H B 432

SENATE COMMITTEE REPORT

DATE: 4/10/90 FURTHER: Resources

DATE TURNED INTO OFFICE: 4/19/90

Labor and Commerce Committee considered CSHB 432 (Resources)

Prohibiting finfish farming; efd.

and recommended:

[ ] replace with _____ CS _____ [ ] same title
[ ] or adopt _____ CS _____ [ ] new title
[ ] technical title change (HB only)

[ ] attached amendment(s)
[ ] _____ letter of intent adopted

[✓] do pass

[ ] do not pass

[ ] no recommendation

[ ] individual recommendations

[ ] further referral to _____

ATTACHES NEW FISCAL NOTE(S): Dept/Date:

[ ] fiscal note(s) _____

[ ] zero fiscal note(s) _____

[ ] appropriation-no fiscal note

APPROVES PREVIOUS: Dept/Date:

[ ] fiscal note(s) _____

[✓] zero fiscal note(s) _____
F+G - 2/8/90

[ ] Governor's bill w/fiscal note

SIGNING DO PASS:

OTHER RECOMMENDATIONS:

Jan Faik No Rec.

Chair: Signature and Recommendation

No. 1

STATE OF ALASKA
19 90 LEGISLATIVE SESSION

BILL VERSION: CSHB 432(Res)
PUBLISH DATE: HOUSE 3/16/90

FISCAL NOTE

REQUEST:

Revision Date: _____
Title: Prohibition of finfish farming

Agency Affected: Fish and Game
BRU: FRED

Sponsor: Ellason et. al., Grussendorf, et. al
Requestor: Steve Cowper

Components: _____

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 91	FY92	FY 93	FY 94	FY 95	FY 96
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	0	0	0	0	0	0
CAPITAL	0	0	0	0	0	0
REVENUE	0	0	0	0	0	0

FUNDING: (Thousands of Dollars)

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

POSITIONS:

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

ANALYSIS: (Attach a separate page if necessary)

FY 90
See attachments.

Prepared by: _____ Phone: 465-4160
Division: ADF&G FRED Division Date: 1/30/90

Approved by Commissioner: _____ Date: Feb 8 1989
Agency: ADF&G

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

Fiscal Note

Bill Analysis --

Background/Legislative Intent

In 1987, the Alaska State Legislature passed SB 297 placing a one year moratorium on finfish farming. The following year HCS SSSB 514 was passed, authorizing the farming of shellfish and aquatic plants, extending the moratorium on finfish farming until July 1, 1990, and establishing the five-member Alaska Finfish Farming Task Force. The shellfish farming program is currently being implemented. HCSSSSB 514 also contained a provision for inland farms in closed waters. The Board of Fisheries however, denied a proposal to make surplus coho eggs available to an interior-based applicant proposing to operate a recycle hatchery. In doing so, the Board of Fisheries asserted that public policy questions pertaining to brood stock acquisition and the privatization of a public resource were questions that should be addressed by the legislature, rather than set by precedent by the Board.

Although the task force was authorized in 1988, it was not funded until last spring. The members were appointed by Governor Cowper and began work last July. The task force recently issued its report and recommended that prior to the end of the moratorium on July 1, 1990, the legislature take statutory action to expressly allow or prohibit finfish farming. SB 397 would prohibit finfish farming by not allowing a person "to grow or cultivate finfish in captivity or under positive control for commercial purposes." As drafted, the state and PNP hatcheries would remain unaffected.

Amendments Proposed

On Page 2, lines 1-5, the third finding asserts that serious disease and genetic risks are posed to wild stocks. As the FRED Division has stated on the record, in legislative hearings and to the task force, if a properly managed, regulated, and funded pathology and genetics program were in place, similar to that run by the FRED division for current public and private non profit hatcheries, then commercial farming of finfish would not pose a serious risk to the health and genetic integrity of wild stocks.

Sale of finfish under a scientific or educational permit is not allowed currently. Accordingly on Page 3, Section 2, the department recommends deleting item 3.

With regard to Section 2, item 4, the department recommends extending the sentence. After the word "ponds", insert: "provided these fish are not reared or released into waters of the state."

A few examples
of correspondence
Supporting HB432/SB397

Chugiak-Eagle River
Chamber of Commerce
(907) 694-4702

P.O. Box 770353
Eagle River, Alaska 99577

12110 Business Blvd.
Eagle River, Alaska 99577

April 4, 1990

SUBJECT: POSITION ON FIN FISH FARMING IN ALASKA

(PLEASE NOTE: For your convenience, no written response to this correspondence is necessary).

Dear Senator Elias on

At our March 22, 1990 regular Board of Directors meeting for the Chugiak-Eagle River Chamber of Commerce, the Board took a position relative to fin-fish farming in Alaska. Despite the fact that the Chamber generally endorses projects which conform to economic development standards appropriate for an arctic environment, it was decided that fin fish farming had some inherent drawbacks. These include the possibility for contamination of wild salmon stocks as well as the possibility of long-term government subsidies necessary to create a viable investment. Certain aquaculture, however, may be demonstrated, to be in the best interests of the state. As a result, the Board passed the following statement regarding fish farming in Alaska:

We, the Chugiak-Eagle River Chamber of Commerce Board of Directors supports the development of the aquaculture industry not including the development of fin-fish - more specifically salmon farming.

If I can answer questions regarding the above position, please feel free to call the Chamber at 694-4702.

Sincerely,

Greg Strong
Board President

sg

COOK INLET COALITION

C/O Susie Kaiser
P.O. Box 110381
Anchorage, AK 99511

April 2, 1990

The Honorable Steve Cowper
P.O. Box A
Juneau, AK 99811

Dear Governor Cowper:

The Cook Inlet Coalition, an organization consisting of Southcentral Alaskan sport and commercial fishermen, would like to bring to your attention our views regarding the mariculture issue in the State of Alaska. We would also like to make the following recommendations:

The Coalition recommends the support of Senate Bill #397, Senator Eliason's Bill banning finfish farming.

We further recommend that the current policies prohibiting importation of live salmonoids, including gametes, should be placed into statute and rigorously enforced.

After reviewing the "**Finfish Farming Task Force Report to the Alaska Legislature**" we find that we agree with Senator Eliason's assessment and support a total ban on commercial finfish farming.

Some of our concerns, both environmental and economic, are listed below.

A) **ENVIRONMENT**

1) Salt water finfish farming (FFF).

a) POLLUTION

1) Disease introduction and/or transmission.
2) Bacterial (concentrations due to densities of fish, enzyme action of fecal matter, etc.).
3) Fecal build-up on seabed.
4) Chemical (treatments for skin ailments, antibiotics in feed, etc.).

2) UPLAND TANK AND POND FFF

a) POLLUTION

1) Disease transmission to nearby watershed and/or ground water.
2) Fecal matter (tanks could possibly dry and treat, this however, is an expensive process. Ponds tend to concentrate and exasperate problem).
3) Chemical (economically untreatable).
4) Bacterial (again possibly treatable in tands with UV radiation, but build-up in ponds likely due to absence of flushing action).

3) SITING

a) OCEAN SITING

1) Conflicting need for flushing action vs. feed for protection from weather and marine predators).
2) Conflict with sport, subsistence, and commercial use.
3) Conflict with land owners/developers.
4) Need for separation of farms from anadromous streams to prevent intermingling of wild stocks with escaped farmed salmon, thus diluting the wild gene bank and promoting disease transfer (Norway disallows sitting within 20 kilometers of anadromous streams).
5) Disease transmission to stocks migrating near pens.
6) Lack of transportation infrastructure where siting possible.

b) LAND SITING

1) Ponds must have no inlet or outlet and must be far enough removed from streams to protect from streams to protect from seepage of pollutants (and disease) to ground water and then streams.

B) ECONOMICS

1) COSTS TO STATE

a) Cost of setting up regulatory infrastructure.
b) Cost of additional personnel.
1) Scientific people.
2) Veterinarians.
3) Enforcement.
4) Staff for permitting and regulating.
c) Cost of transportation infrastructure.

d) Potential cost to set up, operate, and fund loan programs. (If this is not done, with a start up cost of approximately $500,000/farm, most investment will necessarily come from outside Alaska, with most profits also leaving.)

2) OTHER ECONOMIC FACTORS

a) Few people are actually employed and most of those at minimal wages.

b) There is a glut of farmed salmon on the world market forcing farmers to sell below cost.

c) Although there is occasionally a surplus of eggs available it is rate and unpredictable, virtually all eggs are used for sport and commercial projects. In both Washington State and British Columbia the introduction of finfish farming has created vicious competition for eggs with sometime disastrous results to existing industries.

Alaska has the healthiest wild salmon and other finfish stocks in the world, supporting the sport, subsistence, commercial and tourism interest of this State, we feel finfish farming poses unnecessary risks to all parties. As Senator Eliason states, these risks can only be minimized and only then at a substantial cost.

Thank you for your consideration in this important issue.

Sincerely,

for Coalition Members

The Cook Inlet Coalition
C/O Susie Kaiser

cc: All Members of the 16th Alaska State Legislature
House and Senate Resources Committee
Coalition Members
Don Collinsworth
Brian Allee

ALASKA COUNCIL TROUT UNLIMITED
P.O. BOX 2391, SITKA, ALASKA 99835

March 17, 1990

Senator Dick Eliason
Senate
P.O. Box V
Juneau, AK 99811

Dear Senator Eliason,

The Alaska Council Trout Unlimited (ACTU) would like to express our utmost support for Committee Substitute version of House Bill 432 and Senate Bill 397. We would also like to take this time and thank you personally for your stand on this issue. We feel that any mariculture of finfish poses a disease and allocation problem for the states fishery resources. At this time there has been another bill proposed by the Resources and Finance Committee SB No. 195. We are adamantly opposed to this bill also for the same reasons as stated above. We feel that the resources are too valuable to be used in this manner.

We only have to look at the two out breaks in 1990 of VHS (Viral Hemorrhagic Septicemia) recently in Washington to see the detrimental effects that can be had on our resources. The Lummi Fisheries Program just had to destroy 6.2 million coho eggs and smolts because of this virus. Also, the Washington Department of Fisheries found two cases in the Quillayute River system. One wild coho in the Bogachiel River and one wild coho in the Sol Duc River. This closes down both hatcheries to planting fish anywhere else in the state, causing a major disruption of the hatchery programs for both salmon and steelhead. The Lummi Fisheries Program is in inner Puget Sound near Everett and the Quillayute is on the outer coast of Washington. All three of river systems in the Quillayute drainage produce salmon that come to Alaska. There were also two outbreaks in Washington in 1989, one at the Makah Indian Hatchery on Suez River at the Northwest tip of the Olympic Peninsula and one at a hatchery in the San Juan Islands. So you can see that this disease is not controllable nor stoppable when it gets going.

Can we afford to loose our multimillion dollar fisheries that employs one of the largest segments of the Alaskan population in both the sport and commercial fisheries, for a few?

And would it be Alaskan's or the multinational corporation's taking over wherever there are net pens? As they are in Washington, British Columbia and now are trying to do in Maine. If you want some reading look at the most recent National Fisherman and see what the scientist have to say about the net pens and the pollution they produce.

Also, one of the types of egg takes recommended from the Fishfish Task Force was from wild stocks and this is totally unacceptable to the ACTU.

Senator Dick Eliason March 17, 1990

As a conservation and resource oriented association I would hope you would consider the total resource user population and not just a few who want to make a buck at the expense of the majority.

Sincerely,

Jack Willis by OSW

Jack Willis
President

KODIAK SEINERS ASSOCIATION
P.O. BOX 2399
KODIAK, ALASKA 99615
907/487-4939 907/487-2456

February 14th, 1990

Dick Eliason
Rm. 417, Capitol
P.O. Box V
Juneau, AK 99811

Dear Mr. Eliason:

The Kodiak Seiners Association supports bills HB 432 and SB 397 that would prohibit fish farming in Alaska. Much has been written in the fishing press on this issue. To avoid redundancy, we agree that the reported health and genetic complications arising in fish farms throughout the world, the potential for dangerous health implications for our presently healthy and abundant natural salmon stocks, and the potential for disruption and degradation of wild salmon markets, are reasons enough to justify the ban.

Taxes on Alaska's natural fisheries resources being the second largest source of revenue for the State, it would be irresponsible to place finfish resources at the risk by their possible exposure to disease-prone farm fish. In addition, were the same State monies that would be needed to fund the development and regulation of fish farming devoted instead to the enhancement of existing hatchery and wild salmon runs, the State would realize a certain and almost immediate revenue gain.

Finfish farming would be a counterproductive graft onto the healthy body of Alaska's natural fisheries.

Sincerely,

Kodiak Seiners Association
Board of Directors:

Eric Manzer	Dave Kubiak
Oliver Holm	Jeff Povelite
Dana Reid	Chuck McWethy
Chip Treinen	Armin Reimnitz

cc:

Arliss Sturgulewski	Rick Halford	Gov. Steve Cowper
Steve Frank	Fred Zharoff	Bert Sharp
Bill Hudson	Cliff Davidson	Walt Furnace
Dick Eliason	Jalmar Kerttula	Richard Foster
Bettye Fahrenkamp	Mike Navarre	Curt Menard
Mike Davis	George Jacko	SE Seiners Association
PWS Seiners Association		

2 February, 1989

Re: Fin fish farms

Senator Bettye Fahrenkamp
Chair, Senate Resources Committee
P.O. Box V
Juneau, Alaska 99811

Dear Senator Fahrenkamp:

I am a marine biologist, formerly with the Auke Bay Laboratory (NMFS) as a Fisheries Research Biologist. I am not and never have been a commercial fisherman, and there are times when I am not in complete sympathy with their agenda. However, in the case of finfish farming in Alaska, I am entirely in accord with their position.

I don't oppose finfish farming in Alaska because of markets, but because of biology and my deep concern for subsistence and sport fishing here. The concerns about genetics and about disease are valid--in fact I feel they haven't been strongly enough expressed. However, the issues are extremely complex, and it is very hard to express complex issues to the public, and especially to financial interests that do no wish to give them credence.

The scientific evidence of probable harm is strong. The reassurances that no harm will be done should be examined with the same hard nosed skepticism that should have been evidenced when we were assured that oil spills would do little damage (remember the pipeline controversy?) The risks are just too great, no matter what "plans" and assurances are given.

Please reconsider your position on fin fish farming in Alaska. And please remember that biologists in public positions are prevented from speaking out--I can only speak because I no longer work for NMFS. There is plenty of educated opinion out here that fin fish farming is a bad idea.

Thank you for your consideration.

Sincerely,

Natasha I. Calvin
Box 2966
Sitka, Alaska 99835

[illegible]

Greetings Honourable Bettye H. Fennemore,

I am a Fisheries biologist/ Culturist for the State of Alaska. I have 12 years of experience in this field.

I am very concerned about Fin fish farming in Alaska, and it's impact on our resitry productive fish populations.

We have a unique situation in Alaska. Alaskan rivers systems contain over 60% of all Salmon stocks in the world. We without a doubt must not jeopardize this unique natural wonder for economic gain of select promoters. Senate Bill # 397 and House Bill #432, would help to assure protection of this valuable resource.

The maintenance, and restoration of the chemical, physical, and biological integrity of our waters is the primary building block of our fisheries. Without this our fisheries resource could be jeopardized.

I've traveled to New Zealand and have witnessed the Salmon Farming operations there. I observed farm fish escaping into the oceans with no enforcement oversight. There were continual problems with ocean bottom contamination, and disease had entered into their operations making antibiotics and chemical medications and vitamins an additive to their feeding program. Such would without a doubt be the case in Alaska, where the enforcement over Natural Resources is feeble at best.

Genetics were geared toward selective breeding for docile fast growing fish. I have some photos of some of these sad looking Salmonids, if you would like to see them. These genetic traits would be deleterious to our strong ocean run Salmon.

Lax regulation and oversight to curtail these massive problems of contamination would most likely occur as we have seen this to be human nature.

Ocean run chemically free fish stand on their own merit. To have a fresh ocean run Fish on the market is a market all of its own. In New Zealand farmers admitted that there is no comparison in taste and quality between ocean run and farmed fish. We have the quality product. This will be a specialty item in a comparative market of farm grown, colour added antibiotic filled fish. We must always protect our image of clean fresh wild status, because it is the rare exception and not the rule on Earth and this trait will be a continuing asset in all future dealings of commerce, tourism, and economic well being in the state of Alaska. We have something the rest of the world has lost or destroyed. This is our future Bettye.

The Seafood industry is Alaska's largest private basic industry providing nearly 70,000 seasonal jobs which translates to 33,000 direct, indirect and induced year-round jobs. This doesn't include revenues from our giant Sport Fisheries industry which could also be at risk.

This industry is the second largest revenue generator in the state. Fishermen paid $27 million in fish taxes during 1987, and were the major contributor to the marine fuel tax.

Expenditures in Alaska on goods and services in support of processing and harvesting are nearly $300 million.

Alaska leads the nation in value of commercial seafood landings. The 1987 Harvest was worth $1.1 BILLION. In 1987 the wholesale value after primary processing was $1.9 BILLION. 1988 exceeded this to $3 BILLION. The Salmon fishery is the most important, bringing in 42% of all harvest income. This fisheries is critically dependent upon protection of stock genetics, disease prevention and wise management. Under no circumstances must we jeopardize this resource.

Fish are a renewable natural resource if managed and protected properly under the Clean Water Act. Prevention of adverse impact will contribute substantially to the health and welfare of this resource and livelihoods directly and indirectly related to and including tourism, Sport, Commercial, and Subsistence fishing for future generations to come.

The future of the quality of our aquatic ecosystem is on the line. Without this quality we question just how long our fisheries and those in harmony with them will continue to last favourably. We have these viable industries which add great revenues to our economic health. Finfish mariculture and these viable industries cannot and should not be allowed to coexist.

With Kind Regards,

Geoffrey J. Halford

cc: Jalmar Kerttula
Mike Navarre
Walt Furnace
Bill Hudson
Bert M. Sharp
Richard I. Eliason
Steve Frank
Rick Halford
Arliss Sturgulewski
George G. Jacko
Mike Davis
Richard Foster

cc: Fred F. Zaroff
Cliff Davidson
Curt Menard
Paul A. Fischer
C.E. Swackhammer

Comments by Rep. Ben Grussendorf April 9, 1990

HOUSE BILL No. 432 (Resources)

WHAT WE KNOW

- Fishing is the second largest industry in terms of dollars, and **the largest** in terms of employment, in Alaska.

- The wild stocks of Alaska salmon are **healthy** - in numerical strength and because they are virtually disease free.

