of salmon around the world.

The first phase of the production cycle is in a freshwater hatchery. Fertilized salmon eggs reach the smoltification stage anywhere between six and 18 months. Juveniles are then placed in netpens supported by floating cages situated in marine locations. The growout period in saltwater can take up to three years.

Supplemental feeding exists through most of the freshwater phase and virtually all of the saltwater phase. Pen-reared fish are typically fed commercially-produced pelleted feed.

World production of farmed salmon in 1986 is shown in Exhibit 2.1.

EXHIBIT 2.1: WORLDWIDE PRODUCTION OF FARMED SALMON IN 1986
(Metric Tonnes)

	Atlantic	Chinook	Coho	Total
Norway	45,675	-	-	45,675
Scotland	10,300	-	-	10,300
Ireland	650	-	-	650
Faroes	600	-	-	600
Iceland	100	-	-	100
Sweden	150	-	-	150
Finland	40	-	-	40
Spain	150	-	-	150
France	-	-	180	180
Italy	50	-	-	150
Eastern Canada	297	-	-	297
B.C.	-	89	400	489
Washington State	-	-	1,400	1,400
Chile	-	-	1,000	1,000
New Zealand	-	500	-	500
Japan	-	21	7,200	7,221
	58,012	610	10,180	68,802

Source: The DPA Group Inc. Worldwide Farmed Salmon
Production Forecasts to Year 2000, Department of
Fisheries and Oceans, 1988.

As indicated in the exhibit, Norway was the world's largest producer of farmed salmon in 1986, producing about two thirds of the world supply (or about 8% of the 1986 total supply of farmed and wild salmon). The other supply region with considerable Atlantic salmon production in 1986 was Scotland.

The culturing of Pacific species has been more recent and Japan was the only significant producer in 1986. In Washington State, pan-sized Coho production is well established but relatively static.

The production figures in 1986 significantly understate the production potential of British Columbia and Chile, where rapid expansions in the number and size of farms has occurred during the last three years. In British Columbia, emphasis has been with production of Chinook and Coho, with more limited production of trout and Atlantic salmon.