WHY IS THIS SO ?

- **Because many years ago the people of the Alaska made a commitment.** We said to the federal government and to the exploitive outside interests: "let us control our own destiny and we will be responsible stewards of our natural resources". Some could argue that we haven't always lived up to that commitment as it relates to other natural resources, but I think we've done a pretty good job with our fisheries.

- For it's part, the State of Alaska has **invested** millions and millions of dollars in capital investment for docks, harbors, grids, processing sites; not to mention the numerous loans made to capitalize the fleet. We've appropriated millions more in operating budget funds for fisheries management, enhancement, enforcement,inspection, and a variety of other programs all designed to keep this industry healthy and prosperous. As best we could, **we have honored our commitment.**

- In 1972, the people of Alaska passed a constitutional amendment which paved the way for the limited entry system. There was too much gear in the water - our stocks were endangered and the viability of the industry was in question. Limited Entry was enacted not only to protect the stocks but to allow the Alaskan fisherman to continue making a living. This was not a decision made lightly. Everyone knew that limitation meant that some would not be able to freely participate in the industry; but they made the hard choice. **The people of Alaska honored their commitment to keep the industry healthy.**

- Hand in hand with the Limited Entry program was increased attention to fisheries rehabilitation and enhancement. The State invested considerable amounts in hatcheries and other enhancement programs. The Alaskan fishermen formed aquaculture associations

and taxed themselves to help keep the enhancement effort strong. In the past several years, the responsibility of operating a number of state hatcheries has been turned over to the aquaculture associations, thereby easing the need for state funding of those hatcheries. Remember, hatchery fish come to maturity in the wild and are harvested by all user groups - sport, commercial, and subsistence. **The fishermen who tax themselves and try to keep costs down and returns strong at these hatcheries are honoring their commitment to healthy fisheries.**

- Because we all have kept the commitment we made over thirty years ago, we have a strong, healthy fishing industry, and at the pinnacle of that industry is the wild Alaska salmon; in the opinion of many, the finest seafood in the world.

NOW, IF WE KNOW THIS, WHY WOULD WE WANT TO DO ANYTHING THAT MIGHT JEOPARDIZE THE INDUSTRY WE HAVE ALL FOUGHT SO HARD TO KEEP HEALTHY?

- Some risks associated with fish farming:

•<u>The health of the wild stocks</u>. I'm not going to print the laundry list of diseases to which farmed fish are susceptible because they seem to be finding previously undiscovered ones every day. Fish kept in captivity until maturity experience much more stress than do wild fish, and this heightened stress makes them susceptible to disease. If diseased fish should escape into the wild, there is a distinct possibility that the disease they carry could be transmitted to the wild stocks with which they mingle. The migration of disease through the wild stocks could be devastating.

•<u>The reputation for quality that Alaska salmon now possess</u>. In order to control all these diseases, fish farmers must mix large amounts of chemicals into the food pellets given to the captive fish. There is growing concern that these chemicals could make their way into the human food chain. (See "Additives to the Environment of Net-Pen Reared Fish" by zoologist Arther H. Whiteley, included in your bill packet.) Even if these concerns are eventually dealt with through strict regulations, the <u>perception</u> that farmed fish are unhealthy could be detrimental to the marketing of our wild salmon. We all remember the botulism "scare" of the early 1980's and how one or two bad cans of salmon damaged the entire industry.

•<u>Pressure on a budget built with dwindling revenue</u>. No one seems to know how much the State of Alaska will need to spend should we become involved with fish farming. Licensing, monitoring, enforcement, and siting concerns will all have to be addressed through the State

operating budget. (Not to mention the potential need for State loans or other "bail-out" measures that would have be looked at down the road. The economic disaster that British Columbia fish farmers recently faced gives some indication of what could be in store for us.) Given that many of our constituents, and a number of the members of this body, believe that we are presently underfunding the agencies that manage and protect our fisheries, I am not ready to gamble millions of State dollars on fish farming.

•Market control. Fish farming evolved in Norway because of that country's concern about its wild stocks of Atlantic Salmon and its fishermen. Norway then instituted its own "limited entry" system: fishermen became fish farmers and the government was able to control "supply" as the demand for fish in the European markets fluctuated. At first Norway did well, capitalizing on the sudden drop in demand for Alaska salmon following the botulism scare of the early 1980's.

Today, however, Norway is faced with a number of growing problems. The market is glutted with farmed fish and prices have dropped. Their own high government officials have now acknowleged that the spread of disease from farmed fish threatens what's left of their wild stocks with extinction. Last Spring the government of Norway was under siege to fund 100 new fish disease specialists and 150 fish veterinarians. They are now paying the price for what they allowed to happen to their own fisheries.

The light at the end of the tunnel for Norway is the exportation of fish farming technology and as much control as they can exert over the world supply and demand of salmon. We all know where the investment dollars will come from for fish farming in Alaska, and who will pay 10¢ on the dollar when the so-called "Mom & Pop" fish farms can't make it and have to sell out. Take a look at which country's corporations started taking over the British Columbia fish farms that went into receivership this past year. It is interesting to note that a fish farmer in the state of Washington has filed suit in U.S. District Court claiming that foreign national interests have attempted to monopolize the industry in his state; that Norwegian concerns operating through American "fronts" have conspired to destroy competition, remove local control, and violate antitrust laws.

•In conclusion, the Norwegian-type farmed fish may have captured a large share of the world market in the short term, but I am convinced that, in the long term, the wild fish -the quality fish- harvested by the Alaskan fisherman will be the winner. We should not risk our dwindling State dollars, and our reputation for a quality product, on a capital intensive, foreign dominated industry that has brought collapsing prices, environmental problems, and questionable genetic practices in it's wake.

GENERAL CONCERNS WITH "UPLAND" FISH FARMS:

1. Groundwater contamination.

Fish diseases are commonly transmitted through water sources. Contaminated water discharged from an upland farm could seep into the water table or surrounding streams.

2. Broodstock.

Broodstock ownership, genetic mutations and alterations of broodstock by private business could threaten common property ownership of fisheries, The source of broodstock for these farms is a major concern because it would have to come from either: (a) hatcheries within the state (which you cannot presume will have the excess eggs or smolt to sell), or (b) sources from outside the state. Importation of broodstock from outside is extremely hazardous in terms of not knowing exactly what you getting. The Finfish Farming Task Force recommended that the importation of salmon broodstock and the private ownership of broodstock be banned.

3. Water appropriation.

Upland farms will use an enormous amount of water. A 200 ton production capacity farm requires 50 cubic feet of water per second, an amount equal to the amount of water the city of Eugene, Oregon uses. The debate over House Bill 210 demonstrated the controversy which exists relative to the appropriation of water in this state.

4. State budget.

Upland farms will still need to be licensed, inspected and monitored for compliance with state laws and regulations. This will take money away from other programs the resource agencies are having a difficult time administering now. Sonja Corazza, the co-chair of the United Fishermen of Alaska's Mariculture Committee testified in House Resources that Southeast shellfish farmers told her that some lease sites had not been checked in three years. DNR didn't have the personnel or the funds to adequately monitor all the sites.

TWO EXAMPLES OF PROBLEMS WITH "UPLAND" FISH FARMS:

1. The Finfish Farming Task Force toured an upland farm in Washington State that is owned by Dan Swecker and a subsidiary of Sealaska Corporation. The farm grows pan-sized coho salmon.

The majority of the facility consists of above-ground swimming pools where the salmon are raised. The water is supplied from several wells. The farm also has a number of mall, man-made ponds where the adult brood stock is kept.

Members of the task force noticed that a couple of the ponds were dry and abandoned, and asked why. The answer was that the adult fish in those ponds had passed a pathogen down into the water table and that the pathogen had then travelled back into the wells and had been introduced into the swimming pools containing the juvenile fish. This caused an unexpected, but devastating, outbreak of disease among the population.

It took them quite a while to discover the source of the infection, and the solution was to move the earthen ponds as far away as possible and drain them into an adjacent swamp.

2. The deaths of 100,00 cohos in a river in Washington State have been linked to the seepage of water discharged from a nearby landlocked fish farm, as reported in the Seattle P-I, November 1, 1989.

The Fisherman (B.C) Dec '88

Norway sees mounting disease, pollution threat from fish farms

The deadly salmon disease furunculosis, previously unknown in Norwegian waters, is breaking out of fish farms and threatening beleaguered wild stocks, says a top government official.

Svein Aage Mehli, head of the division of Norway's Directorate for Nature Management which is charged with protection of wild salmon, told a Washington State regulatory hearing Nov. 14 that 5,000 farmed salmon infected with the disease escaped this summer into Hjorundfjorden near Molde.

Despite an intensive fishery to catch the fish and a system of net barricades at the mouths of salmon rivers, an infected fish was found in fresh water, he testified.

"If the disease spreads to natural stocks, the situation may be out of control in Norway," Mehli said.

"I feel we are on a sharp edge with diseases. If we have (the parasite) *Gyrodactylus salaris* in more rivers we may just accept our wild salmon is extinct."

(Furunculosis is present in B.C. waters and leads to loss of appetite, fluid retention, ulcers and eventually death in up to 60 percent of affected stocks. It had not been found in Norway until smolt transfers from outside the country were undertaken. Gyrodactylus also has been linked to fish farming and is treated by killing all host fish with rotenone.)

Mehli was qualified as an expert witness at a hearing in Lacey, Wash., of the Shoreline Hearings Board, which is hearing an appeal of a Skagit County decision to reject a fish farm in the mouth of the Skagit.

The fish farm proponents, a tribal group, are appealing the refusal of the Skagit County commissioners to issue permits for the farm on the basis that it threatens Skagit salmon and could pollute the sensitive estuary.

Proponents have denied there is any evidence of a disease threat to wild stocks from farmed salmon.

As a result, the appeal hearing has turned into a deep investigation of the environmental impact of salmon farms on wild stocks. Mehli was flown from Norway to testify on behalf of county commissioners, who backed up their decision by referring to the Suzuki Foundation report on Norway called *Journey to the Future*.

● Svein Aage Mehli, of Norway's environmental agency, testified last month to a Washington State regulatory agency.

Mehli responded angrily to suggestions by fish farm proponents that there is "no conclusive evidence" of disease spreading to wild stocks from farms.

"We are very concerned," he said. "It is not right to ask for conclusive evidence at such an early stage."

Furunculosis imported on smolts destined for salmon farms broke out two years ago and authorities felt they had eradicated it, he said.

This year's outbreak was a shock, as was the continued spread of bacterial kidney disease (BKD), which is very difficult to treat even with antibiotics.

"BKD poses a problem for natural stocks because it was diagnosed for the first time in 1980 and previously did not exist in nature," Mehli said. "It is very easy to see a connection between BKD (in salmon farms) and wild stocks in the river."

"It's reasonable to conclude" BKD spread from farms, he said, and Norwegian scientists "see logic in such a connection." BKD is diagnosed or suspected in 100 netpen operations and hatcheries.

Antibiotic use on Norwegian fish farms climbed to 48 tonnes last year, equal to the requirements for human use and animal husbandry combined.

"If you see the first diagnosis of redmouth disease in Norway just two years ago, it's impossible to ask what happened in such a case," Mehli continued. "Veterinarians underline the seriousness of that situation, that net pen operations have an impact."

Mehli said redmouth now is present in 300 facilities but was unknown until 1985.

"Net pen operations may function as a multiplying station for disease," Mehli said. "They will give greater disease pressure on natural stocks that we didn't see before netpen operations."

Mehli said further studies on the straying of farmed fish into rivers show a sharp increase in the presence of farmed fish. A year ago, 18 percent of the fish found in the rivers studied were of farm origin. In 1988, the figure rose to 40 percent. The origin was confirmed by scale samples and electrophoresis.

Asked if strong regulations could control disease, Mehli agreed they could "minimize problems if they go far enough. Norway has not gone far enough."

Norway is proposing a ban on the transfer of eggs and smolts between regions of the country, he said, and considering a ban on all imports of sexual products like eggs and milt.

Even though existing regulations list diseases which must not be present in imported eggs, the list is limited and "in Norwegian cage culture we know other diseases are knocking at the door."

In theory, he said, fish farmers "want to get rid of disease, but if they see profit in the short term they may react in a different way."

Mehli also confirmed fears of negative genetic effects of farmed fish on wild stocks if they interbreed. "We are very afraid it could affect their ability to migrate."

Netpen salmon have undergone careful selection for size and growth rate, he said, but researchers may have inadvertently selected other characteristics which could have a negative impact if reintroduced into wild stocks.

"First there is a genetic problem and second an environmental problem. If Atlantic salmon (escaping in Pacific waters) have the same requirements as coho or steelhead trout — and we know that salmon escape in great numbers — then you will have competition for space in the rivers."

As to their ability to spawn, "we see them in rivers, they are mature, ready to spawn and we are very worried of what will happen."

New zoning regulations now being implemented in Norway will ban farms within 20 kilometres of salmon rivers and close entire fjords to farming where

Should corporations use public waters for private profit?

By John de Yonge
P-I Columnist

Consider these things about floating fish farms:

■ A typical net-pen fish farming operation on Puget Sound produces pollutants "equivalent to untreated sewage from approximately 10,000 persons." That's what a state report says. The pollution comes from fish feces, urine and food pellets deposited in the water and on the bottom of the Sound.

■ There are 13 commercial pens now operating over 69 acres of aquatic lands leased from the state. These 13 operations daily deposit to the bottom of Puget Sound nearly six times as much oxygen-demanding fecal matter and other wastes than does Metro's Renton Waste Water Treatment Plant, which serves 430,000 people. Materials that deplete oxygen can radically change or kill off the life forms in an unpolluted environment.

■ Siting 27 more fish farms, now delayed by opposition from upland property holders, environmentalists and county officials, would add a pollution load to Puget Sound equal to that from building four new cities the size of Everett.

■ The ". . . proper siting of 100 farms would not have significant impact on the aquatic environment." So says the state's just-issued environmental impact statement on floating net pens.

Those 100 fish farms would produce 55 metric tons of oxygen-demanding waste per day. That's 18 more tons a day than Metro's Renton and West Point treatment plants together produce from the sewage of 1 million people.

Analysis

The environmental impact statement was prepared by three private organizations that supply fish-farm companies with paid expert witnesses.

Under Gov. Booth Gardner, state policy is to hosanna any increase of fish farming in the state's waters and to downplay environmental problems that aquaculture may bring.

The official evangelist is the Department of Agriculture's Dr. John Pitts, veterinarian and former Jefferson County commissioner who appears at meetings and hearings — in one case, as a paid witness for a net-pen applicant — to pooh-pooh environmental objections raised by net-pen opponents.

Opponents are not just those who own shoreline property, who howl against a net pen being erected in their aquatic front yard. They've been fired up by what the state's environmental impact statement confirms: A new, nearby fish farm can give view property a one-time, financial knock.

Opponents include environmentalists like David Ortman of Friends of the Earth, who says: "Why should we be happy about fish farms that dump tons of fish poop every day into Puget Sound?"

They include commercial fishermen like the Puget Sound Gillnetters, who know something that has largely escaped the notice of sport anglers:

Atlantic salmon, not a salmon but a sea-run trout of the Atlantic seaboard, have escaped by the thousands from net pens here and in British Columbia. The B.C. government booms fish farms with a gusto exceeding even the ta-ra-ra-boom-de-ays from Gardner's men and from Brian Boyle, the separately elected head of the Department of Natural Resources, which manages shore bottoms and other public lands.

What's more, hundreds of thousands of Pacific salmon have also escaped from the pens, especially in British Columbia.

So what does that mean?

The state environmental impact statement points out that escaped exotic fish like the Atlantic salmon "could establish self-sustaining populations and compete with indigenous fish," such as steelhead trout.

That may not be far off.

In the North Puget Sound last year, commercial and sports fisherman caught hundreds, probably thousands, of Atlantic salmon weighing up to 10 pounds.

More dangerous by far is that for the first time ever at least three sexually mature Atlantic salmon showed up miles from the sea in the Nooksack River last year, near Bellingham, and one in the Nisqually, near Olympia. Rumor has a fourth Atlantic netted in the Skagit River at Sedro-Woolley.

What's the worry about four fish, though they may be forerunners of thousands to come?

The environmental impact statement warns that accidental importation of "exotic" fish diseases associated with fish farms in Europe could devastate existing salmon and trout runs in state rivers.

Just in the past two weeks the public has learned that such a disease, viral hemorrhagic septicemia or VHS, has shown up at two hatcheries in state waters. It is the first time ever that VHS has been found in North America.

VHS, state fish-disease experts say, has never been found to occur naturally in Atlantic salmon. They say that the chance that Atlantic salmon in pens here are the source of the disease is "virtually zero." The disease was found in chinook and coho salmon, species raised extensively at federal, state and tribal hatcheries and at commercial net-pen operations.

The impact statement does not dwell on what has happened in Norway, where other diseases associated with that country's extensive net-pen industry have ravaged wild Atlantic salmon runs in 32 rivers. The government was forced to poison some streams, set up a salmon sperm bank to preserve wild genes and consider banning any new net pen within 12 miles of a river mouth, an obvious rule not yet under consideration here.

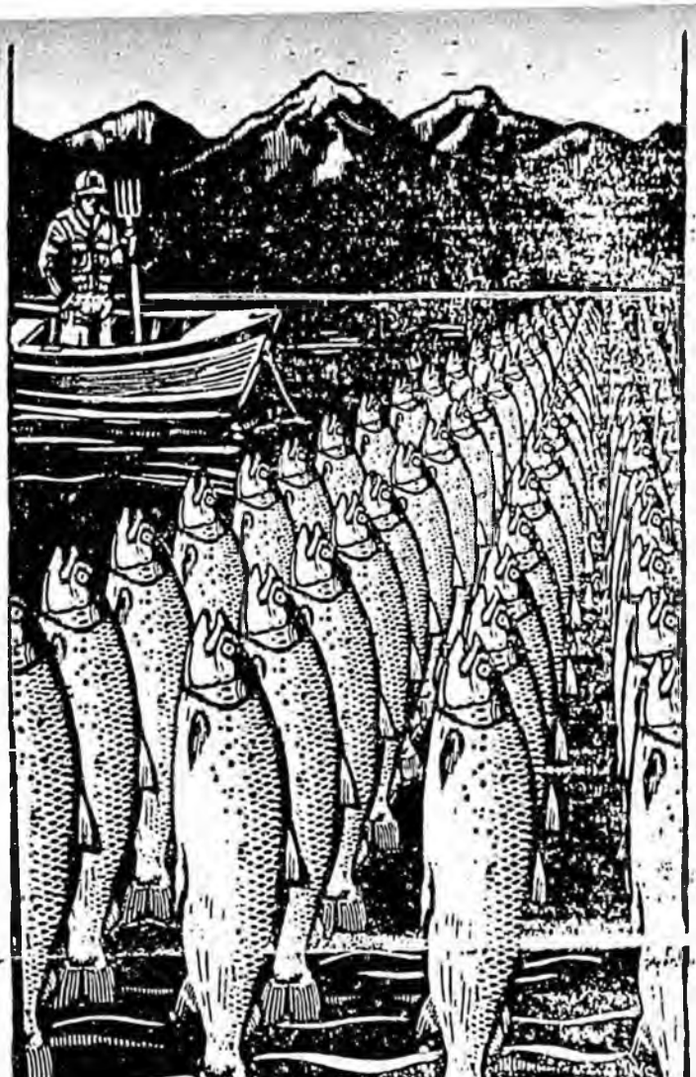
Nor does the statement dwell on the possibility of migrating wild fish catching indigenous fish diseases from net pens here or of net pen escapees spreading such diseases into our river systems.

Fish farmers themselves helped call state attention to feces build-ups beneath pens, a build-up that kills clams, oysters and other bottom dwellers and can create poisonous hydrogen sulfide gas, which can kill all fish in a pen in minutes.

In 1986 Commissioner of Public Lands Boyle limited new net pens to sites where the water is at least 40 feet deep at low tide, a mile away from other pens and with enough current to flush away food and fecal deposits. He also limited the surface area of new pens to two acres or less.

These requirements ended up in "Recommended Interim Guidelines" written for the departments of Agriculture, Ecology, Natural Resources and Fisheries, which share regulation of the fish-farm industry, with Agriculture and Pitts calling most of the shots.

With no force of law and offered to help county commissioners site pens under state law, the guidelines deliberately do not talk about navigation problems, use conflicts and, most important, esthetics.



DUANE HOFFMAN/P-I

> **If the two sides could stop feuding and start talking about necessary standards, we could have a safe, considerable industry.**
>
> —Peter Katz, fish farmer

Commissioners have learned that if they turn down a net-pen proposal, the applicant will seek a full rehearing before the state's Shorelines Hearings Board, with Pitts certain to show up to put the stamp of Gardner's administration on having the permit granted.

Dwain Colby, an Island County commissioner, put the matter thus in a 1987 letter:

"While there may be legitimate reasons for denying a permit to locate a salmon net pen, local government has been placed in the position of being able to say 'yes' to such a proposal but not 'no.' "

Under Gardner, the Department of Ecology has refused to require net pen operators to get pollution-limiting discharge permits under the federal Clean Water Act.

The Sierra Club Legal Defense Fund has announced it will sue the U.S. Environmental Protection Agency if necessary to force EPA to force Ecology to force every net pen operator have such a permit.

The state's draft environmental impact statement declares that the major impacts of net pens can be cured by "proper farm siting to assure dispersion of wastes, flushing of the site and protection of sensitive areas."

It's a view that one can come to easily while talking to such eloquent fish farmers as Peter Katz, a marine architect running the Paradise Bay Co. net farm at Port Townsend and John Forster, a Ph.D. in aquaculture running Joe Farm Washington's similar operations at Port Angeles.

Both pen systems, clean, low in the water, quiet, full of fat, bright Pacific and Atlantic salmon, are barely noticeable in the working harbors that contain them.

But that's quite different than siting a pen in Frenchman's Cove on the west side of Hood Canal, as International Marine Farms Inc. proposes.

Or siting a pen, as Tailfin Inc. proposes, in a main salmon and trout-fishing cove between Fair Point and Bells Beach on the west side of Whidbey Island, where from her home Margaret Johnston looks out across Saratoga Passage to Camano Island. She heads the Marine Environmental Consortium, made up of 20 citizen organizations that oppose fish and other floating farms.

Katz argues for having the state set standards for siting and operating net pens, to ensure that the pens do not harm the environment and to give the net-pen operators a clear but flexible regulatory framework to live with. But Katz feels the industry is getting a bad rap from people like Johnston, who, he says, simply don't want a net pen in their aqueous front yard.

"If the two sides could stop feuding and start talking about necessary standards, we could have a safe, considerable industry . . ." he says. "But we're years away from that."

Forster, president of the Washington Fish Growers Association, dismisses esthetic revulsion as the main drive behind the opposition to what he characterizes as a clean, beneficial industry with great prospects.

"It's more than esthetics. It's an intrusion into a life style that they don't like and they're using environmental problems as a smokescreen. Because of that, the debate is dishonest at the moment, terribly dishonest."

Johnston, at a gathering in her home with other members of the Marine Environmental Consortium, characterizes such comments as unworthy.

"The net pen issue raises a fundamental issue of public policy that involves more than us, though the environmental questions are real and cannot be brushed aside by the industry or the state. The big question is: Should the public waters of Washington State be turned over to a few corporations for private profit?"

That is a proper question for us all to ask. It must be answered by political action. Gardner's administration has already answered "Yes."

To me it seems stupid to site more pens in pristine salt and fresh waters (as an application is pending in Eastern Washington) until we have better, more extensive scientific information about siting than what the draft environmental impact statement supplies.

Until we know if pens can be sited safely anywhere, we would be blind to commit ourselves to putting major sources of pollution in our unpolluted waterways and in waterways we are trying to clean up.

The travesty of Norway's mess demonstrates that

SPECIAL REPORT

West Coast Shake-out

Supply and demand tremors rattle B.C. growers.

by Peter Chettleburgh

THE SHAKE-OUT has begun. Sagging salmon prices, excessive debt, high interest rates and a worldwide glut of salmon have triggered a period of consolidation in the west coast salmon farming industry. On the East Coast where prices are firmer and farmers have been more conservative in their approach there is still a margin of profit, but it too is narrowing as prices continue to slide in the face of skyrocketing worldwide production (220,000 tonnes in '89).

Everyone said it would happen, but no one really wanted to believe it. On the west coast, where prices have been hovering at or below production levels for most of the summer, reality has struck home with a vengeance. The need for cash flow has caused many farmers to sell a lot of small pre-market fish for ridiculously low prices - 90¢ a pound was one figure this writer heard mentioned earlier this summer.

Since May we have heard of at least four west coast farms that have been put into receivership, another two that have been sold at fire sale prices and at least a dozen more which are in desperate need of working capital. Everyone else is holding on, praying for higher prices in the fall.

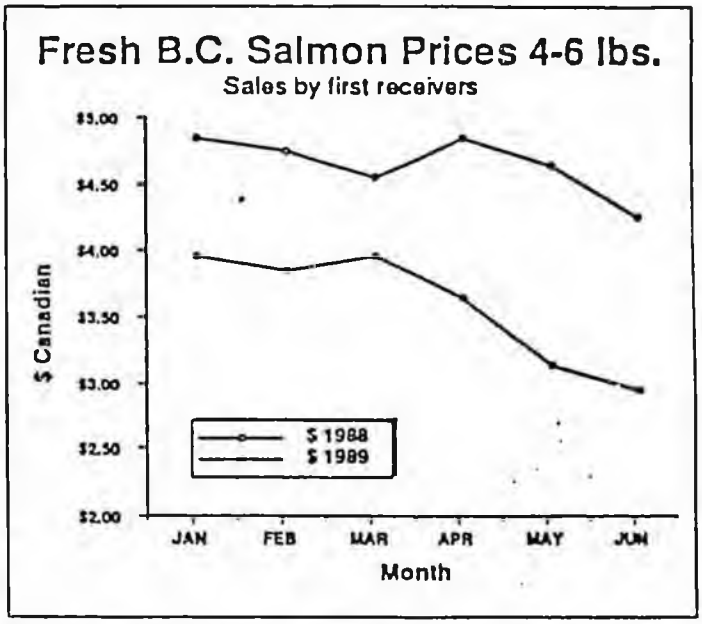
One of the big ones that went into receivership is the Fremstad Group which has four farms, a hatchery and processing plant in the vicinity of Campbell River. It's being handled by the accounting firm of Coopers and Lybrand which was looking for a buyer as we went to press in August.

Triangel Resources near Tofino on the west coast of Vancouver Island found itself in trouble earlier this spring and was taken over by General Sea Harvest, an affiliate of the Finnish conglomerate, Cultor Ltd. (formerly Finnish Sugar Co.), the parent company of Ewos Canada. General Sea and B.C. Packers were also looking at the assets of Ross Passage Salmon Farm, another west coast operation which found itself in trouble earlier this spring.

One other company that is known to be in receivership is Seagrow Industries Inc. (400 tonne capacity) with two sites in Jervis Inlet. The receiver, Coopers and Lybrand, was still looking for a buyer as we went to press.

There were also some amalgamations before the current shake-up began. For instance, within the last year Five Fishes (Sechelt) and Nordic Ventures (Quadra Island) were purchased by B.C. Packers, the large west coast fishing company-cum-processor owned by Westons. Apparently B.C. Packers is on the lookout for other expansion prospects, but doesn't plan to walk into a situation unless all the biological criteria, etc. are just right.

As a general comment, it can be said that the farms with some of the worst financial problems are in the Sechelt area. This is where the goldrush started in 1984 and it is the area that received a lot of the initial debt financing from Norway. Now the Norwegian financing has all but dried up and few investors are prepared to put additional money into the farms because of their current debt structure. Adding to their woes are the growing conditions which many in the industry agree are not as good as those north of Campbell River or on the west coast of Vancouver Island. Indeed, some of the salmon farm sites may end up in the hands of oyster growers who are already lining up for a chance at leases that will probably turn out to be better for shellfish than salmon.



The graph above tells the story. The top line shows prices for B.C. farmed salmon (4-6 lbs.) during the first six months of 1988, while the lower line shows prices for the first six months of 1989. Prices are FOB Vancouver (Source BCSFA).

$250 million investment

A recent estimate puts the total investment in B.C. salmon farms at about $250 million. And this does not include an additional investment of at least $50 million in the supply and services sector (cages, feed, nets, etc). Of this total investment, at least $85 million has come in through Norwegian banks, much of which is now exposed to major losses, according to a recent report in a Norwegian newspaper.

Even for the smaller farms, those with debt in the neighbourhood of $2-3 million, the debt servicing costs of 15-18% will skim off between $300,000 and $400,000 a year. That's a lot of fish, and a lot of debt relative to inventory, assets and equity, particularly in an industry that has yet to establish a solid production base. >>>>

Sechelt

Problems for suppliers

Although the depressed prices are toughest on the farmers, the suppliers behind the scenes are also hit hard. Scantech Resources of Sechelt folded in July after becoming one of B.C.'s major suppliers of fish farm equipment in just four years. President Clark Hamilton says that he lost everything in the failure but is still a strong believer in the future of the industry in British Columbia.

Another supplier which was hard hit was Powell River Net Loft which ceased doing any further work for the fish farming industry in June. The suppliers that are the most exposed are the companies which specialize *solely* in fish farming equipment and services for the B.C market. They don't have the flexibility of companies that serve other industries or those that have national distribution.

What went wrong

It's small consolation that salmon farmers around the world are facing the same problems of overproduction and falling prices. Indeed, both the Scots and Norwegians are taking a serious beating in Europe where production continues to grow at about 50% per year while demand is at about 25%. In Norway the Fish Farmers Sales Organization (FOS) has recommended holding the number of smolts going into the sea at about 50 million this season. This is to reduce production and maintain prices in the years ahead. One of the consequences, however, will be a continued shakeout in the Norwegian smolt producing sector.

In British Columbia the problems seem even worse. Excessive debt financing, high jacking rates and high mortalities from algal blooms and BKD have continued to chip away at profit margins. B.C. growers have also had to cope with a relatively new and untried culture species, chinook. It doesn't have the 20 year track record of the Atlantic species which the Norwegians and Scots have been able to use to their advantage on both the production and marketing sides. It's taken extra time and money for west coast producers who already arrived late in the world growth curve of farmed salmon production.

> "At the end of the day salmon farming will end up like other producing sectors with only the low-cost producers surviving."

Glutted markets

As if this weren't enough, world markets are currently glutted with high inventories of frozen Pacifics, a legacy of an oversupply last year and ample reserves of fresh and frozen farmed Atlantics on world markets this year. Farmed Atlantics now take preference in most European and some North American markets, areas that were once dominated by wild Pacifics. Consequently, the price for both farmed and wild Pacifics has seen a dramatic fall since last December with farm gate prices for farmed chinook (6-9 lb.) dropping more than $1.50 per pound to $2.50 and lower for a while early this summer. (New Brunswick Atlantics (6-9 lb.) were wholesaling for about $1.25 more per

pound than B.C. chinooks of the same size mid-summer, while Norwegian Atlantics were about 50¢/lb less than the New Brunswick product.).

The depressed market conditions came at a particularly awkward time for B.C. growers. The 60 or so companies that started operations within the last four years are at a stage of maximum investment, everything's out on the line, but as yet they haven't had a good chance to make any major earnings and reduce their debt. And now, with salmon prices the way they are, you can be sure that any fish under 4 pounds is being sold below the break-even point.

The worst part is that there aren't any major miracles expected in the near future. Though there should be a modest price rise when the wild-catch season ends this fall, a significant jump in farm gate prices is not likely since the ever-increasing supply of farmed product from Norway, Scotland, Chile and Ireland is flooding markets in Europe and Japan, and making serious inroads into adjacent turf in the United States. It's a classic case of supply and demand theory in action and will only be stabilized by market expansion, strong promotional efforts, more efficient production techniques and well organized selling.

Who will survive?

The farms in the best position are those with the least debt, highest efficiency and deepest pockets, all linked to an efficient means of selling their product. The big integrated national and multinational companies are in a strong position. They can benefit from profits in several segments of the production, processing and distribution chain.

But there is also a future for independent farms if they can maintain a low cost of production. To do so they must run a lean operation, maximizing growth rates, while keeping feed wastage and equipment purchases to the minimum. They will want to have the least expenses possible and get the best prices they can for their product by pursuing niche markets.

Production costs are hard to pin down, but estimates run between $2.50 and $3.50 a pound farm gate depending on the site and

... *Please turn to page 48*

World's shrimp producers face same problems

Shrimp producers in southeast Asia are facing the same slide in prices that hit salmon farmers this year. According to a recent article in *Aquaculture Digest* (July 25, 1989) the pond-side price for giant tiger shrimp fell from $8.50 to $4.40 per kilo in Taiwan last spring and only recovered slightly during the summer. Taiwanese production costs are about $5.00 per kilo.

Once again the main culprit is a hyper-active production sector trying to sell product into already-glutted markets. According to *Aquaculture Digest* the winners in the shrimp game are likely to be the low-cost producers in China and Indonesia while the losers are going to be the high-cost, intensive shrimp farmers of Taiwan, the Philippines, Thailand and the rest of the world. Commercial shrimp fishermen will also have problems remaining competitive in the years ahead, the article adds.

W. C. SHAKE-OUT

Continued from page 23

what costs are included. This means that in mid August, with farm gate prices hovering at about $3.00 per pound, B.C. farmers could make a modest profit if they were operating on the lean side or could be losing up to 50¢ a pound if they were on the high side. Unfortunately, for many of them there was no choice but to sell chinook and coho that were starting to mature. A couple of farmers were seriously looking into the possibility of establishing *U-catch'em* pens catering to wealthy U.S. yachtsmen.

Key to success

One of the most important keys to success in the years ahead will be management. As aquaculture consultant Ted Needham pointed out in a recent issue of UK-based *Fish Farmer* magazine "... every farmer has to find out what his rearing costs really are. ... he can only do this if he works to proper budgets with monthly cash flows projected over two years and updated at least quarterly. All forecasts of fish growth should be based on what has been achieved to date rather than on some hoped-for improvements." Needham's advice is as sound here in Canada as it is in Scotland. The margin for sloppy record keeping slipped away sometime last winter.

What is the outlook?

Is there any light at the end of the tunnel? Depends on who you talk to, but with another 50,000 tonnes projected to come onto world markets next year (275,000 tonnes total) there's not much hope that prices will again reach 1988 levels.

Who are the consumers?

Who's going to eat all this fine, fresh fish? The European market is nearing saturation and what's left will probably go to Scottish and Norwegian producers. The Japanese market is still available but it takes work to penetrate and, once again, the canny Norwegians are already in there, picking up what the Japanese can't produce for themselves (domestic farmed salmon production for Japan is estimated at about 25,000 tonnes of coho this year). The most accessible market left is our big, convenient neighbor to the south and there's still lots of opportunity there if the Canadians will make a serious effort to go after it. Marketing and distribution are pivotal. It will take a concentrated, cooperative effort on the part of all Canadian producers of both wild and farmed fish.

At the end of the day salmon farming will end up like other producing sectors with only the truly low-cost producers surviving. They will sell their fish in a well disciplined market where demand will determine the production that is planned and financed. But at this point not even a prophet could say how long the restructuring will take and who the survivors will be. Ω

FRANK SIMON

Continued from page 42

The intense competition in the salmon business doesn't worry Simon either. "There is always room for a producer who's doing things right," he says. "We want to differentiate ourselves on the basis of quality. We believe that if we do everything right, we'll have a prominent position in the market." Ω

MIX AND MIS-MATCH

Genetic pollution is the most invidious consequence of the escape of farmed salmon, argues Richard Douthwaite, who fears that the mating of farmed with wild fish may eventually eliminate our native stocks

On 9 February 1988 a storm of unusual ferocity hit the west coast of Ireland and swept across the country, leaving a trail of destruction in its wake. In Clew Bay on the Atlantic coast winds were so severe that farmers went down to the beaches the next day with their tractors and collected large quantities of dead fish. It was no surprise that two salmon cages moored in the bay broke up, releasing more than 30,000 fish into the open sea.

It is not always the weather which is to blame for fish farm escapes. One moonless night a few months before the storm, two men in a rowing boat cut the nets of 12 salmon cages moored in Mulroy Bay in Donegal. Almost 10,000 fish, worth £100,000, got away and the farm recaptured less than a quarter of them. The raiders' motive was to catch the escapees in their drift nets and then sell them.

Only recently has concern been expressed about the effects that these escapees might have on wild salmon stocks. Perhaps the matter should have been addressed earlier. The first Scottish attempts to rear salmon in cages were made in the late 1960s and it was as long ago as 1981 that Scotland's output of farmed salmon exceeded its wild catch, with Ireland reaching that position about four years later.

Today the problem is so large it cannot be ignored. Scottish farmed output is expected to be 54,000 tonnes in 1991, about fifty times the size of the wild catch, and Ireland hopes to produce 15,000 tonnes that year. There is so much salmon in cages at sea that if only two or three per cent break free in any year, they will substantially outnumber the native stock.

Escapes would not matter if the freed fish were genetically identical to those born in the rivers up which they swim. However, this is rarely the case. The salmon in each river – even sometimes in the carrier streams – are unique strains which have evolved in the ten thousand years since the ice sheets retreated. In most cases escapees will not be of that strain. There are 400 distinct stocks of wild salmon in Scotland, according to a report produced last year by the Scottish Wildlife and Country Link. It also states that wild salmon transferred from one river to another perform less well and have harmful effects on the native stock.

Farmed fish are increasingly being bred, like pigs and cattle, for characteristics which suit life in captivity rather than in the wild. Consequently, if escapees enter a river and mate with wild fish, they will pass on genes which tend towards placid behaviour, late sexual development and more rapid growth. Cross-bred young are therefore less likely than pure-bred natives to survive in the sea and return to the river as adults.

Even if farmed fish turn up in a river but mate with each other rather than with the wild fish, the effects are still adverse. They will

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Genetic pollution is not the only threat which fish farming poses to the survival of wild salmon. Disease organisms and parasites multiply rapidly in the confined conditions of a salmon cage and from there they can easily migrate to affect other fish. It is for this reason that salmon farmers become wary if another farm establishes cages within a few miles of its own, which is why whole lochs in Scotland are allocated to one farm.

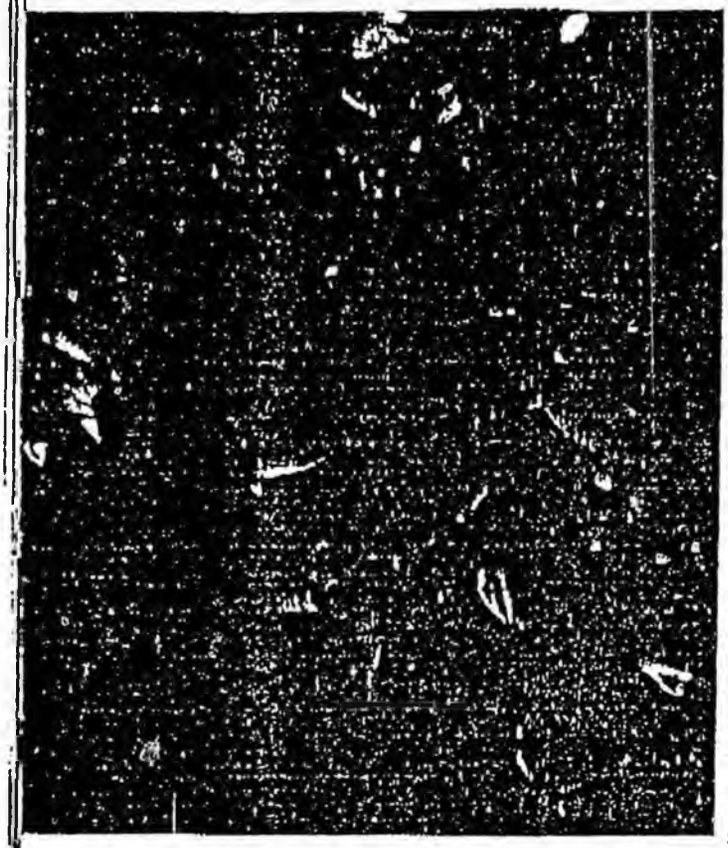
New [illegible] appear in farmed salmon [illegible] every year. Pancreas disease [illegible] in Ireland in 1984 after occurring first in Scotland in 1976. Seventeen of the 21 farms in Ireland now have it and output is consequently down by 25 per cent because of deaths or stunted growth.

The most worrying disease appeared only last year, in Norway: Salmon Anaemia Syndrome kills 80-90 per cent of young fish. Again, its cause is completely unknown.

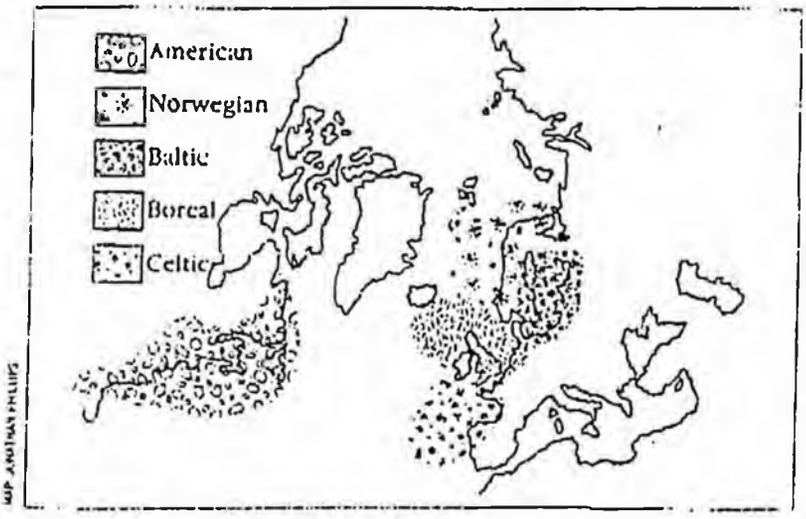
In spite of the threat that diseases present both to their own and to the wild stock, some fish farms are their own worst enemy. In Scotland dead diseased salmon are known to have been dumped at sea rather than incinerated on land, spreading pathogens far and wide.

There are also two dangerous parasites. One is a tape worm which uses the edible mussel as an intermediate host, then moves on to affect wild fish. The worm weakens wild salmon, rather than killing them directly, lessening their ability to return up turbulent rivers to their spawning grounds and also making them more vulnerable to disease.

The second parasite is a flatworm, *Gyrodactylus salaris*, which has completely wiped out stocks of wild salmon in 28 rivers in Norway. It was accidentally introduced when farmed fish were imported from infected hatcheries and put out into freshwater cages. The pest attacks parr – young salmon which have not yet developed the physical features that allow them to live in the sea. 'It is the most serious threat to Atlantic salmon in Norway today,' says Rear Admiral D.J. Mackenzie, director of the Atlantic Salmon Trust, Pitlochry. The only cure so far is a drastic one – to poison any remaining salmon in the river and then restock with uninfected fish.



Previous page: grilse from the Spey. Above: fish jostle for food in the confinement of the cages. Right: distribution of the main races of Atlantic salmon



MAP JONATHAN PHILLIPS

compete with the natives for spawning areas and their young will compete for food. As a result, fewer native fry may survive to set off for the sea as smolts and consequently fewer adult natives will return after a year or more to complete the reproductive cycle. (A young salmon passes through fry, parr, smolt and grilse stages before becoming a mature adult.)

The situation is so serious that regular escapes from farms could eventually wipe out all native salmon. Research in Norway, where salmon have been farmed for much longer than in Scotland or Ireland, shows that in some rivers up to two-thirds of the fish are already of the farmed variety. 'If genetic pollution continues at its present rate, the hereditary variations of some of the river species will be halved within seven years,' says Professor Harald Skjervold whose research findings in this field all point to this alarming conclusion.

Any experienced salmon fisherman will confirm that salmon stocks vary from river to river. 'Some are early rivers where large salmon enter in the spring,' says leading salmon geneticist Professor Noel Wilkins of University College, Galway. 'Other rivers have significant runs only in late summer, when the returning fish are smaller and younger. Some rivers are noted for the fine shape of their fish, others are not.'

Andrew Young, who managed the fisheries of the Duke of Sutherland more than 130 years ago, knew why this was: 'Each river has its own peculiar race of fish,' he wrote. 'We have now shown that salmon undoubtedly return to the river where they have spawned and where they belong to the race of fish that inhabit that particular river.' Professor Wilkins agrees: 'Salmon return to their own river with amazing accuracy and mating occurs predominantly between individuals who were born in the same river system.'

It is this inbreeding which has allowed the different strains to develop. In some rivers a higher proportion of fish come back after two or more winters at sea than after one year as grilse. Thus, if all the smolt are killed by disease or pollution one year, others are left to return to the river the following year to spawn, giving a chance for numbers to recover.

Fish farmers are deliberately trying to eliminate this characteristic: what they want are fish with a low grilsing rate, because it is more profitable to produce bigger fish which spend two winters in the sea than smaller fish which spend one. Norwegian salmon fit this bill and consequently their eggs have been widely used in Scottish and Irish hatcheries instead of the native strains. Farms also want their hatched fish to be ready to go to sea after one year in fresh water – it is obviously uneconomical to keep them in freshwater cages for an extra season. But again, in the wild, a stock in which some fish go to sea after one year and some after two has a better chance of surviving than one which does not.

Then there is the question of homing. Tagging experiments have shown that a higher proportion of wild fish return to their native rivers from the sea than do hatchery-bred fish released as fry into streams other than those from which their parents came. However, if any introduced fish which do return are caught and mated, their young will show a better return rate, which will

Although fishermen have known for hundreds of years that salmon stocks differ from river to river, scientists have only confirmed this belief within the last 20 years. Using a technique called electrophoresis they can analyse the proteins with which each fish is made up with great precision.

The first finding revealed by this technique was that there are five main races of Atlantic salmon, four of which share a common feeding ground off western Greenland. The Baltic salmon is the exception, feeding as an adult in the sea which gives it its name.

The second finding was that salmon vary genetically to a surprising extent from river to river, even within the same race. Dr Tom Cross, now of University College, Cork, examined fish from the Bandon and Munster Blackwater rivers in the south of Ireland and found significant differences in their liver enzymes even though they were both of the Celtic race and the river mouths only 80 miles apart. Dr Cross repeated his tests with Boreal fish from the Moy and Carrowniskey in north-west Ireland and found the Carrowniskey fish very different again.

'The differences that exist between salmon from different rivers,' says Dr Cross, 'are due to the small population sizes and the fact that they have been apart for 5,000 years. How important the differences are to survival, we cannot say. I think we ought at least to keep the the different races apart.'

• Contrary to claims by B.C. salmon farmers that salmon egg transfers pose little threat to wild stocks, an Atlantic salmon advisory body has advised extreme caution to avoid disease and genetic problems.

Report sees genetic threat

"None of the benefits of transfer of young Atlantic salmon and salmon eggs into Canadian waters outweigh the threats to native stocks," says a top body of Canadian fisheries scientists.

Fish farmers, the B.C. government and the federal fisheries department have allowed major imports of Atlantic salmon to Pacific waters, claiming they pose a minimal threat to wild stocks. The imports are scheduled to end in 1989.

But a review of egg imports by the Canadian Atlantic Fisheries Scientific Advisory Committee in 1986 warned that "there are unpredictable genetic risks associated with transferring European salmon stocks to North America and the potential benefits to Canadian aquaculture interests may be low."

CAFSAC is a top scientific advisory group which provides background information for Canadian representatives on international bodies studying conservation of Atlantic salmon.

Its conclusions go a long way to support the call issued by the UFAWU in May demanding a halt on any movement of salmon eggs and smolts, particularly Atlantics, until protection of wild stocks can be assured.

The CAFSAC scientists concluded that most of the benefits of imports accrued to the aquaculture industry because "it could allow the industry to expand as quickly as possible (and) it could be cheaper than purchasing local seedstocks."

In the long run, they said, it would "encourage the multinational nature of the aquaculture industry by allowing surplus seedstock in one country to be moved to another country."

But the imports carry the risk of disease, they warned, pointing to the Norwegian experience with the parasite Gyrodactylus salaris.

"Although the Canadian Fish Health Protection Regulations are considered among the best fish disease control mechanisms in the world," they wrote, "they are not infallible, a fact which, along with the large number of potential pathogenic organisms that are not considered under the Canadian regulations, makes the likelihood of an unwanted pathogen or strain of pathogen entering the country with fish from a certified (disease-free) source a very real possibility."

The CAFSAC report is part of a longer study by the North Atlantic Salmon Conservation Organization, a Scotland-based body supported by Atlantic salmon-producing nations.

B.C. salmon farmers have been enraged by UFAWU calls for controls to avert genetic pollution of wild stocks by farmed fish, claiming such pollution is unknown or unlikely to occur.

But NASCO warns that importation of European Atlantics to Atlantic Canada "provide risks of undesirable impacts on North American Atlantic salmon stocks.

"There are new disease or strains of diseases which may be introduced, also hybridization with North American stocks could result in loss of genetic diversity and reduced productivity."

NASCO concluded there is "an urgent need to develop new techniques to study the effects of hybridization, e.g. potential impacts of genetic impoverishment resulting from 'domesticated' or genetically engineered Atlantic salmon stocks (cultured salmon) spawning with wild stocks and hybridization of different strains of wild stock."

NASCO recommends that until definitive measures are in place to protect the genetic integrity of wild stocks, aquaculture projects should:

- use stocks originating as closely as possible to the project area,
- use sterile fish,
- establish "river preserves where no transfers or hatchery stocks is allowed in order to maintain the genetic integrity of some wild stocks; and
- manage stocks to ensure they are not reduced below a minimum size.

The Fisherman 7-15-88

Government of Canada
Fisheries and Oceans

Gouvernement du Canada
Pêches et Océans

NOTICE

LOST AND

Genetic fears of pen salmon are real

Page 4 February 27, 1989 Peninsula Clarion

Other View

☐ By SONJA CORAZZA

Alaska fishermen's concerns over genetic pollution and disease problems associated with escaped pen-farmed salmon are not unwarranted. Some 13% to 20% of all farmed fish escape, as documented by Norwegian scientists and European countries.

Also, verly large numbers of fish occasionally escape from pens. Their scientific studies show that the escapees do spawn in rivers up to a proven distance of 20 kilometers from their net pens. As a consequence of this research, and with great concern for the genetic integrity and survival of their wild salmon stocks, Norway has just imposed a series of new regulations on the pen-farmed salmon industry.

No salmon farms will be located within 20 kilometers of salmon rivers, and entire fjords will be closed to farming where salmon rivers are present.

This past December in Jarvis Inlet, B.C., 300,000 pen-farmed salmon escaped in winter storms that hit Canada. Floating net pens were found for miles up and down the coast.

Norway, in the salmon farming business for 20 years, has found itself combatting new diseases in net pens every year. Last spring, fish farmers requested that the government hire 100 new fish disease specialists (adding to their 60 disease specialists and nearly 150 fish veterinarians) before allowing any new permits to be issued in their country. A group of farmers who have lost tons of their farmed salmon due to a deadly salmon disease called *furunculosis* and government controls is suing the Norwegian government for $25 million. Last summer 5,000 fish infected with *furunculosis* escaped in Norway. Despite intensive efforts to capture the diseased fish, an infected fish was found in a freshwater stream.

In order to control disease in pens, Norway's use of antibiotics in pen farming has risen 170% in the past two years to reach a level of 48 tons, more than the use in animal husbandry and human use combined. With the present focus on health and nutrition, how does this reliance on antibiotics fit our view of pen-farmed salmon as a healthy addition to our diets?

Norway's most severe threat to their wild salmon stocks is from a parasite called *gyrodactylus salaris* that is responsible for wiping out 30 wild-salmon rivers. The *gyrodactylus salaris* parasite entered Norway via imported salmon eggs from Sweden. Importing eggs was prohibited by regulation, but those regulations were lifted as the result of pressure by farmers with economic concerns. The only control for the fatal parasite is by treating the rivers with a chemical called rotenone; unfortunately, rotenone kills everything in the rivers, not just the parasite, hence the loss of wild salmon by the tons in Norway.

Ownership of the pen-farming industry continues to be an issue. In Washington state, a local fish farmer is suing foreign corporations, primarily Norwegian, for attempting to monopolize the industry. Who would own the farms in Alaska?

The Alaska State Legislature should fund the Mariculture Task Force, a forum where these concerns and others need to be researched.

SONYA CORAZZA of Homer heads the Mariculture Committee of the United Fishermen of Alaska. This article came "signed" by United Fishermen of Alaska, as follows: Alaska Crab Coalition, Alaska Independent Fishermen's Marketing Association, Alaska Longline Fishermen's Association, Alaska Trollers Association, Bering Sea Fishermen's Association, Bristol Bay Drift-netters Association, Concerned Area M Fishermen, Cook Inlet Aquaculture Association, Copper River Fishermen's Cooperative, Cordova District Fisheries United, Kenai Peninsula Fishermen's Association, North Pacific Fisheries Association, Northern Southeast Regional Aquaculture Association, Peninsula Marketing Association, Petersburg Vessel Owners Association, Prince William Sound Aquaculture Corp., Prince William Sound Seiners Association, Seafood Producers Cooperative, Southeast Alaska Seiners, Southern Southeast Regional Aquaculture Association, United Cook Inlet Drift Association, United Southeast Alaska Gillnetters, Western Alaska Cooperative Marketing Association, and at-large delegates, Bill Hall, Ruel Holmberg Sr. and Bob Honkola.

seafood producers have turned to an increasing degree to foreign suppliers. The reason is that the cost of local packaging has risen to 20-10% more than that of imported products.

Spokesmen for Kassagerd Reykjavikur and Plastprent, two of the main manufacturers, said demand was always subject to fluctuation and that no massive change had yet taken place. Eggert Hauksson, Plastprent's managing direc-

position had never been so tight, with so little tolerance of price increases on the m.:.et. Bjarni Lúdviksson, m.naging director at Icelandic Freezing Plants Corporation, said that as yet only a fraction of the corporation's packaging needs had been supplied from abroad. "Obviously we have to hold our own costs down, and while the dollar is so weak we must use the opportunity. If the króna is devalued, everything will change overnight."

NEWSNET

PROCEEDINGS against Mike Ikenze, the former Icelandic Consul in Nigeria who acted as an intermediary in attempts to sell stockfish from a group of Icelandic producers in 1984, have been dropped following his agreement to repay one-quarter of the GBP300,000 which he received for use in landing sales contracts.

SHRIMP CATCHES around Eldey off the southwest of the country are likely to be banned for some time following poor results of trial catches in the area. Only 20kg were caught in a two-hour trial haul recently. Closure of the area could have serious results for local fishermen, who have in many cases filled their quotas for other species.

LUMPFISH CATCHES this season have been very poor, and production of lumpfish caviar is expected to amount to only about 9,000 barrels, against 27,000 last year.

A NEW EXPORTING enterprise has begun in Sandgerdi, a village in the southwest of the country, where two local residents, Thorbjörn Danielsson and Eirikur H. Sigurgeirsson, have been assisted by chef Sigmar B. Hauksson in marketing whelk and crab in Sweden and France. Sales to a Swedish restaurant have already been agreed, and exports to France are to start in the autumn. The Swiss market is also being considered.

JUNE CATCH FIGURES

In tons	June		Jan-June	
	1988	(1987)	1988	(1987)
Cod	80,624	(88,482)	211,580	(208,508)

Hopes high for capelin

The capelin season began on 10 July, with 49 Icelandic vessels sharing a provisional quota of 398,000 tons. With the prices for meal and oil rising because of poor soya harvests in the USA and growing demand in the Far East, hopes are high for a successful season. The quota is to be revised in November.

News from Iceland August 1988

Salmon fishing:

Problems posed by sea-cage escapees

Salmon fishermen trying their luck this season in the Ellidaár rivers, which flow through the eastern part of Reykjavik and are popular with local residents, are complaining that large numbers of the salmon they are landing are "escapees" from aquaculture stations and are consequently smaller and less attractive than the wild types.

According to biologists studying the problem, the fish are fairly easy to recognize. They generally have damaged fins and are shorter and fatter than the true natives of the river. In many cases they weigh only about one pound.

Biologists are concerned about the effects of the presence of the cultivated fish in rivers. A survey made two years ago estimated that 60-70 cultivated salmon had entered Ellidaár, a significant number in terms of the genetic effect on the local stock. Studies from Norway show that up to 10% of the fish in rivers near large aquaculture stations can be "escapees."

Fish farming still draws opposition

Anchorage Daily News 2-20-90

By DAVID FOSTER
The Associated Press

RICH PASSAGE, Wash. — The history of salmon-fishing in the stormy North Pacific is filled with tales of brave fishermen riding the wild seas, but its future is being shaped in calmer waters.

Thousands of salmon in this sheltered arm of Puget Sound are captives in sunken pens the size of basketball courts. Crowded fin to fin, they swim endless laps, gobbling feed pellets and being fattened toward the day they'll be scooped up and whisked to market.

Yet while the crenulated coastline and pristine waters that stretch from Washington's Puget Sound to southeastern Alaska might be ideal for fish farming, the political climate is not so welcoming.

In Alaska, where commercial fishermen are a powerful

Please see Back Page, FISH FARMING

FISH FARMING: Young industry has run into resistance

Continued from Page A-1

lobby, bumper stickers in fishing towns proclaim "Real Fish Don't Eat Pellets," and the legislature is considering a permanent ban on fish farms when a two-year moratorium expires in July.

In Washington state, salmon farmers have the official blessing of the legislature, but that has helped little in the face of challenges from fishermen and environmental groups, which have defeated several proposed farms.

The fish waste produced by a two-acre salmon farm is equivalent to the sewage produced by a town of 5,000 people, claims a Washington citizens group called the Marine Environmental Consortium.

Environmentalists also fear introduced species such as Atlantic salmon — favored because they fetch a higher price and are more docile than Pacific salmon — will corrupt the local gene pool and spread disease. Wealthy owners of shoreside homes, meanwhile, don't want fish farms spoiling their views.

Promoters call fish farming an efficient way to help meet the world's growing appetite for fish. Not only does it provide a year-round supply of fresh salmon to supplement the seasonal wild catch, they say, it also creates jobs free of the hazards of commercial fishing, one of the nation's most dangerous occupations.

They also contend salmon-farming provides an economic incentive to preserve clean water.

"We're the best environmentalists of all, because we're dependent on it," said Jerry Polley, site manager for Global Aqua, the nation's largest salmon farm. "If something's wrong with the water quality, we're going to be the first to complain."

Production of farm-raised salmon, here and abroad, has boomed in five years, flooding markets traditionally held by wild salmon and driving down prices.

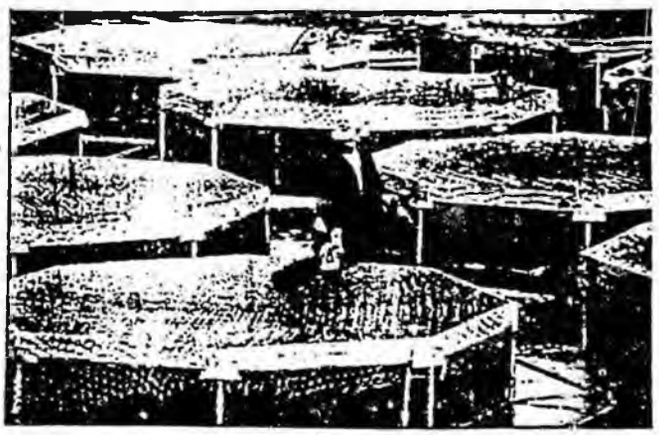
"For the first couple of years, as more salmon was around on a year-round basis, the farmed fish seemed to help the wild market," said commercial fisherman Randy Babich. "Now it's a battle at the retail counter."

Fish farming, or aquaculture, is hardly a new concept. For years, farmers have raised oysters in the Northwest, rainbow trout in Idaho and catfish in the Southeast. But techniques have developed more slowly in domesticating salmon, the mainstay of fisheries off Oregon, Washington, British Columbia and Alaska.

For years, it was practiced only by the Norwegians, forced into salmon farming by their declining wild fish populations. But interest has spread quickly since 1985, after Norway refined methods to raise salmon cheaply enough to compete with the wild catch.

In 1983, world production of farm-raised salmon was 23,500 metric tons, just 3 percent of the 670,000-ton wild salmon catch. By last year, farm-raised salmon production had soared to an estimated 202,000 tons, or 30 percent of the relatively constant wild catch.

Norway still leads the pack, producing about 75 percent of the world's farm-raised salmon, but other places, including Scotland, Chile, Canada and Iceland are catching up.



Daily News file photo

Alaska Department of Fish and Game technician feeds penned salmon at Little Port Walters in southeast Alaska.

The United States, with 50 fish farms in Washington state and Maine, lags far behind, producing 1 percent of the total.

Many of the U.S. salmon farms are run by Norwegian companies, including Global Aqua's four-acre operation in Rich Passage, 10 miles west of Seattle.

Global Aqua's farm is fairly typical: a huge raft anchored offshore holds 40 pens, each lined with a net holding as much as 15 tons of fish, which range from finger-size smolts to fat-bellied salmon 2 feet long.

A half-dozen workers tend the pens from metal walkways, filling automatic feeders and mending nets. At harvest, workers herd fish into one end of the pens, scoop them out with an oversize dipnet and load them onto a boat. The salmon are still kicking when they reach a Seattle processing plant 30 minutes away.

In the three years it takes to raise salmon to harvest, farmers contend with prowling otters, hungry sea lions and diseases that can wipe out whole farms if left unchecked.

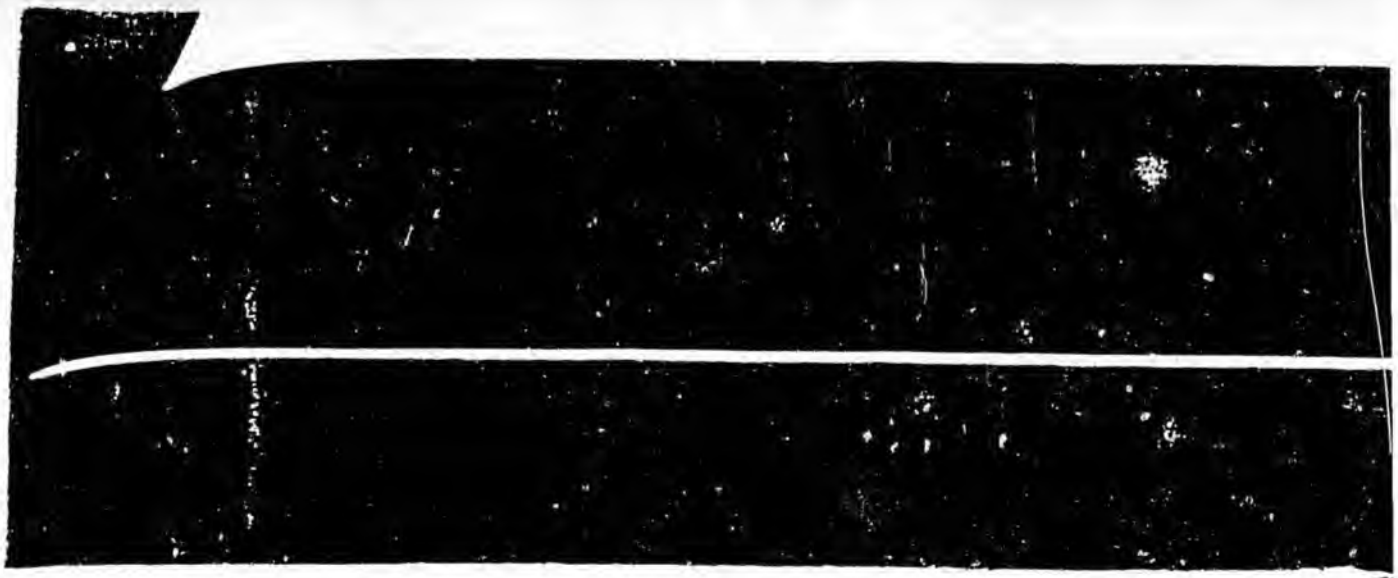
Aquaculturists say their operations will never be a major blot on the coastline.

"It would take just 40 acres of farms to produce all of the salmon that was imported into the United States in 1988," said Chris Gibson of Sea Farm Washington in Port Angeles. "The industry does not need a lot of space."

It may need even less space in coming months. Worldwide growth of salmon farming and recent overproduction in Norway have glutted the market with fish. Prices have plunged, and many farms are selling below cost just to keep cash flowing.

In British Columbia, lax regulation and a surge of Norwegian investment capital helped the number of fish farms soar from five to 135 in the past six years. But now many are in trouble. Nineteen have filed for receivership in the past year, and small businesses are being bought out by large investors better able to outlast the lull in prices.

Aquaculture boosters profess confidence in their



The Fisherman (B.C.) Dec 1988

Fish farm use of antibiotics poses threat

The widespread use of antibiotics in fish culture poses a serious potential threat to public health, says a Washington State zoologist, and should be strictly controlled.

Arthur Whiteley, a zoologist with a long-standing interest in microbiology, told a Washington State Shorelines Hearing Board inquiry Nov. 14 that antibiotic use on fish farms will produce antibiotic resistant bacteria in the human food chain.

If these resistant bacteria occur in humans, "the diseases caused by that organism could not be medically treated.

"It would eliminate from the tools of the physician those he would want to control disease."

Whiteley was qualified as an expert witness in the hearing, which was set up to hear an appeal against a decision by Skagit County to deny permits for a fish farm near the mouth of the Skagit River.

Whitley produced a pile of scientific studies which show that "in almost every case resistant bacteria is selected by the use of antibiotics in fish culture."

In other words, use of antibiotics to treat bacteria causing fish disease kill all but the bacteria which is resistant to the medication.

Studies have proved that this resistance can be transferred from one type of bacteria to another, Whiteley said, and can create resistance to several types of antibiotic.

Whiteley said this type of transference has been documented in the case of a vibrio bacteria which causes disease in fish. In a laboratory, this resistance was transferred to different bacteria which exist in the North Pacific food chain and are pathogenic to humans.

"This has not been observed in the wild," he said, "but there is a probability it could occur. Experiments indicate the genetic mechanism is in place ... and we can predict it will occur in nature under certain conditions."

The Centre for Disease Control in Atlanta has found the same phenomenon in beef and poultry, he said, and blame it for a dramatic increase in salmonella.

The only solution, he said, is to ban the use of antibiotics in fish culture which are used in human treatment.

In B.C., both oxytetracyline and erythromycin are used in fish culture even though they also are used in human medicine. There is no inspection to determine whether or not this transference of resistance is occurring in B.C. or whether fish sold to consumers is free of antibiotics.

UFAWU loses close vote

The Fisherman 5/23/89

Farms offer 'surplus' chinook

Surplus chinook smolts offered to the fisheries department by the B.C. Salmon Farmers Association should be destroyed, says the UFAWU, rather than released in a makeshift enhancement scheme.

At least eight farms offered the smolts for sale earlier this month, suggesting that some kind of technological breakthrough led to survival rates above their forecast.

In fact, the proposal to sell the "surplus" chinook to the Salmonid Enhancement Program is a bid for a bail-out by an industry facing collapsing prices, said the UFAWU May 10.

"Prices for farmed salmon have tumbled a dollar a pound in the past few months," said union spokesman Geoff Meggs. "They simply can't afford to feed these fish and are hoping the taxpayer will bail them out."

Fisheries department spokesman Ted Perry said at least six million fish were available in farms and hatcheries from Duncan to Powell River. He said DFO would not buy any fish, nor accept donations of fish that were not genetically pure Big Qualicum or Robertson Creek stock.

The fish would be released by DFO into the wild.

At press time, the farmers were insisting on selling the fish, which will starve unless fed by mid-June.

"Release of these fish poses a disease threat to wild stocks and would open the door to private ocean ranching," Meggs said. "Fish farmers have resisted every effort to win appropriate government regulations, but they're not shy about asking for government money when times get tight."

Uncontrolled growth of the industry has seen farm fish harvests rise to 6,000 tonnes last year from 387 tonnes in 1986. Prices have crashed from an average annual farm gate value of $3.17 to $2.27, according to B.C. provincial statistics.

"Spending on salmonid enhancement has been frozen," Meggs said, "but apparently money may be found for this boondoggle. It's a slap in the face to SEP volunteers who have donated thousands of hours and faced steady funding cuts to even to consider this kind of a scheme."

Consumer group urges farm salmon controls

Both levels of government should step up their regulation of the fish farming industry, says the Consumers' Association of Canada (CAC), to protect the consumer and wild salmon stocks.

In a comprehensive task force report on the industry released April 17, the CAC declares that "a self-regulated industry is not in the consumer's best interest."

Farmed fish is being sold "without specific regulations since pre-existing legislation is begin used to govern a new industry," the report says.

In particular, the task force recommends:

- stepped-up provincial government monitoring and regulation of the aquaculture industry;
- public sector testing of fish for market to determine levels of residues;
- monitoring of environmental impacts and prosecution of regulatory violations; and
- consumer labelling to distinguish farmed and wild fish and to report harvest dates.

The report also urges the B.C. Salmon Farmers Association to rejoin the Canadian General Standards Board committees on feed and feed additives to seek ways to reduce residues and contaminants.

The task force expressed concern about colorants, drugs and other medication used in aquaculture "which may remain in the product at the point of consumption."

Antibiotics are a very real problem, the report says, because "long-term consumption of subclinical dosages of antibiotics by humans (for example, by consuming antibiotic-containing fish) can lead to the development of resistant strains of bacteria in the body system."

Treatment of infection in humans can be undermined by such doses, the report notes and "there is a potential for allergic reactions by individuals sensitive to antibiotic traces."

(The farm industry has established a Quality Assurance program with spot-checking which it says will control this problem. Fish must be held 42 days after drug treatment before going to market. The provincial government is recommending at least double that time.)

The task force recommends much tighter controls and monitoring of antibiotic use, including certification of farmed staff handling drugs.

The CAC proposes an industry commitment to "produce, catch and process fish without negative impact to the environment."

All types of fish, farmed and wild, should be checked for chemical residues, PCBs and pesticides.

Consumers should insist on protection of wild stocks, the CAC concludes. "A fish farm industry at the expense of the wild stock would, in fact, reduce the choices of fish for the consumer."

Algea, disease, low prices hammer B.C. salmon farmers

British Columbia's fish farming industry, wracked by collapsing prices, disease, algae blooms and bankruptcies, is facing a major corporate shakedown.

Despite continued assurances by industry leaders that all is well, signs of trouble include:

★a rash of receiverships affecting about 12 farms and three companies;

★devastating algae blooms throughout the Strait of Georgia which have wiped out some farms and crippled others;

★industry agreement that the Sunshine Coast, the scene of a salmon farming goldrush only three years ago, may see an exodus of operations to colder, algae-free waters; and

★continued low prices which are driving down wild salmon prices and forcing more producers to the wall.

The most visible problem has been the algae blooms, which sweep in on hot, calm days and suffocate salmon in their pens within hours. Persistent low levels of algae are believed to contribute to stress and disease.

Losses to various diseases continues to be high on many B.C. farms, according to industry publications.

According to the *Sechelt Press*, a plankton bloom during the Labor Day weekend wiped out five farms, severly damaged five others and destroyed 300 tons of salmon worth about $2 million. The regional dump, which was to be closed to farm waste Oct. 20, was opened especially to handle the emergency.

Farms in Agamemnon Channel took the brunt of the assault, but the entire region was affected. Local fishermen heard radio chatter from farmers seeking some place to dispose of the sudden large volumes of dead fish.

Professor Larry Albright of Simon Fraser University told a public meeting on the impact of fish farms later that month that the entire Strait of Georgia is so infested with the algae that farms will be removed from the area completely.

Meanwhile, prices continue to drop, heading below $1 a pound according to some market reports. The break-even point is estimated to be around $2.25 to $2.50 a pound level.

The crunch of falling prices, provoked in part by aggressive marketing by Norwegian producers, is hitting farms hard in many areas.

Coopers and Lybrand, receiver for threee firms put into receivership by secured creditors, reports continued financial problems for farms in the Campbell River area.

Eric van Soeren, receiver for North American Salmon Corp., operator of six sites around Quadra Island, and Sea Grow, with operations at Nelson Island, saidSept. 19 that new buyers had not been found.

But both firms were thrown into receivership by Norwegian banks seeking to slow their losses on loans to B.C. producers. Now van Soeren is seeking a buyer for Atwood Bay farm near Desolation Sound and expects a busy fall with other troubled firms. He would not disclose who is buying the farm.

As a result of the chaos, the normally boosterish industry is shying away from an optimistic DFO analysis of the industry which predicts production could hit 80,000 to 100,000 metric tons by the year 2000.

Product of 50,000 tons is very realistic, the Price Waterhouse report claims. But industry spokesmen believe that disease and other problems will keep them in the low-growth range of about 20,000 tons until the turn of the century.

(Ed: The above article was reprinted with permission from The Fisherman, Geoff Meggs, Editor)

Fish farmer sues foreigners

A Washington state fish farmer and his corporation have sued in U.S. District Court alleging that foreign national interests have attempted to monopolize the commercial fish farming industry in his state. Lee A. Holley III of Lopez Island in northern Puget Sound alleges in his suit that foreign business interests, primarily Norwegian, operated through American national fronts to destroy competition in the industry, remove local control and violate antitrust laws.

Holley, owner of Northern Nights Fish Farms Inc., is suing several Norwegian corporations that have either sole or partial ownership of farms in Puget Sound. Also named in the suit are state officials and other individuals who allegedly contributed to illegal activity. Holley charges that large financial contributions were made to state political campaigns by the foreign interests, which, he says, also assisted in defeating a moratorium proposed against new businesses in San Juan County, where Holley lives.

Comments from the Norwegian companies and state officials were being withheld pending litigation, according to several reached by telephone.

— Brad Matsen

The Fisherman January 25, 1989

Fish farm drug hits wild stock

Fishermen harvesting shellfish off Scotland say a chemical used by salmon farmers is killing marine life.

Scientists at Aberdeen University have linked the chemical with increasing numbers of wild salmon going blind.

The controversy has erupted over Nuvan 500, which farmers use to control pests. Its byproduct dichlovros, is listed by the 1987 North Sea Conference as one of 26 most dangerous chemicals in waterways.

The debate highlights the severe problems salmon farming disease treatment can pose for the marine environment and other marine life.

According to the *London Observer*, in a report on its wire service Jan. 11, scientists at Norway's Institute of Marine Research in Bergen have found the chemical could be damaging sensitive lobster and crab larvae around the farms. Mussel and oysters also absorb the chemical.

Nuvan is strictly controlled on land, but salmon farmers have easy access because they are not subject to the same regulations.

Fishermen and environmentalists are demanding a ban on Nuvan, but farmers say they will be decimated by sea lice if Nuvan is taken from their arsenal. They favour voluntary controls.

Nuvan is not registered for use in Canada, meaning it is unavailable. Valery Brooks, of the B.C. Salmon Farmers Association, said sea lice are not a problem in this province, but a special session on lice is scheduled for an aquaculture conference in Dartmouth next month.

Scientists there have concluded that sea lice threaten the viability of salmon farming in Atlantic waters and 96 percent of farms must use treatments to control the parasite

A new problem for fish farmers

Foes of Puget Sound pens make an issue out of virus new to Northwest

By Jane Hadley
P-I Reporter

An exotic virus that caused fisheries officials to order almost 4 million fish and eggs destroyed at two hatcheries last week has given new ammunition to foe of fish-raising pens in Puget Sound.

Opponents of the net pens said yesterday they plan to make an issue of the virus at hearings tomorrow and Thursday on a state Department of Fisheries environmental impact statement on net pen fish farming.

But proponents of expanded fish farming on Puget Sound say it would be irresponsible to speculate on the source of the virus. They said there is no evidence pointing to Atlantic salmon or net pens as the cause, as some opponents charge.

But, Jerry C. Grover, of the U.S. Fish and Wildlife Service said logic pointed to the Atlantic salmon.

There are 13 existing net pen operations in the state, most of which grow the Atlantic salmon. Close to 20 other net pens have been proposed.

The virus, known as viral hemmorhagic septicemin or "VHS," was found in cell cultures in two hatcheries in December and positively identified Feb. 17. It has never before been reported in North America. It has caused substantial fish losses in Denmark and other European countries.

No fish reportedly have died of the disease in Northwest waters to date.

The virus was found in cell cultures at the Fish and Wildlife Service's Makah Hatchery near Neah Bay and a joint state-private hatchery at Glenwood Springs on Orcas Island.

"From the conversations I've heard, everyone's looking at the net pen aquaculture industry in Puget Sound and Canada," said Grover, fisheries associate manager for the U.S. Fish and Wildlife Service regional office in Portland.

Grover said it's important "not to be finger-pointing because we don't know" and labeled such a guess as "speculation."

He added, "It doesn't take too much gray matter to put two and two together. You have to ask how the thing leap-frogs from Europe to Puget Sound. The common denominator would be Atlantic salmon. That's what the scientists are talking about."

The state Department of Fisheries, several scientists and an industry spokesman immediately jumped on Grover's comments.

"I'm certain this issue will be thrown at the

See FISH, Page B4

Seattle Post-Intelligencer
February 25 1987

Fish: Virus origin to be probed

From Page B1

industry, when, in fact, I think it's groundless," said Anne Kirske, executive director of the Washington State Fish Growers Association.

But environmentalists were just as indignant yesterday and accused the state Fisheries Department of being a "booster" of net pen farming.

"This is really a terribly threatening thing," said L. Joe Miller, president of the Marine Environmental Consortium, a coalition of numerous local groups fighting proposed net pen operations around Puget Sound.

"It's the kind of thing environment groups we work with have been anticipating and dreading and, now, here it is," he said. "The state and industry have said, no, this is not a realistic concern. They've said we're only worried about our views. Now they say this (virus) has come in on somebody's boot, which is really an insulting suggestion."

Grover discounted the "boot" theory and some other suggested sources. He said it's "kind of far-fetched, even impossible" to believe that somebody who traveled in Europe brought the virus in on his or her boot. The virus can survive only a short time outside living tissue, he said.

Grover said his agency, the state Fisheries Department, the Wildlife Department, and Indian tribes are launching a massive testing program to try to track down where the virus might have spread. The U.S. Fish and Wildlife Agency, for example, will test the 35 miles of the Soses River and its tributaries that are upstream of the Makah Hatchery.

The current theory, he said, is that Soses River fish shed the virus and it got into the hatchery through its water intake.

The Fisheries Department will test saltwater around Glenwood Springs as well as some net pen operations. He said test results should be available in late March.

Grover and Dr. Marsha Landholt, a fish pathologist at the University of Washington, said the rainbow trout is the most susceptible species of fish to get the disease from the virus. Coho salmon can carry the virus and pass it on without getting sick. But fisheries experts are worried about steelhead, because they are a type of rainbow trout.

Several weeks ago, Washington state rainbow trout were injected with the VHS virus in a federal laboratory and suffered "a high incidence of mortality," said Peck of the Fisheries Department. Landholt said VHS may seem "like a scourge to us because it's a new disease. But if you talk to people in Denmark and Europe that have VHS, they don't seem to worry to the degree we are. They seem to manage around it."

Landholt said they disinfect and destroy all fish in all infected hatcheries as well as those downstream.

Puget Sound anglers hooking Atlantic salmon

by Brad O'Connor
Times staff reporter

FISHING
WILDLIFE
NOTEBOOK

Steve Loop caused quite a stir in June when he showed up at Seacrest Boathouse in West Seattle with a 5½-pound Atlantic salmon he'd caught while fishing for blackmouth near the Southworth Ferry landing.

Atlantics are not supposed to be swimming around Puget Sound and it was only the second Dave Nelson, Seacrest manager, had seen in his 17 years at the boathouse.

Atlantics – 1 million or more of them – are in the Sound, but all are supposed to be confined to net pens where they are reared by private growers for markets mostly in the south, the East Coast and California.

Loops' Atlantic was an escapee.

Since June, Nelson has weighed about a dozen others, all caught on on hook and line, which is remarkable. While Atlantics provide some of the world's greatest freshwater sports fishing, they rarely are caught on sports gear in salt water.

"Ponder this," said Nelson, "if we've seen a dozen here, there must be many, many more swimming around out there."

He's correct. There are more.

Will Sandoval, biologist for the Muckleshoot Tribe, said his tribal fishermen have told of netting several Atlantics during summer and fall salmon seasons.

"Some told of catching three or four a day," he said.

Three that Sandoval checked during a state and tribal test fishery for sockeye in July were approaching sexually maturity.

"What concerns me is that they may have been looking for somewhere to spawn. Even if they can't spawn successfully, there's a risk they could be carrying some exotic disease."

Decades ago, attempts were made to establish spawning runs of Atlantics in Washington and British Columbia. All failed and the belief among some fisheries scientists is that further attempts to establish Atlantic runs on the West Coast also would fail.

In fact, most fisheries managers nowadays shudder at the thought of Atlantics spawning in any West Coast stream – not only because of the risk of disease, but because of increased competition for food and space with native trout and salmon.

Reports of Atlantic catches are funneled to Lee Hoines, a Department of Fisheries biologist at Olympia. Of the 203 reported to him last year, most were caught by commercial fishermen in the Bellingham area and around the San Juans.

However, two were caught in fresh water, [illegible] on the Nooksack River and another in July in Cedar Creek, a tributary of the Nisqually.

What if they did spawn successfully?

"My assumption is that they can't. I can't say that absolutely is the case, but I hope they don't," said Tim Flint, another WDF biologist.

Soapbox

De Yonge was right on fish-farm perils

By Arthur H. Whiteley, John W. Brookbank and Annamarie K. Johnstone

In his article (P-I Op-Ed, March 29), State Land Commissioner Brian Boyle took severe exception to John de Yonge's March 5 Focus Section article on fish farms.

We believe that de Yonge's pithy comments were right on target.

Boyle argues against relating fish-farm pollutants to untreated human sewage. In terms of organic sludge whose combustion consumes dissolved oxygen from the water, and loading of the water with various nitrogen compounds and phosphate which act as fertilizers, the two pollutants are essentially alike.

The question of dilution of these discharges is relevant.

Metro's West Point Wastewater Treatment Plant dumps its soluble discharge into the main channel of Puget Sound at considerable depth, permitting dispersion. Fish-pen wastes are deposited on the site as feed pellets and feces, which settle as sediment and dissolved components that enter the water column. The sites are channels or embayments with restricted water flow, not rivers, with a one-way flow that flushes things away. Tides flow and ebb and currents in bays create eddies, leading to retention and accumulation of the pen wastes.

Metro sewage must undergo treatment, at substantial and justified expense to our citizens who create this waste. Discharge is monitored by a permit, mandated by federal Clean Water Act. The fish-pen solid waste enters the bay raw, untreated, without disinfection — and free to the fish farmer. Washington's pens have avoided the federal discharge permits, although the Sierra Club Legal Defense Fund threatens the state with legal action if this requirement is not enforced.

real, just as it has been in Norway.

Boyle's understanding of the *Gyrodactylus salaris* issue in Norway is at variance with reports from Dag Dolmen of the Directorate for Nature Management in Trondheim. This trematode parasite has been introduced into Norway, according to Dolmen's analysis, "through stocking with salmon parr from infected hatcheries/fish farms." Johnson and Jensen report that total salmon catches in infested Norwegian rivers (1970 to 1984) dropped to 16 percent of levels in uninfested rivers. These were mostly wild fish which have been nearly decimated by a parasite spread through "hatchery-/fish farm" stockings. The smolts that are stocked in salt water fish farms are reared as fry in fresh water hatcheries.

In November, Svein Mehli, head of the division of the Directorate for Nature Management concerned with protection of wild salmon in Norway, testified for Skagit County before the State Shorelines Hearing Board. Mehli reported the escape into Norway waters of thousands of pen-reared salmon carrying furunculosis, the appearance of bacterial kidney disease in farmed stock, the presence of redmouth disease in 300 salmon pens — a disease previously unknown in Norway — and of his concern about "other diseases knocking at the door." Given these facts, we disagree with Boyle's position that "environmental arguments against fish farms are essentially specious."

Boyle objected to de Yonge's extrapolation of the targeted 100 fish pens to the sewage equivalent of Seattle's sewage outfall — as "scientifically absurd." But Boyle can find a graph on pages 133 and 134 of the draft Programmatic Environmental Impact Statement to which he referred that shows that 100 pens will load Puget Sound with biological oxygen demand (organic sludge) 150 percent higher than that of the West Point plant, and add an amount of dissolved nitrogen to the embayments equal to that from this sewage plant. We think de Yonge stated things correctly.

In Norway, which has much smaller farms than are permitted here, pens are moved every couple of years to try to mitigate environmental problems. Moreover, they are located closer to the open water at the mouth of fjords. In some regions, alternate fjords are kept free of pens to create security zones between sites.

Atlantic salmon can become diseased in their pens and they do escape. This year commercial fishermen have recorded many Atlantics caught along with native salmon south of San Juan Island and between Bellingham and Point Roberts. Escaped Atlantics have been picked up in the Nooksack, Skagit and Nisqually rivers. These are adult fish, apparently ready to breed. We feel that there remains a possibility that they will breed, that they will become established and that they will compete on the breeding grounds with native salmonids — how successfully neither we nor Boyle knows yet. The presence of potentially diseased pen escapees among breeding natives poses a danger that in our opinions is

Boyle must be well aware of the current concern about appearance of viral hemorrhagic septicemia (VHS) in resident salmonids and doubtless has seen the U.S. Fish and Wildlife Service summary of March 3, 1989, which reports that this virus is confirmed in yearling coho and steelhead trout and fall chinook salmon fry from the Makah hatchery. We assume that he is aware of the opinion from the U. S. Fish and Wildlife Service that the logical, though not proved, avenue for entry of this new disease is via Atlantic net-pen culture. If these are proved to be "specious arguments," then we can drop them.

Is it fair for "the working stiffs" on the gillnet boats, purse seiners and reef boats — white and Indian alike — to be crowded off their fishing grounds, or worse, to have their resource diminished? Should clam growers, who have husbanded their rich resource for three generations, be forced to contend with pollution from a fish pen?

In order to generate new jobs and revenue, a wiser course for our state would be to accept the mitigation measure in the draft EIS — to culture salmon in tank farms. These should be on privately owned land with effluent monitored and regulated by permit and then discharged into deep water. In this way the negative impacts of floating mariculture — navigation hazards, storm-caused breakup of pens, dissemination of disease, release of untreated wastes, difficulties with antibiotics and impairment of aesthetics — would be eliminated. Lastly, land-based fin-fish culture would place the costs of this industry on those who profit from it.

■ Dr. Arthur H. Whiteley is professor emeritus of zoology at the University of Washington; Dr. John W. Brookbank is professor emeritus of microbiology and cell biology at the University of Florida. Dr Annamarie K. Johnstone is a marine microbiologist. Soapbox columns are contributed by readers

Juneau Empire
2-20-90

Japanese buying up Norwegian fish

Surplus of pen-reared fish threatens Alaska's seafood markets in Japan

THE ASSOCIATED PRESS

ANCHORAGE – Norwegian fish farmers are attempting to sell a huge surplus of pen-reared salmon in Japan, long the main market of Alaska seafood processors.

The 88 million pounds of frozen fish could add to an already glutted Japanese salmon market, and drag down prices for this summer's Alaska salmon harvest, according to a U.S. embassy cable from Japan.

More than 80 percent of Alaska's salmon goes to Japan, most of it frozen.

The Norwegians so far have been unable to sell most of their frozen fish, but may cut prices in order to move it, according to the cable released by the U.S. International Trade Administration. If that happens, the Norwegian salmon "will be a threat to U.S. frozen, chum, coho and sockeye salmon," the cable said.

"If they dump it on the market, that would create one hell of a mess," said Roger Dahlke, marketing manager for Trident Seafood, a Seattle processor with plants in Bristol Bay and the Aleutians.

Dahlke said Trident is currently trying to sell a lot of Alaska salmon in Japan. But the company is making little headway in a market swamped with both fresh farm-raised fish and frozen fish left over from last season.

As of December, wholesale prices for sockeye salmon had dropped by more than a third from summertime levels, according to Pacific Fishing Magazine. Prices haven't moved much since then, according to industry officials.

Bill Atkinson, publisher of a seafood newsletter that tracks Japanese markets, doubts the Norwegians will be willing to drop their price low enough to compete on the glutted frozen market.

"The Norwegians are not really interested at selling at a loss," Atkinson said. "And the Japanese are not going to accept a high price for them when there are all the other less expensive fish available."

But one unnamed importer cited in the embassy cable said at least 44 million pounds of the frozen Norwegian fish probably will end up in Japan, knocking down salmon prices just as Alaska's annual harvest begins.

"This scenario, if true, is very critical for U.S. salmon fishermen," embassy officials said. Japanese buyers might import Norwegian salmon in an attempt to force down Alaska salmon prices during preseason negotiations, the cable said.

"With this type of volume they could start eroding traditional (Alaska) sockeye markets," said Gary Ervin, president of the Kenai Peninsula-based Seafoods From Alaska.

Pen-reared salmon production has been expanding rapidly since the Norwegians pioneered the aquaculture technology in the early 1980s. Salmon farming has been banned in Alaska but is legal in Europe, South America, the South Pacific, Canada and the Pacific Northwest.

Farmers feed the salmon until they reach market size. They offer the fish fresh on a year-round basis. Most Alaska salmon is sold frozen or canned.

Within the past five years, farm-raised salmon have taken over most of the European market, as well as much of the East Coast market, according to a report by the state-funded Alaska Finfish Farming Task Force Force.

Last year Norway produced more than 330 million pounds of salmon, a nearly 60 percent increase from 1988, and farmers have been unable to sell all that fish.

That production, combined with a record Alaska salmon harvest and a strong Japanese chum harvest, created a huge glut on the worldwide market. The amount of unsold fish is estimated by the state finfish task force at more than 200 million pounds. That equals the entire 1989 export of Alaska salmon to Japan.

When Norwegian fish farmers could not sell all their fish, they froze large amounts and began pushing it toward Japanese markets long claimed by Alaska.

"I think the impact of farm-reared salmon on traditional Alaska markets is profound, and simply going to accelerate," said Chuck Becker, Anchorage district director of the U.S. Commerce Department's International Trade Administration.

Additives to the Environment of Net-Pen Reared Fish

Pacific Marine Fisheries Commission 42nd Annual Meeting
Seattle, Washington, Ocober 16-18, 1989

PHD Arthur H. Whiteley and Annamarie Johnstone

We have been asked to address our remarks to the matter of additives to the environment of net-pen reared fish. In this particular forum, we assume the emphasis should be on additives that may have an impact on humans when these fish come to market, rather than the impact on the plant and animal communities in the natural environment, though these are not wholly separable.

By its very nature, net-pen rearing of salmon requires the use of numerous chemicals, sometimes in large amounts, some used in the fresh water hatcheries to produce the fry and smolts, some used in the grow-out period in the marine pens, and others used during processing of the fish for the market. Partial lists are shown in Table 1, compiled from Austin and Austin, 1987, from a 1988 report for the Nature Conservancy Council by the University of Stirling, and from other sources.

The lists include chemicals used in salmon and in other forms of fish culture, both in this country and in foreign countries. Inasmuch as farmed fish are imported from some of these other countries, inclusion of these chemicals in the lists may be relevant to the matter of seafood surveillance in the United States marketplace.

Chemotherapeutics. The most relevant additives for present purposes are antibiotics and therapeutants used to control bacterial diseases. Because of stress, disease may cause losses of 30-40%, sometimes higher. Diseases in salmon farms include *Vibrio anguillarum* (vibriosis), *Aeromonas salmonicida* (furunculosis), *Aeromonas hydrophila* (hemorrhagic septicemia), *Yersenia ruckeri* (red mouth), *Vibrio salmonicida* (Hitra disease), *Renibacterium salmonarum* (bacterial kidney disease). To combat these diseases, medicated food containing antibiotics is supplied. In Washington, the FDA approved antibiotics and therapeutants are oxytetracycline (OTC), Romet 30 (sufadimethoxine and orthomeprim) and sulfamerazine. In addition, Tribrissen (sulfadiazine and trimethoprim) is used in Norway and Scotland, and in British Columbia erythromycin is used to control BKD. In Japanese fish culture a wide variety of antibiotics has been used, but has recently restricted the use of chemotherapeutics in cultured fish (Aoki, 1988, pers. comm).

In the US, Norway, BC and Scotland, doses of drugs are as indicated in Table 1B. It is anecdotal, however, that additional amounts of antibiotics are used by farmers, who may mix the drugs with feed and binders. Control of use of antibiotics in Norway and Scotland is regulated by veterinarians, and this is supposed to be the case in B.C. In the British Isles it is apparently easy to find legal loopholes to permit other antibiotics and doses to be used (Austin and Austin, 1987). In Washington fish farmers are supposed to notify the Department of Fisheries if they use antibiotics, but veterinarian supervision is not required. Generally approval exists for only therapeutic use of these

drugs. Nonetheless they often are used prophylactically inasmuch as sick fish may not take the medicated food.

There appears to be no medical or public health supervision or regulation here, or in the other fish farming countries, on the use of antibiotics and chemotherapeutics other than the requirement of FDA approval of the three drugs and their dosages. There appears to be no monitoring by agencies of the use of these drugs or their persistence in marketed fish.

The amounts or drugs used are enormous. In Norway last year, 48 metric tons (105,000 lbs) of OTC alone were used - more than in animal husbandry and human health uses combined (Mehli, 1988, pers. comm. and press accounts). This figure has grown from 13,691 lbs in 1984 (Midtlying, 1985). The 1984 figure for Tribrissen, nitrofurazolidon and sulfamerazine is 30,204 lbs (Midtlying, 1985). Comparable figures for British Columbia and Washington are not at hand. Assuming the dosages cited earlier for the 13 Washington pens, calculation leads to a first approximation of about one ton of OTC, a figure similar to that given by a Washington fish pen operator (Dr. A. Bill, 1989, pers. comm.).

The relevant issue here is "Do these uses affect man?" Consumers clearly would be exposed to residual antibiotics in the fish meat. Because of the potential for these residues producing a serious problem in public health, Japan has recently restricted the use of chemotherapeutics, and does not allow cultured fish to move to market if residual drugs can be detected in fish meat (Aoki, 1988, pers. comm.). The potential for adverse effects has been emphasized by Austin (1988, conference in Vancouver, B.C.; Austin and Austin, 1987). The current regulations for control of such residues are based on admittedly minimal research. The FDA requires a 21 day withdrawal period after the last medicated feeding of OTC and 42 days for Romet 30 before slaughtering for the market. In B.C. the withdrawal period is 42 days, and in Norway 61 days. Very few data exist for measurement of persistence of these drugs in fish flesh after feeding. McCracken et al (1976) measured the presence of trimethoprim in trout muscle 77 days after medication; Salte and Liestøl (1983) calculated that the withholding period for trout receiving OTC should be 100 days at winter temperatures, and for Romet 30 they recommended withdrawal periods of 60 days, above 10^0C. All authors emphasize that temperature is a seriously complicating factor - residues of Romet 30 persisted for several months in fish at colder temperatures, leading Salte and Liestøl to recommend using the component drugs only in summer. Clearly these limited data do not support the FDA regulation of 21 days. New, more refined measurements of drug residues in salmon coming to market clearly are needed - a recurrent theme of the Austins. Some of these measurements are being made now at the University of British Columbia by McErlane et al. (1989), and Grondel et al. (1987) have published a pharmacokinetic analysis of OTC distribution in carp. In the absence of more detailed studies, humans ingesting farmed salmon may be receiving subtherapeutic doses of antibiotics. One would like to see regulations established for testing the product, by agencies, as it comes to market to ensure the absence of detectable residues. Methods used should be such as those approved by the National Committee for Clinical Laboratory Standards

used by the Clinical Laboratories, Laboratory Medicine, University Hospital, University of Washington.

The issue extends beyond the limits of the penned salmon. Much of the antibiotic fed escapes into the fluid environment and, notably, into the sediments that accumulate beneath the pens (Jacobsen and Berglind, 1988), where it may be exposed to native fish, shellfish, and other indigenous species, thus providing another avenue to humans who may catch and consume these forms.

The medical consequences of the mis-administration of antibiotics are numerous, and are well discussed in such modern treatises as Goodman and Gilman (1985) and Kucers and Bennett (1987). A number of them are antigenic and elicit immunological hypersensitivity responses; some have toxic effects in various tissues varying with the physiological and health state of the person; some particularly should be avoided during pregnancy; tetracyclines lead to discoloration of infants' teeth and may interfere with bone growth; some, notably the tetracyclines, may lead to the development of superinfections by resistant strains of bacteria; they may interfere with the normal immune response; and the breakdown products of antibiotics, including OTC, can be toxic particularly in individuals with compromised livers. Basically, it is poor medical practice to ingest unneeded antibiotics or deteriorating antibiotics.

Another cluster of problems associated with use and misuse of antibiotics is the generation of strains of pathogenic bacteria that have resistance to the drugs. Such strains have now appeared in essentially all fish culture communities that have been adequately tested. Mostly the resistance factors are carried on R plasmids, which also usually are found to carry resistance determinants for 1 to 8 additional antibiotics, thus showing multiple drug resistance. In high proportions, these R plasmids are transferable to other bacteria, and thus drug-resistance may be disseminated to other ecosystems. Studies at the Centers for Disease Control have shown that outbreaks of salmonellosis could be traced to drug-resistant *Salmonella* derived through the foodchain back to land farms associated with agricultural antimicrobial use (Cohen and Tauxe, 1986). It is prudent to evaluate the possibility for a similar generation of R plasmids in fish farms and their dissemination to human populations in the marketplace. When drug-sensitive populations of pathogens are replaced by drug-resistant populations, then treatment of the affected fish becomes ineffective, and, if the R plasmids are in human pathogens, treatment of patients would be adversely affected. Particularly, it is a general principle that medically important antibiotics, including oxytetracycline, the sulfas and erythromycin, should be restricted in their nonmedical uses to minimize R plasmid selection and transmission.

When antimicrobials are used in fish farms near commercial or recreational shellfish beds, there is the further potential for drug-resistant organisms to be concentrated by the shellfish, through filtration, and thus enter human populations.

Food additives. The dry pellets, fed to the penned fish in the marine environment, contain fish meal, grains, fish oils and carbohydrates, supplemented by minerals and vitamins as indicated in Table 2. While these additives have no direct human import, it is reported that planktonic blooms of

the ichthyotoxic dinoflagellate, *Gyrodinium aureolum*, were enhanced by the biotin in fish farm wastes (Turner et al., 1984). These blooms cause mortalities to cultured fish, and, unfortunately, to wild fish as well (Bullock et al., 1985).

Pigment is added to the feed to produce a colored flesh in farmed salmon, inasmuch as the color of wild salmon flesh is derived from natural food organisms. In Great Britain, the carotenoid canthaxanthin, an analog of astaxanthin common in natural food organisms, is used in the form of carophyll red. It is stated in a report from the University of Stirling that this use is banned in the US because of possible carcinogenic properties of canthaxanthin (NCC Report, 1988). To date a petition for its use has not been submitted to the FDA (FDA, Seattle Office, 1989). A petition is presently under consideration for use of astaxanthin as a colorant. A main local supplier adds canthaxanthin as a colorant. There clearly are gray areas here where research and regulation is sorely needed.

Many wild fish are rich in omega 3, polyunsaturated fatty acids. A higher ratio of omega 3/omega 6 fatty acids is believed favorable for maintaining low cholesterol levels in humans. Cultured fish and other sea foods, because of their artificial diets, may have low levels of omega 3 fatty acids, and thus unfavorable ratios of omega 3/omega 6 (Suzuki et al., 1986; Chanmugam et al., 1986). Consequently, individuals eating farmed salmon in the expectation of gaining this supplement will typically be erring, unless the farmer has specifically added it as a dietary supplement and indicated this in marketing. The dry pellets supplied locally generally do not have omega 3 acids added as a supplement (Moore-Clark Co., 1989, pers. comm.) because these are contained in the fish oils of the fish meal used.

Moist pellets, which are more commonly fed during the hatchery phases of salmon farming, are derived from fish meal that is pasteurized, combined with additives, and frozen. However, moist pellets used in some fish farms in Puget Sound contained *Salmonella spp.* (Draft PEIS, WDF, p. 116, 1989). Moist pellets used in British Columbia have been found to contain *Salmonella* (Kelly, 1988, pers. comm.; Babink, 1988, pers. comm.). In these cases it is unclear whether the pathogens had survived the pasteurization, or had appeared subsequently. These pathogens can persist for a period of time in marine waters, are harbored by fish in polluted waters, without harm to them (Buttiaux, 1963). Marine shellfish can concentrate *Salmonella* and transmit them to humans. There is, therefore, a potential for fish culture to join animal husbandry as a mode for affecting humans in the manner described by Cohen and Tauxe (1986).

Hormones. At this time, hormones are being used in B.C., experimentally and perhaps to an extent in actual culture, to control the sex, size and behavior of penned salmon, both *Oncorhyncus* spp. and *Salmo salar*. Gonadotropin, gonadotropin releasing factor and analogs, and antiestrogens have been used in adult females to modify spawning. Androgens and estrogens are used to cause feminization, and, in combination with other techniques, to produce triploid and tetraploid stocks for production of sterile salmon. A review is provided by Donaldson (1986).

In general, these treatments are used on egg-producing females or on eggs and sperm, and the likelihood of carry-over of hormones to adult, marketable fish is tiny. Anabolic steroids including methyl testosterone,

thyroid hormones, somatotropins, certain pituitary hormones can be used to accelerate growth in juveniles and the timing of smoltification (Donaldson, 1986). If these hormones, or androgens and estrogens, were used for growth acceleration or other effects on near-harvest adults, then there would be cause for concern to human consumers.

Pesticides. A remarkable list of agents are or have been used in salmon culture. Examples are: formalin, malachite green, acriflavin, Nuvan, Neguvon, Chloramine T, MS222, copper sulfate, tributyltin, diquat, in addition to the chemotherapeutics. Some are used in Scotland and Norway which apparently are not used, or not permitted, in the U.S. and B.C. Lists are incorporated into Table 1 of this presentation.

Treatment of salmon lice (*Lepeophtherius salmonis*). These copepod ectoparasites pose a severe problem for adult penned fish in Scotland and Norway. In Europe, organophosphate pesticides (Nuvan^R (dichlorvos; Scotland) and Neguvon^R (trichlorfon which forms dichlorvos; Norway) are primarily used. Fish are treated by immersion in a concentration of 1 ppm for 1 hr, as needed. In 1984 39,600 lbs of Neguvon were used in Norway (Midtlyng, 1985). They are inhibitors of acetylcholinesterase activity in the cholinergic nervous system. These agents not only kill fish lice, but other crustacea in the environment as well, including commercially important species such as crabs, lobsters and mussels (Egidius and Moster, 1987), and they cause potentially serious problems to the treated fish (Davies and McKie, 1987; NCC Report, 1988). These agents are restricted by the EPA in the U.S. (Seattle EPA Office, 1989). In Washington, the carbamate Sevin^R (carbaryl) has been suggested for use for treatment of salmon lice, and it is used in oyster culture for controlling ghost shrimp. Sevin, also, is an inhibitor of acetylcholinesterase. Sevin has recently been restricted in parts of the United States, and its discharge is regulated by an NPDES permit. BRAVO (chlorothalonil), a fungicide has been suggested for and used recently on fishpen nets, a use banned by EPA because it is a class B carcinogen (EPA, Seattle, 1989).

Disinfectants and Antifoulants. Formalin and malachite green have been used for control of ectoparasites and fungi, usually in the fresh water phases of farming. Malachite green, a potential teratogen (NCC Report, 1988), is now banned. MS-222 is used under certain conditions for anaesthesia, but with a 21-day withdrawal period for clearance from tissues. Hatchery ponds are sterilized with chlorine.

To prevent fouling of nets by growth of algae and encrusting invertebrates, fish farmers have treated nets and pen structures with the antifouling agent, tributyltin (TBT). This substance, at exceedingly low concentrations, has a variety of adverse effects on marine invertebrates and perhaps on vertebrates (Bailey, D.S., 1987). When, in 1987, farmed salmon appeared in the Seattle markets carrying substantial amounts of TBT in their flesh, the state enacted a law prohibiting this use and partially eliminating it from use on boats. A similar law exists in the national statutes, in Great Britain and other parts of Europe. Despite this ban, a Canadian Governmental memorandum on August 11, 1988, titled "Private Salmon Hatcheries and Netpen Facilities, Some Serious Concerns" indicates that 25% of BC pens are still treated with unregistered boat hull paints, sometimes including TBT, which liberate

large quantities of particulate paint into the water, sometimes onto oyster beds, thus creating potential hazards for two kinds of aquacultured products.

If antifoulant is used on nets now, usually it is copper-based. Copper and other heavy metals are highly toxic to many marine invertebrates. Standards for permissible amounts of copper in farmed fish flesh appear to be lacking.

Summary. There are a number of chemicals and additives used in net pen culture now that have the potential for adverse human impact. Often these are used at the discretion only of the user, and with little or no external monitoring. There appears to be little or no input into this regulation by public health agencies.

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Table 1
Chemicals Used in Net Pen Culture of Fish
(From Austin and Austin, 1986; The Nature Conservancy Report, Scotland, 1988; and other sources)

Chemotherapeutics

- Oxytetracycline
- Romet 30[R] (sulfadimethoxine and orthomeprim)
- Sulfamerazine
- Tribrissen[R] (trimethoprim
- Erythromycin
- Penicillin G
- Oxolinic acid
- Minocycline
- Clindamycin
- Kitasamycin
- Rifampicin
- Hyamine 3500
- Copper sulfate
- Streptomycin
- Sulfisoxazole
- Kanamycin
- Fumequine
- Chloramphenicol
- Chloramine T
- Acriflavin
- Acetic acid
- Formalin
- Malachite green
- Iodine
- Iodophor
- Benzalkonium
- Nitrofurantoin

Pesticides

- Dichlorvos (Nuvan[R], an organophosphate)
- Trichlorfon (Neguvon[R], an organophosphate)
- Carbaryl (Sevin, a carbamate; used in oyster culture)
- Diquat

Antifoulants and Disinfectants

- Tributyl tin - now banned
- Copper paint
- Bitumen
- Chlorine
- Chlorothalonil

Anaesthetics

- MS-222 (tricaine methane-sulfonate)
- Benzocaine
- Carbon dioxide

Food additives

- Colorants-canthaxanthan
- Minerals
- Vitamins
- Omega 3 fatty acids

Table 1B

Doses of Antimicrobials Commonly Used in Salmon Net-pen Culture

Antimicrobial	Dose, mg/kg of fish/day	Days of Treatment
Oxytetracycline	75	10
Romet 30	50	5
Sulfamerazine	220	14
Tribrissen	30	10
Erythromycin	10-25, or unspecified	4-21

These regimens are repeated 2 or 3 times a year

Table 2
Mineral and Vitamin Food Additives in Salmon Pellets

(Data from Nature Conservancy Council Report 1988, and Moore-Clark Analysis)

Minerals

- Calcium phosphate
- Magnesium sulfate
- Sodium Chloride
- Potassium chloride
- Iron sulfate
- Zinc sulfate
- Copper sulfate
- Manganese sulfate
- Cobalt sulfate
- Chromium chloride
- Ethylenediamine dihydroiodide
- Selenium

Vitamins

- Thiamine hydrochloride
- Riboflavin
- Calcium pantothenate
- Niacin
- Pyridoxine hydrochloride
- Biotin
- Folic acid
- Cyanocobalamin
- Inositol
- Ascorbic acid
- Choline chorlide
- Menadione
- alpha tocopherol acetate
- p-aminobenzoic acid
- Retinol acetate
- Vitamin A
- Vitamin B12
- Vitamn D3
- BHA-BHT, antoxidant

Alaska Water Resources Board
Resolution No. 89-22

Possible Impacts of Fish Farming

WHEREAS: A strong market for fresh salmon and therefore a demand for rearing areas exists for pen reared salmonid fin fish.

WHEREAS: The State of Alaska has an abundance of salt and fresh water environments ideally suited for this economic activity.

WHEREAS: There is a persistent and ever growing clamor on the part of fin fish growers to have Alaskan water resources made available to them.

WHEREAS: The State of Alaska has a very large, extremely valuable wild fish population distributed throughout the state upon which very valuable commercial, subsistence and recreational fisheries are also dependent.

WHEREAS: After an initial period of very rapid growth and expansion into lucrative markets for their product the fin fish industry elsewhere in the world is now beset with problems of disease, parasitic infestations and escapement of penned stocks leading to the degradation of wild salmon stocks.

WHEREAS: There are among the so far identified dangerous diseases and infestations those that are demonstrably able to be transported from country to country and from continent to continent under present conditions.

WHEREAS: Among these afflictions there are disease infestations for which there is no known treatment and parasitic infestations which once established would require the roetinone treatment of entire river systems to eradicate.

NOW THEREFORE BE IT RESOLVED: The Alaska Water Resources Board recommends that there be no fin fish farming of salmon or trout in Alaska until it can be established that the disastrous consequences of inadequately regulated fin fish farming now being experienced in other parts of the world will not occur here; and

NOW THEREFORE: The Board further recommends that the Fin Fish Task Force created but not funded by the 15th Alaska Legislature be reactivated, funded and charged with the task of assemblying the necessary information to assure that fin fish farming, if allowed, will not constitute a deadly hazard to our wild stocks.

Adopted this 9th day of March, 1989
Alaska Water Resources Board

Peg Tileston

Peg Tileston, Chairwoman
Alaska Water Resources Board

Alaska Mariculture Association

TO: Senate Labor and Commerce Committee

FROM: Rodger Painter

DATE: April 18, 1990

RE: Upland Finfish Farming

The Alaska Mariculture Association (AMA) respectfully requests that you consider amending House Bill 432 to allow upland finfish farms. While there may be room for legitimate disagreements over the impacts of salmon net pen culture in marine waters, there's a great body of research and experience showing that the environmental and biological effects of upland fish farms are negligible. This conclusion was unanimously supported by the Alaska Finfish Farming Task Force.

Opponents of finfish farming have attempted to suggest that land-based farms can harm wild stocks through groundwater contamination. Often cited as an example is a report by the Washington Department of Ecology (DOE) which concluded that a 1989 fish kill in the Black River probably was caused by pollutants discharged from a land-based fish farm. What is not mentioned is that the report was thoroughly discredited by an independent group of state and federal scientists.

Attached is a critique of the DOE study by the Interagency Work Group on Fish Health, which is comprised of recognized experts in fish health issues. The review was prepared at the request of the Washington House Fisheries and Wildlife Committee. The group unanimously determined it was impossible to justify DOE's conclusions and that DOE erred in ruling out ambient river conditions as a cause of the kill.

The Alaska Department of Fish and Game should be provided with the authority to require upland farms to treat discharges to protect wild stocks on a case-by-case basis. ADFG already requires a few state hatcheries to treat wastewater discharges as a safeguard against transmission of pathogens to wild stocks. Indeed, ADFG's success in preventing disease transmission to wild stocks from hatcheries demonstrates the safety of upland fish farms.

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

HB 432 & SB 397 and Upland Finfish Farming in Alaska

House Bill 432 and its companion measure (SB 397) would impose a ban on all finfish farming activities. This is an unreasonable response to the concerns of fishing groups which have focused on the net pen rearing of salmon in the marine environment.

The Alaska Finfish Farming Task Force spent several months grappling with these concerns, and determined that net pen rearing of salmon can be regulated in a manner minimizing environmental and biological impacts. The task force also stated that upland finfish farms present few potential problems, and the impacts of marine culture of non-salmon species would be much less than salmon in net pens.

Upland fish farming virtually eliminates the potential for escapees and impacts on the genetic integrity of wild stocks. Likewise, the potential for transfer of disease from fish cultured in upland farms to wild stocks can be eliminated with proper treatment of wastewater discharges.

Why should operations such as the small-scale coho salmon farm in Fairbanks two years ago be banned? Under a narrow exception in the three-year moratorium on finfish farming, Andy and Pam Wescott of Fairbanks started farming in tanks in their workshop, using water from a private well and disposing of wastewater in the city sewer system. The broodstock came from surplus salmon returning to a local stream. The operation had no disease problems, and the director of the state's hatchery program said the fish were very healthy and were in excellent condition. The Wescotts were forced to close down their farm when the Board of Fisheries (six of seven members are commercial fishermen) refused to approve the required authorizing regulations.

There now are several arctic char farms in Canada including a freshwater tank farm in Whitehorse. The Mat-Su valley has tremendous aquifers and could be suitable for the culture of char, salmon or trout. Should the residents of the Mat-Su and other Alaskans be denied these economic development opportunities? What are the objections to these land-based aquatic farms? Are there valid public policy reasons to prevent an environmentally and biologically sound industry?

The fishermen's concerns always have been the net pen rearing of salmon. The primary objection to other forms of finfish farming is that it represents the camel's nose under the tent and it might set the stage for later approval of salmon farming. Is that how Alaska is going to diversify its economic base? Passage of HB 432 in its present form would be quite a statement about the legislature's commitment to economic development.

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

College of Ocean and Fishery Sciences
Office of the Dean, HN-15

February 6, 1990

Representative Richard A. King
Chair, House Fisheries and Wildlife Committee
House of Representatives
State of Washington
Olympia, WA 98504

Dear Mr. King,

In December, 1989, members of the Interagency Work Group on Fish Health received copies of the following documents: (1) the Black River Fish Kill Report, (2) the Appendices to the Black River Fish Kill Report, (3) a document prepared by Washington Department of Fisheries that was mistakenly omitted from the Appendices, and (4) the Department of Ecology news release regarding the kill. Work Group members were asked to review the Report and Appendices in the manner they would normally apply to the peer review process for scientific journals. On January 8, 1990, the committee convened in Seattle to discuss the documents and to prepare a response to the House Fisheries and Wildlife Committee. A list of Work Group members who participated in the review are attached to this letter.

Work Group members concurred that Department of Ecology (DOE) and Department of Fisheries (WDF) personnel expended a considerable amount of energy in attempting to determine the cause of the fish kill; however, the members were unanimous in their opinion that the conclusions drawn from the study (Report Section 6.0) cannot be supported by the data collected (Report Section 4.0).

Conclusion 1--"fish kill event was not caused by ambient river conditions."

Although DOE was notified of the fish kill on August 8, 1989, and had personnel on site within hours, ambient river condition surveys were not conducted until August 17-18 (Report Table 7). This 10-11 day delay in collecting samples makes it impossible to reconstruct the conditions existant at the postulated onset of the kill (August 6-7).

The data collected in the August 17-18 survey included measurements of water temperature, dissolved oxygen (DO), percent saturation, and conductivity, but did not include measurements of river flow. Considering the season of year (summertime; period of elevated productivity), the high daytime temperatures (>19 C) and the low-gradient nature of the Black River, flow rate was a critical factor for evaluation.

DO levels of 6.7-11.8 ppm measured in surface waters contrasted sharply with the life threatening DO levels (<1.1- 2.6 ppm) measured near the bottom of the river (the portion of the water column utilized by many aquatic species, including salmonids). While it is true that fish avoid low dissolved oxygen levels whenever it is possible to do so, it is well known that avoidance may not be possible when DO levels decline over large areas as a result of nighttime aquatic plant respiration.

Given the low oxygen levels, the high water temperatures, and the absence of flow rate data, it is not possible to rule out ambient river conditions as a cause of the kill. In fact, the Report states (p. 29) that the "combination of low river velocity, high nutrient concentrations, high productivity, and stratified pools is one which can put the lower Black River at risk to conditions which induce anoxia."

Conclusion 2--"the fish kill was caused by a pollutant."

The Report states (p. 29) that " no pesticides or herbicides were found in the Black River sediment samples" and that "metals were below toxic levels." The Report further states (p.29) that the finding of a whitefish carcass near river mile 13 provided indication that "a limited summer kill was occurring", an event "which is normal."

The Appendices contain (l) correspondence from Dick Huntamer (DOE) to Steve Hunter (DOE) stating that acid/base neutral organics, volatile organics, pesticides/PCB's, organo-phosphorous pesticides and herbicides were not present in significant levels; (2) correspondence from Margaret Stinson (DOE) to Dave Halleck (DOE) stating that bioassays conducted at Biomed Research Laboratories revealed no evidence of toxicity; (3) data from Analytical Resources Incorporated indicating that while residual formaldehyde (12.74 ppm) was present in the sediment of the settling pond at Global Aqua, none was detected in water samples taken from the river. Not included in the Appendices (but provided to Work Group members) was a report from Patrick F. Chapman (WDF) stating that fish mortality patterns in the river did not support the theory of a toxic pollution spill.

In the absence of any data indicating the presence of chemicals in water, sediments, or flesh, and in the face of a statement that limited summer kills are normal on the Black River, it is impossible to justify the definitive statement made in Conclusion 2.

Conclusion 3--"kill...probably occurred on August 6, 1989, and began in the vicinity of river mile 9.2."

On August 8, 1989, WDF personnel collected fish carcasses at river mile 6.5. Based upon the degree of decomposition noted in the tissues, they speculated that the fish had been dead for 24-48 hours. That observation forms the basis for fixing the onset of the kill. Given the statement (p. 15) that "carcasses were not visible from the shore", it is possible that the kill started earlier but was not detected.

The conclusion that the kill began in the vicinity of river mile 9.2 is based upon stream and shoreline surveys conducted by WDF, DOE, and the Chehalis Indian Nation. The data presented in the report (Table 5) and in the Appendices (Attachment 7) are not sufficiently quantitative to permit evaluation of this conclusion. Therefore, lacking further documentation, the conclusion is unwarranted.

Conclusion 4--"Black River contained elevated levels of ammonia, nitrites, nitrates and phosphorous."

Dr. Gary Wedemeyer, a physiologist specializing in water quality factors that affect fish health, reviewed the data contained in the Report and Appendices and stated, based on his experience, that the nutrient levels in themselves did not appear to be life threatening to salmonids. He cautioned, however, that the data were difficult to interpret because nitrite levels were lumped together with nitrate levels and reported as a single value. The interpretation problem arises from the fact that nitrite is extremely toxic to fish, while nitrate is essentially non-toxic.

Conclusion 5--"investigators were not able to find physical evidence of pollutants being actively discharged into the Black River."

No comment.

Conclusion 6--"Results...indicate discharge permits in this area warrant upgrading."

The evidence presented in the Report is inconclusive. It neither supports nor refutes this statement.

Summary of Comments--The Work Group members who independently and then jointly reviewed the study unanimously concur that the evidence presented in the Report is mixed and that it does not support any particular cause for the fish kill. We recommend, therefore, that the Summary (1.0) and Conclusions (6.0) sections be re-written to reflect this fact, and that the body of the text be edited to remove unsupported and unprofessional innuendo.

Recommendations for future fish kill studies--Fish kills are reported in the State of Washington on a regular basis. Some kills arise through natural causes (e.g. poor ambient conditions, epizootics, toxic phytoplankton blooms, supersaturation), others through the activities of man (e.g. chemical spills, toxic discharges, physical disruption of habitat). In investigating fish kills, it is important (l) that data collections be initiated in a timely fashion, (2) that appropriate data be collected, (3) that studies be approached in a scientific manner, and (4) that studies be conducted in a way that will utilize the strengths of appropriate State agencies and that will draw upon the expertise of qualified professionals whose training and credentials are relevant to the investigation.

Points 1 and 2--In 1972, the Department of Ecology published a manual entitled "Guidelines for Evaluating Fish Kill Damages". Detailed in that publication are the procedures to be used when investigating a kill as well as the types of data to be collected. A number of the Guidelines were not followed in the present study, and their omission contribute to deficiencies in the Report. We recommend that DOE review and update this publication, and implement the guidelines in all future investigations.

Point 3--Members of the Work Group were troubled by the tone of the Report and by the apparent desire of the author(s) to identify a culprit. In investigations of this type it is critical that agency personnel take a dispassionate, open-minded approach to the investigation.

We realize that fish kills can be dramatic, disheartening events to the on-site investigator, and that they can create a storm of public outrage. However, if the investigator allows personal feelings to come into play or if he/she makes a priori assumptions regarding the cause of the kill, important points can be overlooked and critical data can be lost.

Because of the high visibility of fish kills and because of the potential damage that can result from incomplete investigation or incorrect interpretation of data, we also recommend that reports be subjected to peer review by non-agency personnel prior to publication.

Point 4--The various State agencies differ in the range of expertise that their staff may bring to the investigation of a fish kill. For example, DOE personnel are uniquely well qualified to conduct chemical analyses, but WDF and WDW personnel have the knowledge that is required to evaluate fish pathology, fish habitat requirements, hatchery operations, etc. While there was interagency co-operation in this study, increased effort should be made in the future to utilize the expertise of appropriate State agencies and to address differences of opinion that may arise regarding interpretation of data. When necessary, investigators also should make efforts to capture skills from other organizations (e.g. universities, federal laboratories).

We hope that this letter has provided the assistance you requested. If the Work Group can be of further service to your Committee or if you require additional information, please feel free to contact me.

Sincerely,

Marsha L. Landolt

Marsha L. Landolt, Chairman
Interagency Work Group on
Fish Health Issues

WORK GROUP MEMBERS PARTICIPATING IN REVIEW

DR. RALPH ELSTON
Senior Research Scientist
Battelle Marine Research Laboratory
Sequim, WA

DR. LEE HARRELL
Veterinary Medical Officer
Manchester Fisheries Research Laboratory
National Marine Fisheries Service
Manchester, WA

MR. JOHN KERWIN
Program Manager
Washington Department of Wildlife
Olympia, WA

DR. MARSHA L. LANDOLT
Professor, Fish and Shellfish Pathology
School of Fisheries
University of Washington
Seattle, WA

DR. MICHAEL SCHIEWE
Research Microbiologist
Northwest Fisheries Center
National Marine Fisheries Service
Seattle, WA

DR. GARY WEDEMEYER
Chief, Fish Health Environmental Requirements Research Section
National Fisheries Research Center
US Fish and Wildlife Service
Seattle, WA

DR. JAMES R. WINTON
Project Leader, Fish Disease Research Group
National Fisheries Research Center
US Fish and Wildlife Service
Seattle, WA

APR 18 1990

April 12, 1990

Senator Bettye Fahrenkamp
P.O. Box V
Juneau, Alaska 99811

Dear Senator Fahrenkamp,

I would like to commend you for your opposition to a permanent moratorium on finfish mariculture. As a fisheries economist at the University of Alaska, I am amazed at the level of legislative support in favor of a permanent moratorium. Alaska is in desperate need of new industries to mitigate the inevitable decline of the oil industry. There is limited potential for expansion in the fishing industry since virtually all State and Federal fisheries are fully Americanized. Timber markets are saturated to such an extent that the timber industry is unlikely to expand without substantial subsidization. Alaska is disadvantaged in most agricultural production. Although there is potential for some expansion, particularly in the area of game culture, it is unlikely that the agricultural sector will become a major source of revenue. Hard rock minerals and coal could be greatly expanded. Mining combined with processing and in-state manufacturing of export goods, would result in considerable revenues. However, the mineral industry is hobbled by the lack of roads, numerous state and federal hurdles, and the prevailing high wage rate. Tourism is a wonderful source of revenue that can be anticipated to continue to expand. Finfish mariculture also has the potential for generating substantial revenues.

Alaska has a comparative advantage in finfish mariculture for several reasons. Firstly, there are many protected waters with excellent exchange all along the extensive coastline (especially in Southeast Alaska, Prince William Sound, Kodiak, and along the Aleutian Peninsula.

Secondly, the fishing industry is under increased pressure to more fully utilize their catch and to reduce discharges of fish processing byproducts. After the roe has been stripped or fillets removed, fishmeal is about the only product that can be made out of the residuals. The world price for fishmeal is so low that it barely covers shipping costs. Finfish mariculture would use fishmeal as a primary input. Alaskan mariculturists would be able to buy fishmeal at below world prices (since they would face lower transportation costs). Alaskan fish processors would be able to sell fishmeal at higher prices than they currently receive because of the increased local demand.

Thirdly, finfish mariculture would be able to provide fish processors with deliveries out of season. This could increase the number of processors able to operate on a full year rather than seasonal basis. Full year employment opportunities would encourage processor employees to relocate to Alaska, spend their wages in Alaska, become Alaskans. Since mariculture is a nearshore operation, it would increase the profitability of shorebased processors thereby improving their ability to compete with offshore processors.

Provided by Rodger Painter

Fourthly, finfish mariculture is a compliment to fishing. The same vessels that are locked in an ever faster Olympic race for a share of the limited fishery resources could be used out of season to tend mariculture operations. The costs of developing and operating small scale salmon pen operations are far less than the costs of purchasing a Bristol Bay gillnet permit, and could easily be financed through commercial agriculture or fishing banks. Smolts could be purchased from state or cooperative hatcheries, with the proceeds of smolt sales available to subsidize current fisheries enhancement programs.

Finally, concerns about genetic pollution of wild fisheries, localized eutrophication and disease are not entirely unfounded, however, they are not unique to mariculture. Current enhancement programs alter genotypic frequencies and offer conditions which increase the potential for disease. One possible solution to concerns about genetic pollution would be mandated sterilization of penned fish (the economic feasibility of sterilization has been demonstrated in a number of cultured fish species). Localized eutrophication is also a problem with agriculture, urbanization, and the discard of fishery and fish processing byproducts. In mariculture, eutrophication is evidence of a poorly run operation, too much feeding and excessive stocking densities.

Although mariculture in not a panacea, it is an opportunity that Alaska shouldn't ignore.

Respectfully,

Keith Criddle
4530 Stanford Drive
Fairbanks, AK 99709

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

SOUTHEAST REGIONAL OFFICE
DIVISION OF LAND AND WATER MANAGEMENT

STEVE COWPER, GOVERNOR

400 WILLOUGHBY AVENUE
SUITE 400
JUNEAU, ALASKA 99801-1000
PHONE: (907) 465-3400

March 23, 1990

Re: Thorne Ferguson

Honorable Richard I. Eliason
c/o Pouch V
Juneau, Alaska 99811

Dear Senator Eliason:

Research of our records indicates that T. Ferguson Construction, Inc. did purchase U.S. Mineral Survey 419B, known as the Maine, Montere, and San Francisco claims from Georgia-Pacific Corporation, (Warranty Deed, 1984). The property is located at Copper Harbor, Hetta Inlet, on the west side of Prince of Wales Island. In 1985 In 1985 Mr. Ferguson submitted applications intended to obtain approval of what appeared to be a multi-stage development. According to one of the cover letters, the initial stage of construction (development of a seasonal resort for hunting as well as fresh and salt water fishing) was intended to support the second stage (the development of a hatchery and fish farm); see ADL lease application 104488.

In September of 1987 the applicant indicated to DNR they had received a Army Corps of Engineers permit dated in June of 1986. Proposed construction under the Corps permit consisted of a lodge, barge ramp, and docks to be constructed in conjunction with the proposed private fish hatchery. The permit stated that the lodge and docks would supported by approximately 100 piles, and the barge ramp would consist of a timber crib bulkhead placed at M.L>L>W. and back-filled with approximately 1,800 cubic yards of shot rock fill (see Army Corps of Engineers Public Notice of Application for Permit Hetta Inlet 7, dated September 3, 1985).

However, contrary to the lease application and corps notices, a letter from the State Office of Management and Budget dated August 22, 1985 appears to indicate that the applicant dropped the hatchery portion of its proposal at that time. Mr. Menzies letter of June 2, 1986 appears to furnish the reason. The OMB consistency determination of May 9, 1986 purposely dropped consideration of the hatchery and hydroelectric plant.

10-J35LH Re: Thorne Ferguson

The 1986 Army Corps of Engineer Permit is the only document that appears to still imply a remaining interest in a hatchery. None of the State approvals, including Water Use Applications LAS 6089 and 6090 involve the hatchery proposal directly.

It appears clear from the file that the applicant was never assured of being able to develop a hatchery. That although it is something that he wanted to do, he decided to proceed with the lodge with no guarantees that he would be able to construct the hatchery. It is possible that the $500,000 figure thrown around would include the $370,000 initial purchase price.

Please let me know if there is anything else I can do.

Sincerely,

Andrew W. Pekovich
Regional Manager, SERO

CC: Larry Ostrovsky
Gary Gustafson
Janet Burleson